

Appendix A: Energy Efficiency CAP

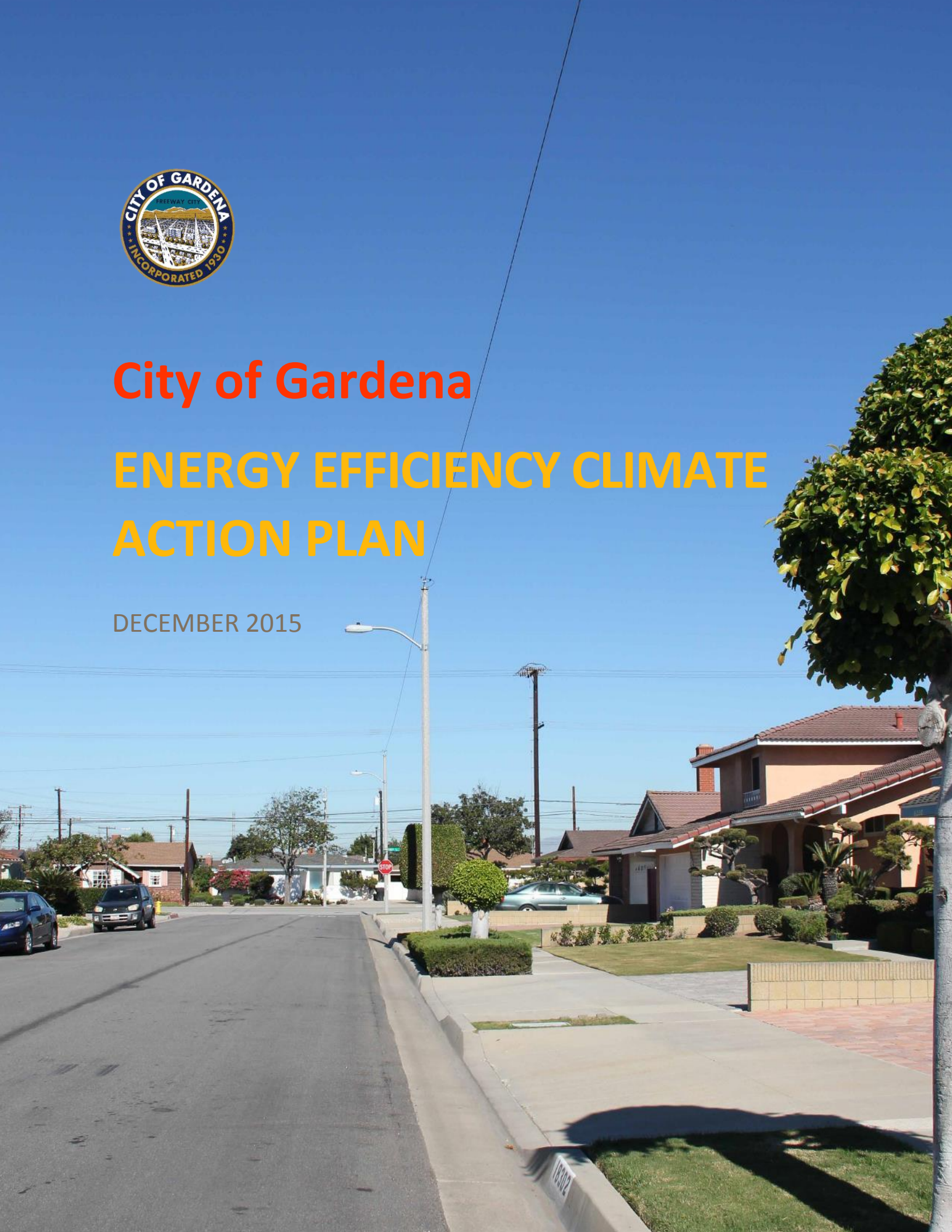
South Bay Cities Climate Action Plans
December 2017



City of Gardena

ENERGY EFFICIENCY CLIMATE ACTION PLAN

DECEMBER 2015



City of Gardena

ENERGY EFFICIENCY CLIMATE ACTION PLAN

DECEMBER 2015

Prepared for:



Prepared by:

ATKINS

3570 Carmel Mountain Road, Suite 300
San Diego, California 92130

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Acronyms

AB	Assembly Bill
ADC	Alternative Daily Cover
BAU	Business-as-Usual
CAFE	Corporate Average Fuel Economy
CH ₄	Methane
CAP	Climate Action Plan
CARB	California Air Resources Board
CEESP	California Long Term Energy Efficiency Strategic Plan
CIWMB	California Integrated Waste Management Board
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
CPUC	California Public Utilities Commission
EECAP	Energy Efficiency Climate Action Plan
ELP	Energy Leadership Partnership
EO	Executive Order
GHG	Greenhouse Gas
GWP	Global Warming Potential
HERO	Home Energy Renovation Opportunity
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 ₂ O	Nitrous Oxide
PACE	Property Assessed Clean Energy
RPS	Renewable Portfolio Standard
RTP	Regional Transportation Plan
SB	Senate Bill
SBCCOG	South Bay Cities Council of Governments
SBESC	South Bay Environmental Services Center
SCAQMD	South Coast Air Quality Management District
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCG	Southern California Gas Company
SEEC	Statewide Energy Efficiency Collaborative
SCS	Sustainable Communities Strategy

Executive Summary

The City of Gardena (City), in concert with the South Bay Cities Council of Governments (SBCCOG), is committed to providing a more livable, equitable, and economically vibrant community and sub-region through the implementation of energy efficiency measures and subsequent reduction of greenhouse gas (GHG) emissions. By using energy more efficiently, Gardena will keep dollars in the local economy, create new green jobs, and improve the community's quality of life. The efforts toward increasing energy efficiency described in this report will be done in coordination with the City's other planning and land use decisions. Through this Energy Efficiency Climate Action Plan (EECAP), the City has established goals and policies that incorporate environmental responsibility into its daily management of its community and municipal operations.

Inventories

The first step in completing the EECAP was to update the City's community GHG emissions inventories. These inventories show us a snapshot of the emissions that the community itself puts into the atmosphere. The City had already completed community inventories for 2005 and 2007, and in 2014, the SBCCOG added inventories for 2010 and 2012. The year 2005 is the base year, which means that future emissions reductions will be measured against emissions that occurred in 2005.

The City's community GHG emissions decreased 5% from 2005 to 2012, falling from 443,106 MT CO₂e in 2005 to 420,447 MT CO₂e in 2012. Figure 1 shows the change in emissions levels over time, as well as the amount that each sector (e.g. residential energy, on-road transportation) contributes to the overall GHG emissions.

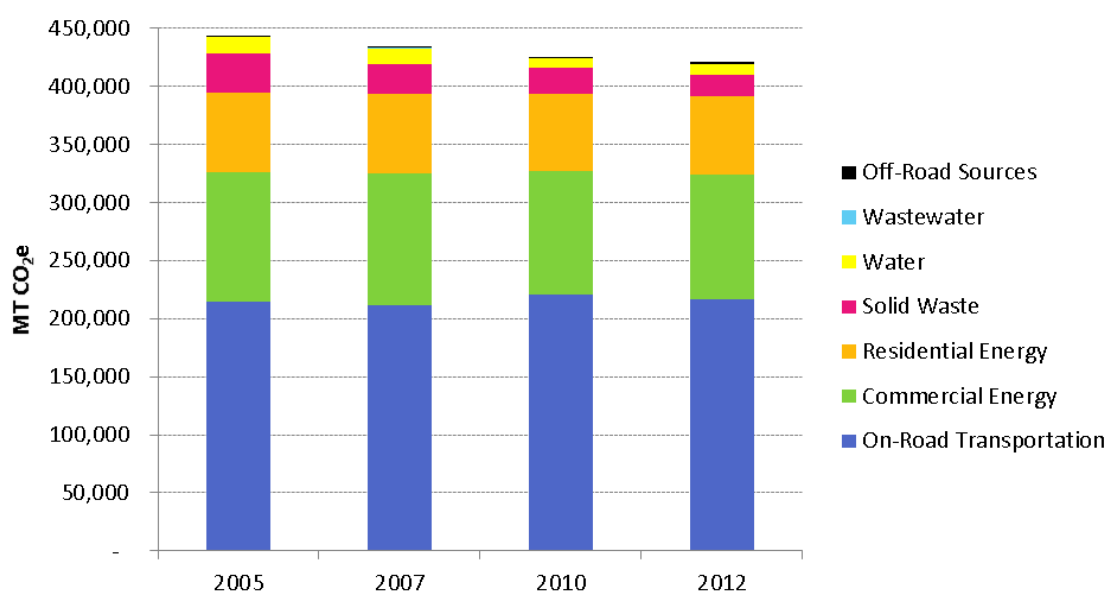


Figure 1 Community Emissions for 2005, 2007, 2010, and 2012

Table 1 Community GHG Emissions by Sector for 2005 and 2012

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	% Change 2005 to 2012
On-road Transportation	214,764	216,034	0.6%
Commercial Energy	111,097	107,688	-3.1%
Residential Energy	69,005	67,783	-1.8%
Solid Waste	32,789	18,654	-43.1%
Water	14,424	8,273	-42.6%
Off-road Sources	795	1,836	130.9%
Wastewater	232	179	-22.8%
Total	443,106	420,447	-5.1%

Similarly, SBCCOG updated inventories for the City's municipal operations, which now include emissions snapshots for 2005, 2007, 2010, and 2012. Municipal emissions are a subset of community emissions and account for about 2% of community emissions. Even though the municipal emissions are a small portion of the overall community emissions, they represent tremendous opportunity for reductions because these are the emissions that the City has the most direct control over.

From 2005 to 2012, the City increased its municipal emissions by 7%, from 7,744 MT CO₂e to 8,267 MT CO₂e. Figure 2 shows trends in municipal GHG emissions over time as well as sector-level details for the municipal inventories.

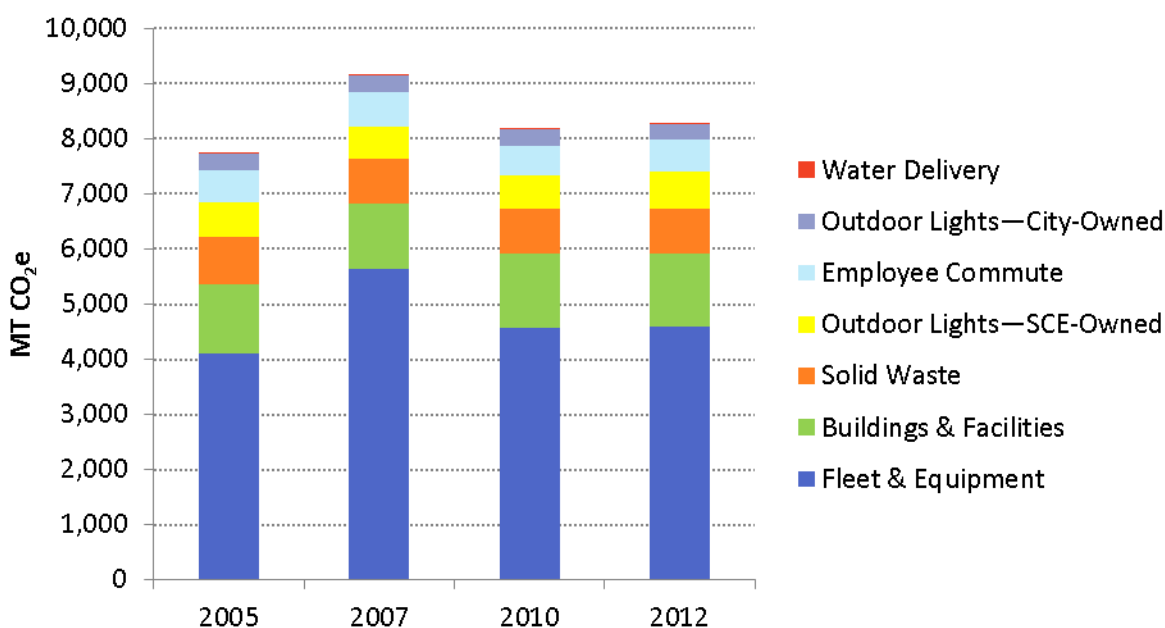
**Figure 2 Municipal GHG Emissions by Sector for 2005, 2007, 2010, and 2012**

Table 2 Municipal GHG Emissions by Sector for 2005 and 2012

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	% Change 2005 to 2012
Fleet & Equipment	4,095	4,603	12%
Buildings & Facilities	1,264	1,313	4%
Solid Waste	870	816	-6%
Outdoor Lights—SCE-Owned	623	663	6%
Employee Commute	584	581	-1%
Outdoor Lights—City-Owned	301	290	-4%
Water Delivery	7	1	-86%
Total	7,744	8,267	7%

Forecasts and Target Setting

The next step in the EECAP process was to estimate future emissions in the City and establish GHG reduction targets. Consistent with the State's adopted AB 32 GHG reduction target, the City is working to reduce emissions back to 1990 levels by the year 2020. This target was calculated as a 15 percent decrease from 2005 levels, as recommended in the AB 32 Scoping Plan. A longer-term goal was established for 2035. The goal for 2035 is to reduce emissions 49% below 2005 levels, which would put the City on a path toward the State's long-term goal to reduce emissions 80% below 1990 levels by 2050 (Table 3).

Table 3 Emissions Reduction Targets for Community and Municipal Operations

	Community	Municipal
2020 Target	15% below 2005 levels	
2020 Emissions Goal (MT CO ₂ e)	376,640	6,582
2035 Target	49% below 2005 levels	
2035 Emissions Goal (MT CO ₂ e)	225,984	3,949

The City's future emissions were estimated using demographic indicators such as population and job growth. Emissions for the City's municipal operations were estimated using the number of staff anticipated in future years. Growth indicators used are shown by sector in Table 4.

Future emissions estimates also included reductions that would happen with implementation of legislation adopted at the State level. That is, some level of emissions reduction is anticipated within the City as a result of policies implemented at the State level, including:

- Low Carbon Fuel Standard
- Assembly Bill (AB) 1493 and Advanced Clean Cars
- California Building Code Title 24
- Renewable Portfolio Standard
- Senate Bill X7-7

Table 4 Growth Factors Used for Forecasting 2012, 2020, and 2035 GHG Emissions

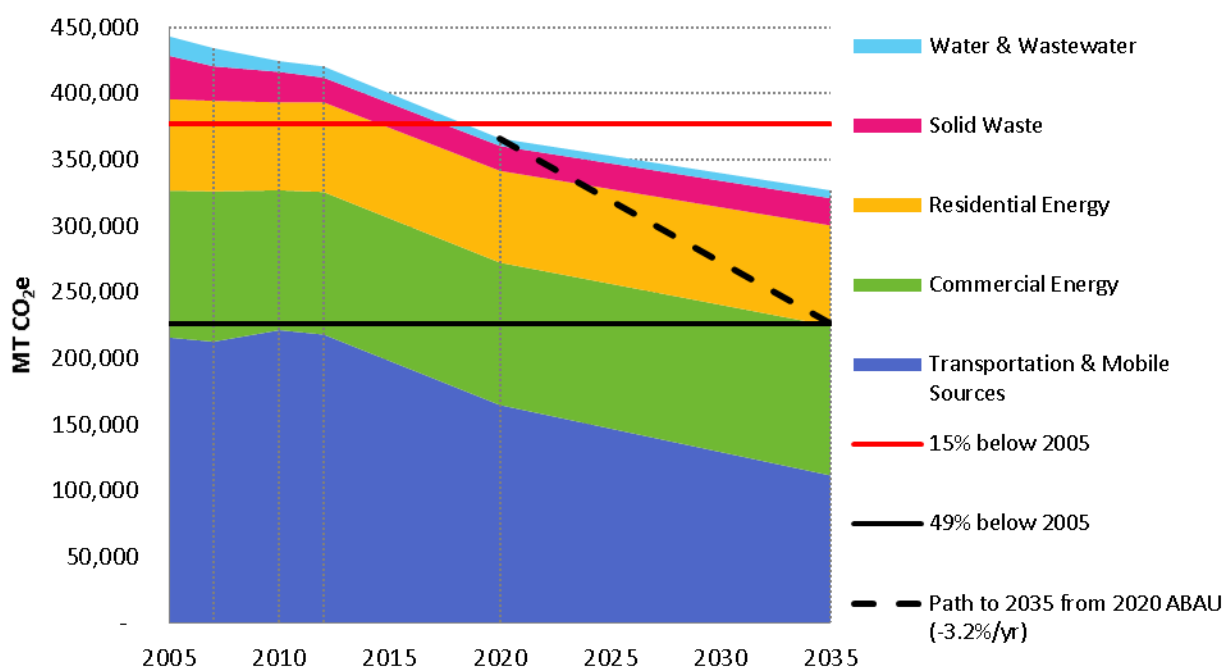
Sector	Demographic Indicator	2012	2020	2035
Transportation	Vehicle Miles Traveled	438,021,537	384,357,899	406,458,483
Solid Waste, Water, Wastewater, Off-road Sources	Service Population (Population + Jobs)	88,180	88,600	96,900
NA ¹	Population	59,124	59,700	66,200
Commercial/ Industrial Energy	Jobs	29,056	28,900	30,700
Residential Energy	Households	20,586	21,000	23,200
Municipal Jobs	Municipal Emissions ²	348 FT/187 PT	400 FT/200 PT	500 FT/300 PT

¹ Not Applicable. Population data are shown for informational purposes but are not used for forecasting any sector.

² The number of jobs in the City is used as an indicator for all municipal operation emissions.

FT: Full-time employees; PT: Part-time employees.

The resulting projected emissions are considered an “adjusted” business-as-usual (Adjusted BAU) forecast. Historic emissions, Adjusted BAU forecast, and 2020 and 2035 targets are shown in Figure 3 for the community and Figure 4 for municipal operations. For the community, the Adjusted BAU forecast indicates the 2020 emissions target will be met, but additional measures will be needed to meet the 2035 goal. For municipal operations, the Adjusted BAU forecast indicates the 2020 and 2035 emissions targets will not be met, and additional measures will be needed to meet the goals.

**Figure 3 Community Emissions Inventories, Projections, and Targets**

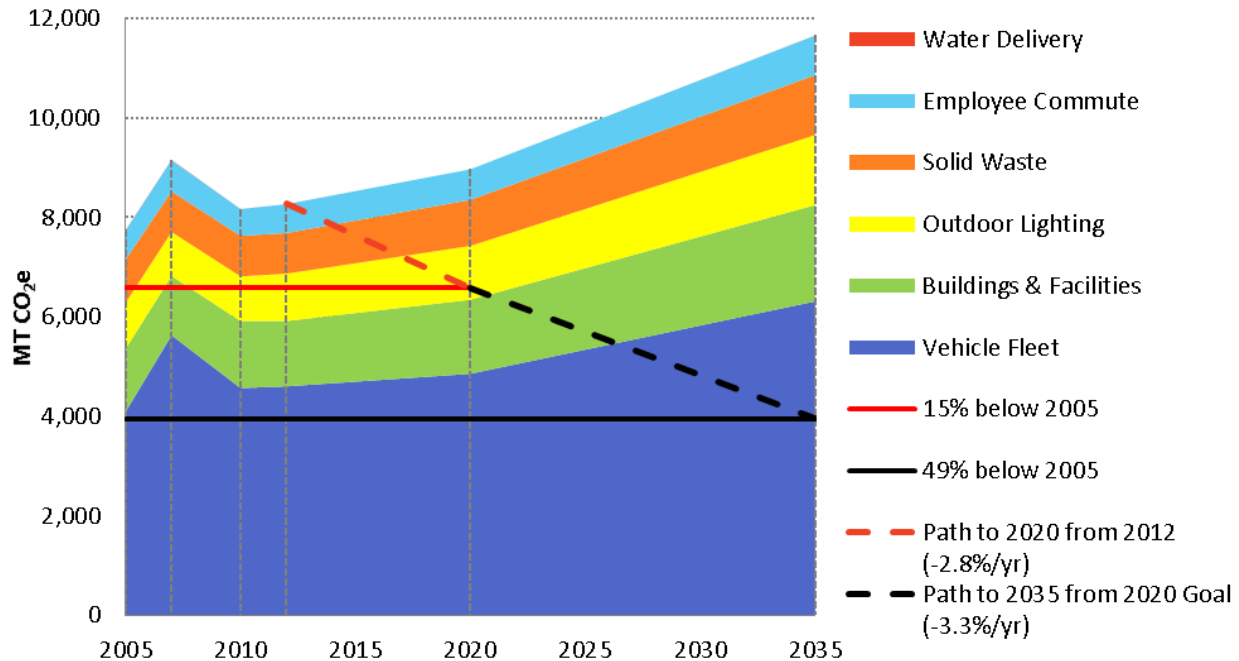


Figure 4 Municipal Emissions Inventories, Projections, and Targets

Energy Efficiency Measures

The City has already demonstrated its commitment to conserve energy and reduce emissions through a variety of programs and policies. Programs to reduce GHG emissions include implementing water efficient landscape ordinance and participation in multiple home financing programs that will allow home and business owners to obtain low-interest loans for implementing energy efficiency in their buildings. In order to reach the reduction target, the City will also consider implementing the additional local reduction measures described in this report. These measures encourage energy efficiency and water conservation. Table 5 and Table 6 summarize the measures that would be implemented to meet the community and municipal GHG reduction goals, respectively, for 2020 and 2035.

Table 5 Community GHG Reduction Strategies

		Reductions (MT CO ₂ e)	
Measure No.	Measures	2020	2035
Goal 1: Increase Energy Efficiency (EE) in Existing Residential Units			
Measure 1.1	EE Training and Education	Supporting Measure	
Measure 1.2	Increase Participation in Existing EE Programs	43	202
Measure 1.3	Establish, Promote, or Require Home Energy Evaluations	Supporting Measure	
Measure 1.4	Promote, Incentivize, or Require Residential Home Energy Renovations	10,225	48,567
Goal 2: Increase Energy Efficiency in New Residential Development			
Measure 2.1	Encourage or Require EE Standards Exceeding Title 24	154	730
Goal 3: Increase Energy Efficiency in Existing Commercial Units			
Measure 3.1	EE Training and Education	Supporting Measure	
Measure 3.2	Increase Participation in Existing EE Programs	608	2,886
Measure 3.3	Promote or Require Non-Residential Energy Audits	995	4,726
Measure 3.4	Promote or Require Commercial Energy Retrofits	16,797	79,786
Goal 4: Increase Energy Efficiency in New Commercial Development			
Measure 4.1	Encourage or Require EE Standards Exceeding Title 24	No new commercial development is projected, therefore no GHG reduction or energy savings were quantified.	
Goal 5: Increase Energy Efficiency through Water Efficiency (WE)			
Measure 5.1	Promote or Require WE through SBX7-7	796	3,783
Measure 5.2	Promote WE Standards Exceeding SB X7-7	2	10
Goal 6: Decrease Energy Demand through Reducing Urban Heat Island Effect			
Measure 6.1	Promote Tree Planting for Shading and EE	323	1,534
Measure 6.2	Incentivize or Require Light-Reflecting Surfaces	Unable to quantify GHG reduction potential due to unknown variables.	
Total		29,942	142,224

Table 6 Municipal GHG Reduction Strategies

Measure No. Measures		Reductions (MT CO ₂ e)	
		2020	2035
Goal 1: Participate in Education, Outreach, and Planning for Energy Efficiency			
Measure 1.1	Increase Energy Savings through the SCE Energy Leader Partnership	Supporting Measure	
Goal 2: Increase Energy Efficiency in Municipal Buildings			
Measure 2.1	Conduct Municipal Building Energy Audit	Supporting Measure	
Measure 2.2	Require Green Building Certification	Under Consideration	
Measure 2.3	Participate in Demand Response Programs	Supporting Measure	
Measure 2.4	Participate in Direct Install Program	51	159
Measure 2.5	Adopt a Procurement Policy for Energy Efficient Equipment	98	309
Measure 2.6	Install Cool Roofs	Under Consideration	
Measure 2.7	Require New or Retrofitted Buildings to Exceed Title 24	Under Consideration	
Measure 2.8	Increase Recycled Water Use	53	168
Measure 2.9	Utilize an Energy Management System	Supporting Measure	
Goal 3: Increase the Energy Efficiency in City Infrastructure			
Measure 3.1	Retrofit Traffic Signals and Outdoor Lighting	390	1,226
Measure 3.2	Upgrade or Incorporate Water-Conserving Landscape	Under Consideration	
Measure 3.3	Plant Trees for Shade and Carbon Sequestration	Under Consideration	
Goal 4: Reduce Energy Consumption in the Long Term			
Measure 4.1	Develop an Energy Reinvestment Fund	Supporting Measure	
Total		592	1,860

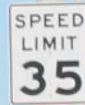
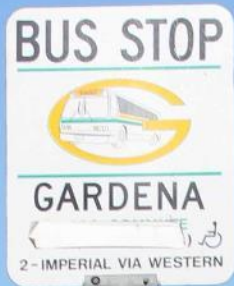
Implementation

To reduce GHG emissions and meet the City's GHG reduction goals, the City must work to fully implement the EECAP. The following section identifies a process for implementation and monitoring for the strategies described. The six step process is summarized in Figure 5



Figure 5 Process of Implementing the EECAP

Upon successful implementation of this EECAP, the City and its partner agencies will demonstrate the potential economic, social, and environmental benefits of increasing energy efficiency and leading on environmental stewardship within the community.



Chapter 1

Introduction

The EECAP is the City’s plan to become more energy efficient. The City recognizes that energy efficiency is necessary and can be achieved cost-effectively. The EECAP is built upon efforts at the Federal, State, regional, and local levels along with the other cities in the South Bay Sub-Region. Through this effort, the City has developed and will implement energy efficiency and greenhouse gas reduction efforts that preserve the City’s character while fostering a more sustainable future.

Purpose and Need for the Energy Efficiency Climate Action Plan

Jurisdictions in California are increasingly facing the need to address climate change and energy efficiency due to increasing energy rates, changing weather and climate conditions, and state mandates. Many communities have taken local control of the issue by developing plans or strategies that will increase energy efficiency and lower GHG emissions in a manner that is most feasible in their community. An Energy Efficiency Climate Action Plan (EECAP) is one such effort. An EECAP evaluates the energy and other resource consumption in a jurisdiction and identifies strategies that will increase the jurisdiction's energy efficiency and lower GHG emissions over time. Development and adoption of this EECAP allows the City of Gardena (City) to:

- Understand its municipal and community energy use and GHG emissions now and in the future;
- Identify strategies at the local level that will result in long-term energy efficiency;
- Develop a plan to implement strategies; and
- Monitor and report progress toward energy-efficiency goals.

Further, this EECAP serves as a foundation for developing a comprehensive Climate Action Plan (CAP), which would expand the strategies for reducing GHG emissions to all sectors of the City's economy, including transportation and solid waste.

The EECAP provides the framework to implement and monitor energy efficiency strategies in the City that are feasible, cost-effective, and improve the quality of life for its citizens.

Alignment with California's Long Term Energy Efficiency Strategic Plan

In September of 2008, the California Public Utilities Commission (CPUC) adopted California's Long-Term Energy Efficiency Strategic Plan (CEESP). The purpose of the plan is to provide a single roadmap for maximum energy savings across major groups and sectors in California. The Strategic Plan presents an integrated framework of goals and strategies for energy efficiency, and affirms the role of energy efficiency as the highest-priority in meeting California's energy needs.

In January of 2011, the CPUC updated the CEESP, which set the following goals for local governments:

1. Local governments lead adoption and implementation of "reach" codes stronger than Title 24 on both a mandatory basis and a voluntary basis.
2. Strong support from local governments for energy code compliance enforcement.
3. Local governments lead by example with their own facilities and energy usage practices.
4. Local governments lead their communities with innovative programs for energy efficiency, sustainability, and climate change.
5. Local government energy efficiency expertise becomes widespread and typical.

Based on the energy efficiency strategies selected by the City, the EECAP advances these goals. Upon successful implementation of the EECAP, the City can keep dollars in its local economy, create new green jobs, and improve quality of life within its community. The efforts toward energy efficiency improvements and GHG emission reductions are consistent with the goals and policies found in the City's General Plan.

Regulatory Setting

Federal and State

In addition to the CEESP, the State and Federal governments promote energy efficiency and GHG emissions reductions through legislation, regulations, planning, policy-making, education, and a variety of programs. The programs most relevant to the EECAP are summarized in Table 7.

2005	Executive Order S-3-05: Reduce emissions to <ul style="list-style-type: none"> ■ 2000 levels by 2010 ■ 1990 levels by 2020 ■ 80% below 1990 levels by 2050
2006	Assembly Bill 32: Reduce emissions to 1990 levels by 2020
2009	Senate Bill X7-X: Reduce per-capita water use 20% by 2020
2013	Title 24 Building Efficiency Standards: Increase energy efficiency standards for new building construction.

Table 7 Climate Change Legislation and Policy

Bill & Date of Issuance	Title	Description	Implementing Agency
Public Law (PL) 88-206	Clean Air Act	Federal policy to address global climate change through monitoring, reporting, and regulation of GHG emissions.	EPA
Executive Order S-3-05 (2005)	Greenhouse Gas Initiative	Set statewide GHG emissions targets to 2000 levels by 2010; 1990 levels by 2020; and 80% below 1990 levels by 2050.	California Air Resources Board (CARB)
Assembly Bill (AB) 32 (2006)	Global Warming Solutions Act	State must reduce GHG emissions to 1990 levels by 2020.	CARB
Senate Bill (SB) 1078, 107, and X1-2, and Executive Order S-14-08 and S-21-09	Renewable Portfolio Standard	California investor-owned utilities must provide at least 33% of their electricity from renewable resources by 2020.	California Public Utilities Commission
SB 1368 (2006)	Emission Performance Standards	Requires the California Public Utilities Commission (CPUC) to establish a performance standard for base-load generation of GHG emissions by investor owned utilities.	California Energy Commission (CEC)
Executive Order S-20-04 (2004)	California Green Building Initiative	Reduce energy use in state-owned buildings 20% from a 2003 baseline by 2015.	CEC
California Code of Regulations (CCR) Title 24	2013 Building Efficiency Standards	Statewide green building code that raises the minimum environmental standards for construction of new buildings in California.	CEC
AB 811 (2008)	Contractual Assessments: Energy Efficiency Improvements	Provides financing to allow property owners to finance renewable energy generation and energy efficiency improvements.	California cities and counties
AB 474 (2009)	Contractual Assessments: Water Efficiency Improvements	Designed to facilitate the installation of permanent water conservation and efficiency improvements on private property through a voluntary financing program between public entities and property owners.	California cities and counties
AB 1493 (2002)	Pavley I and II	GHG emissions must be reduced from passenger vehicles, light-duty trucks, and other non-commercial vehicles for personal transportation.	CARB
Executive Order S-1-07 (2007)	Low Carbon Fuel Standard	The carbon intensity of transportation fuels in California must be lowered 10% by 2020.	CARB
SB X7-7	Statewide Water Conservation	Water suppliers must reduce urban per capita water consumption 20% from a baseline level by 2020.	Department of Water Resources

Regional

Regional agencies have a role in identifying more localized plans and priorities than the State and Federal governments. Two agencies in particular, the Southern California Association of Governments (SCAG) and the South Coast Air Quality Management District (SCAQMD), provide regional planning and air quality standards that affect the City and can provide funding sources for implementing the EECAP.

Southern California Association of Governments

SCAG undertakes regional planning for the six-county region of Los Angeles, Orange, Riverside, San Bernardino, Imperial, and Ventura counties. SCAG's efforts focus on developing regional strategies to minimize traffic congestion, promote environmental quality, and provide adequate housing. The Regional Comprehensive Plan and Guide sets forth broad goals intended to be implemented by participating local and regional jurisdictions and SCAQMD. SCAG has adopted companion documents to the Regional Comprehensive Plan and Guide, most notably the Regional Transportation Plan.

SCAG worked with the Los Angeles County Metropolitan Transportation Authority, elected officials, and local jurisdictions in Los Angeles County to develop the 2012–2035 Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS). The long-range plan improves overall mobility, reduces GHG emissions and enhances the quality of life for the region's residents. Approved by state and federal agencies in June 2012, the plan includes \$180 billion in transportation projects for Los Angeles County. The RTP/SCS will be updated every four years and some of the projects will result in benefits to the City and sub-region.

South Coast Air Quality Management District

The South Coast Air Quality Management Plan (AQMP) is a comprehensive program designed to bring the South Coast Air Basin into compliance with all federal and State air quality standards. The AQMP was prepared and adopted by SCAG and the SCAQMD. Because of the importance of motor vehicles as a pollution source, the AQMP places substantial emphasis on reducing motor vehicle miles traveled. Cities can facilitate this by taking an active role in solving air pollution problems through adoption of trip reduction ordinances at the local level, the adoption of Air Quality Elements of City general plans, and the implementation of land use policies that mitigate the negative traffic impacts of land development. A major strategy for the SBCCOG and the South Bay cities to improve air quality standards and reduce vehicle emissions has been, and will continue to be, to promote alternative fueled vehicles both in municipal fleets and through building the supporting infrastructure in the South Bay sub-region.

The Role of the South Bay Cities Council of Governments

This EECAP is developed through the South Bay Cities Council of Governments (SBCCOG), which received funding from SCE's 2013-2014 Local Government Partnership Strategic Plan Pilots program. SBCCOG is a joint powers authority of 16 cities and contiguous unincorporated areas of the County of Los Angeles. SBCCOG member cities include Carson, El Segundo, Gardena, Hawthorne, Hermosa Beach, Inglewood, Lawndale, Lomita, Manhattan Beach, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Torrance, and the Harbor City/San Pedro communities of the City of Los Angeles, along with the County of Los Angeles District 2 and 4 unincorporated areas (Figure 6). The 15 communities served by Southern California Edison (SCE) are participating in this effort. This excludes the City of Los Angeles, which obtains its electricity through the Los Angeles Department of Water and Power.



Source: <http://www.southbaycities.org/>

Figure 6 South Bay Member Cities

The SBCCOG has demonstrated its commitment to increasing environmental quality and awareness among its residents, local businesses, and jurisdictions while maintaining economic prosperity through effective sub-regional coordination. The effort also helps the SBCCOG meet the first goal (Goal A) of its Strategic Plan for Environment, Transportation and Economic Development: to facilitate, implement and/or educate members and others about environmental, transportation and economic development programs that benefit the South Bay.

SBCCOG has assisted the South Bay sub-region in related programs and policies, including many of the resources identified later in this EECAP. SBCCOG assisted the 15 participating cities to develop individual EECAPs, such as this report, resulting in cost-effectiveness and sub-regional coordination. SBCCOG also developed a sub-regional EECAP that identifies the cumulative efforts for the South Bay and identifies synergies that may compound the success of each city's EECAP by coordinating implementation of shared strategies and positioning the sub-region for unique funding opportunities.

City Profile

Setting

The City of Gardena is a community of approximately 59,000 residents and has over 20,500 households. The City's population is about 39 percent Hispanic, 25 percent Asian, 24 percent African American, 9 percent White, and 3 percent other races/ethnicities.

Table 8 Demographic Data for 2005, 2007, 2010, and 2012

	2005	2007	2010	2012	% Change 2005-2012
Population	59,277	59,095	58,854	59,124	-0.3%
Households	20,442	20,596	20,588	20,586	5.2%
Jobs	30,362	31,780	28,728	29,056	-4.3%
Service Population (Population + Jobs)	89,639	90,875	87,582	88,180	-1.6%

The median age of residents is 39 and the median household income is the third lowest in the South Bay sub-region (Figure 7).

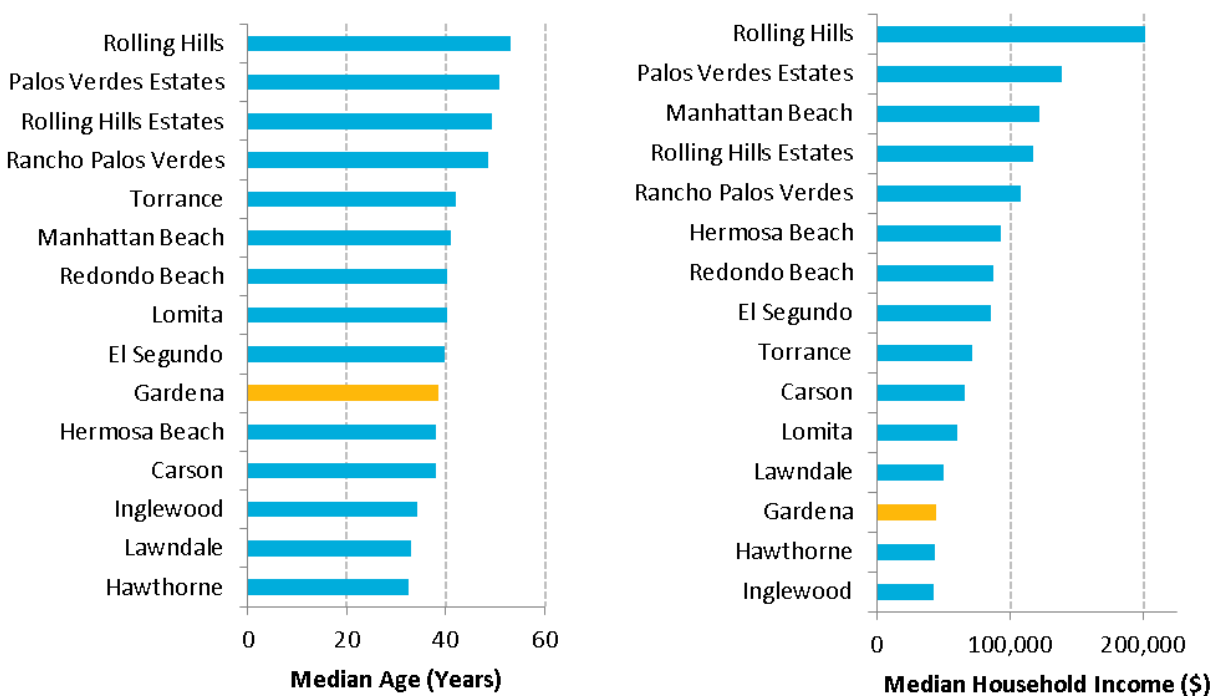


Figure 7 2012 Median Age and Household Income for Cities within the South Bay Sub-region

Existing Sustainability Efforts

The City has a number of policies, plans, and programs that demonstrate its ongoing commitment to sustainability, energy efficiency, and GHG emissions reductions. These are highlighted below.

General Plan Policies

The 2006 Gardena General Plan guides the physical development of the city and acts as a long range blueprint for development decisions. The General Plan's Circulation Element and the Conservation Element contain a number of policies that reduce energy and water consumption and GHG emissions.

The Circulation Element addresses GHG emissions indirectly through the goal of providing a safe and efficient local street system. Policies to address this goal include congestion management and traffic-calming measures and devices. The Conservation Element includes a goal to conserve energy resources through the use of technology and conservation methods. Recommended policies include energy efficient building designs, compliance with Title 24 regulations, and encouraging the residential and business communities to install energy saving features and appliances in existing structures. Table 9 summarizes these relevant policies.

Table 9 Gardena General Plan Policies Related to Energy, Water, and GHG Reductions

Source	Element	Objective	Policy
Energy	Circulation Element	Alternative Transportation	CI 2.5, 3.1, 3.2, 3.3, 3.4
	Conservation Element	Energy Conservation	CN 4.1, 4.2, 4.3
Water		Water Conservation	1.2, 1.6, 1.8

Source: City of Gardena General Plan (2006)

Energy Leadership Partnership

Valued Partner

The SCE's Energy Leader Partnership program provides a framework that offers enhanced rebates and incentives to cities that achieve measurable energy savings, reduce peak-time electricity demand and plan for energy efficiency. The program has a tiered incentive structure with threshold criteria required to trigger advancement to the next level of participation. The City of Gardena is a Valued Partner of the program based on their energy efficiency accomplishments to date.

Beacon Award Program

The Beacon Award program is sponsored by the Institute for Local Government and the Statewide Energy Efficiency Collaborative (SEEC). The Beacon Award recognizes California cities and counties that have achieved measurable reductions in GHG emissions and energy savings, adopted policies and programs to address climate change, and promote sustainability. On January 10, 2012, City Council adopted the program to become a Beacon Award Proud Participant, and continues to work towards achieving the Silver, Gold, and/or Platinum Beacon Award levels.

Property Assessed Clean Energy Financing

Property Assessed Clean Energy (PACE) is a mechanism to finance energy efficiency, renewable energy, and water conservation upgrades to residential and commercial facilities. Financing is repaid as a special

assessment on their property tax, allowing the home- or business owner to finance improvement projects that will result in GHG reductions without needing up-front capital.

The City has joined the Home Energy Renovation Opportunity (HERO) program this year, which is a PACE program for residential upgrades, administered by the Western Riverside Council of Governments. Products eligible under the HERO program include lighting upgrades, building insulation improvements, water efficiency enhancement, renewable energy production, water heating technologies, and mechanical system upgrades.



In 2013, City Council adopted a resolution to participate in the California Figtree PACE program, which is a PACE program to help commercial and certain residential property owners improve their properties and lower their utility bills with energy efficiency, renewable energy, and water conservation upgrades. The program helps property owners voluntarily finance technologies such as solar panels, cool roofs, insulation, windows, doors, heating and cooling equipment, lighting, and plumbing equipment.



In addition, the City of has adopted a resolution to participate in [Los Angeles PACE](#). This financing option is available to Los Angeles County commercial, industrial and multi-family property owners to fund on-site energy efficiency, renewable energy and water-saving improvements. Under the program, the County issues a bond to a lender, which secures funding for the construction of the energy upgrade. Property owners then repay financing twice a year through an assessment on their property tax bill.

South Bay Bicycle Master Plan

The South Bay Bicycle Master Plan is intended to guide the development and maintenance of a comprehensive bicycle network and develop a set of programs and policies throughout the South Bay Region. The participating cities include El Segundo, Gardena, Hermosa Beach, Lawndale, Manhattan Beach, Redondo Beach, and Torrance. The multi-city bicycle master plan encourages the replacement of vehicular trips with bicycle trips, which has a measurable impact on reduced fuel consumption and subsequently fewer mobile source pollutants.

The City of Gardena's Public Works Division includes a number of Environmental Services links for residents and businesses on its website, including the following energy-related organizations, agencies, and programs:

- Southern California Edison
- Southern California Gas Company
- California Department of Water Resources
- South Coast Air Quality Management District



Chapter 2

GHG Emissions, Forecasts, and Reduction Targets

Key Findings

Community

- The City of Gardena decreased emissions 5% from 2005 to 2012, from 443,106 MT CO₂e to 420,447 MT CO₂e.
- Commercial Energy, Residential Energy, Solid Waste, Water, and Wastewater sector emissions decreased while On-road Transportation and Off-road Sources sectors increased emissions from 2005 to 2012.
- Energy-related emissions account for 42% of the total community emissions.
- Under the Adjusted Business-as-Usual (BAU) forecast, emissions will be 363,510 MT CO₂e in 2020 and 324,068 MT CO₂e in 2035. These emissions levels are 18% lower in 2020 than 2005 and 27% lower than 2005 by 2035.

Municipal

- Municipal emissions have increased 7% from 2005 to 2012, from 7,744 MT CO₂e to 8,267 MT CO₂e.
- Emissions in all sectors decreased between 2005 and 2012 except for the Buildings & Facilities, Vehicle Fleet & Equipment, and SCE-Owned Outdoor Lights.
- Municipal energy use accounts for approximately 2% of all emissions.
- Under the Adjusted BAU forecast, emissions will be 8,967 MT CO₂e in 2020 and 11,657 MT CO₂e in 2035. These emissions levels are 16% higher in 2020 than 2005 and 51% higher than 2005 by 2035.

This chapter describes the City's community and municipal historic energy use and GHG emissions inventories, and projects future usage and emissions for the years 2020 and 2035. The target-setting section describes GHG reduction levels that the City has chosen for 2020 and 2035.

Specifically, this chapter includes (words and phrases in bold are described in Table 10:

- Historic GHG emissions in **community inventories** and **municipal inventories** for 2005, 2007, 2010, and 2012;
- Future GHG emissions for 2020 and 2035 under a **business-as-usual** forecast scenario and **adjusted business-as-usual** forecast scenario; and
- **Reduction targets** for 2020 and 2035.

Table 10 Key Terms in this Chapter

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

GHG Emissions Inventories

GHG emissions inventories are the foundation of planning for future reductions. Establishing an existing inventory of emissions helps to identify and categorize the major sources of emissions currently being produced. The City has four years of historic inventories, which show the major sources of emissions and how those sources vary over time. The 2005 inventory (for both community and municipal operations) is considered the **baseline year**. A baseline year is established as a starting point against which other inventories may be compared and targets may be set, and is generally the earliest year with a full emissions inventory. The most recent inventory (2012) has the most relevant data for planning purposes, while the interim years (2007 and 2010) provide context and may help identify trends or anomalies.

Emissions Reporting

There are several types of GHGs and each GHG has a different capacity to trap heat. To report GHG emissions as a single number, emissions are reported in carbon dioxide equivalents, or CO₂e, with each GHG normalized and calculated relative to CO₂ using its GWP. Table 11 describes the GHGs analyzed in this chapter, their symbol, GWP, and primary community sources of emissions. More detail regarding the GHGs can be found in the Inventories, Forecasts, and Target-Setting Report, Appendix A.

Table 11 GHGs Analyzed in the Inventories

Greenhouse Gas	Symbol	Global Warming Potential	Primary Community Sources
Carbon Dioxide	CO ₂	1	Fossil fuel combustion
Methane	CH ₄	25	Fossil fuel combustion, landfills, wastewater treatment
Nitrous Oxide	N ₂ O	298	Fossil fuel combustion, wastewater treatment

Source: IPCC Fourth Assessment Report, 2007

Emissions Sectors

The inventories identify the major sources of GHGs emissions caused by activities in sectors that are specific to community or municipal activities. A **sector** is a subset of the economy, society, or municipal operations whose components share similar characteristics. An emissions sector can also contain subsectors that provide more specificity about the source of emissions (e.g., natural gas and electricity are subsectors of the energy sector). The sectors evaluated for the inventories are summarized in Figure 8. More detail can be found in Appendix A.

Community Sectors	Municipal Sectors
<p>Commercial/Industrial Energy includes emissions from electricity and natural gas consumption in non-residential buildings and facilities (including outdoor lighting) in the City.</p> <p>Residential Energy includes emissions from electricity and natural gas consumption in residential buildings in the City.</p> <p>On-road Transportation includes emissions from vehicles traveling (wholly or partially) within the City.</p> <p>Solid Waste includes emissions from waste that is generated in the community and sent to landfills.</p> <p>Water includes emissions from the electricity used to source, treat, and deliver imported water in the community that is not accounted for in the community utility data.</p> <p>Wastewater includes emissions from treating wastewater generated in the community.</p> <p>Off-road Sources include emissions from operating equipment for construction, commercial, light industrial and agricultural activities; lawn and garden equipment; and recreational vehicles such as all-terrain vehicles.</p>	<p>Buildings and Facilities includes energy use by the government, including electricity and natural gas.</p> <p>SCE-owned Streetlights includes energy for streetlights on fixtures owned by SCE.</p> <p>City-owned Outdoor Lights includes energy for streetlights and traffic signals on fixtures owned by the City.</p> <p>Water Pumping & Irrigation includes energy for water pumping and irrigation.</p> <p>Vehicle Fleet & Equipment includes emissions from vehicles owned or operated by the government or contracted by the City for services such as street cleaning. It also includes equipment, such as emergency generators.</p> <p>Employee Commute includes emissions from fuel use in vehicle trips by municipal employees commuting to and from work in the City.</p> <p>Solid Waste includes emissions from waste generated by municipal employees or at municipally-owned facilities.</p>

Figure 8 Community and Municipal GHG Emission Sectors

Calculation Methodology

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

Community Emissions

The City of Gardena reduced emissions 5% from 2005 to 2012, from 443,106 MT CO₂e to 420,447 MT CO₂e. Commercial Energy, Residential Energy, Solid Waste, Water, and Wastewater sector emissions decreased while On-road Transportation and Off-road Sources sectors increased emissions from 2005 to 2012.

As shown in Table 12 and Figure 9, the Transportation sector was the largest contributor to emissions in both 2005 (49%) and 2012 (51%) by producing 214,764 MT CO₂e in 2005 and 216,034 MT CO₂e in 2012. This change represents a 0.6% increase in emissions from 2005 to 2012. Commercial/Industrial energy is the second-largest contributor to emissions, adding 25% and 26% in 2005 and 2012 respectively. While the proportion of emissions did not change significantly over time, the total emissions decreased by 3% from 2005 to 2012, from 111,097 MT CO₂e to 107,688 MT CO₂e. The proportion of emissions from the Residential sector was also steady, at 16% in 2005 and 2012, although total emissions decreased by almost 2%, from 69,005 MT CO₂e in 2005 to 67,783 MT CO₂e in 2012. Solid waste comprised 7% of the total (32,789 MT CO₂e) in 2005, but was reduced to 5% of the total (18,654 MT CO₂e) in 2012. Water, Wastewater, and Off-road sources made up the remaining emissions in each year. Water and Wastewater emissions declined from 2005 to 2012; however, Off-road Sources increased 131% (from 795 to 1,836 MT CO₂e) in the same period. Off-road sources comprise a very small percentage of overall emissions, but are variable primarily due to construction-related emissions, which are based on the level of development estimated in the City each year.

Table 12 Community GHG Emissions by Sector for 2005 and 2012

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	% Change 2005 to 2012
On-road Transportation	214,764	216,034	0.6%
Commercial Energy	111,097	107,688	-3.1%
Residential Energy	69,005	67,783	-1.8%
Solid Waste	32,789	18,654	-43.1%
Water	14,424	8,273	-42.6%
Off-road Sources	795	1,836	130.9%
Wastewater	232	179	-22.8%
Total	443,106	420,447	-5.1%

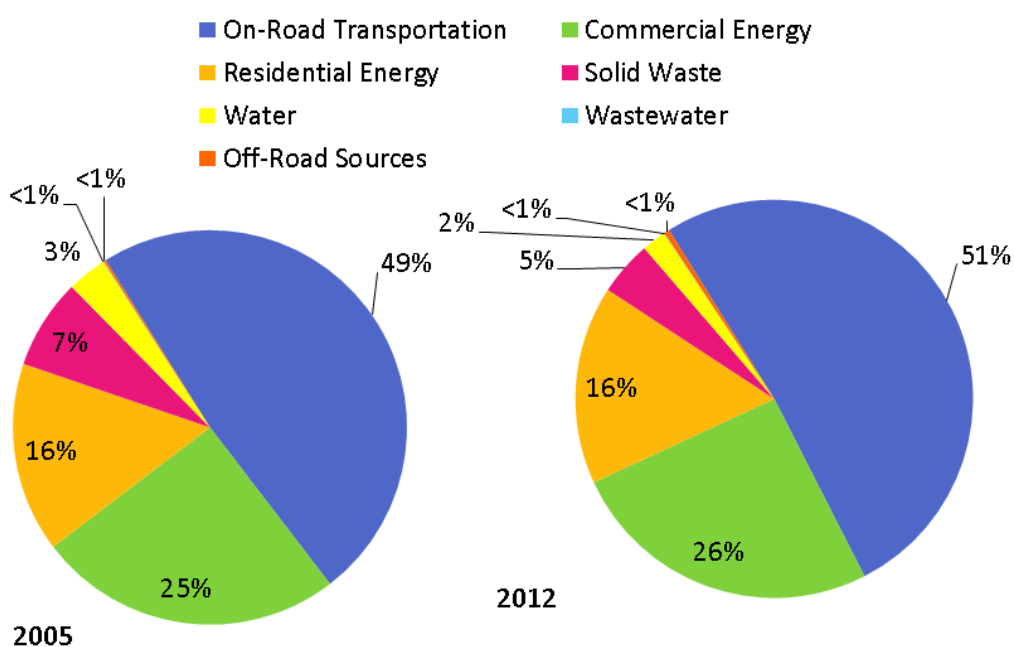
**Figure 9 Community GHG Emissions by Sector for 2005 and 2012**

Figure 10 shows the GHG emissions by sector for all inventory years. Emissions are variable among the inventory years, and may reflect changes in the economy, weather, and programs implemented to reduce emissions.

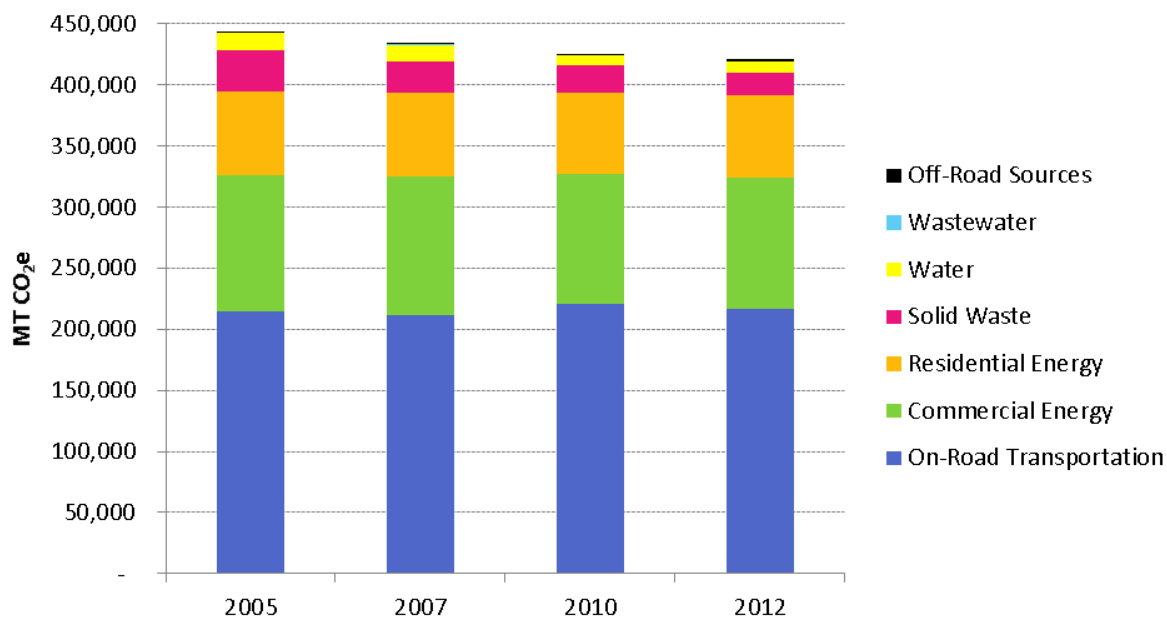


Figure 10 Community GHG Emissions for 2005, 2007, 2010, and 2012

Table 13 summarizes activity data for each sector and subsector. The activity data show that vehicle miles traveled, Residential electricity, Commercial/Industrial natural gas, and solid waste (ADC) increased from 2005 to 2012, while Residential natural gas, Non-Residential electricity, landfilled solid waste, and water decreased from 2005 to 2012. Wastewater and Off-road emissions use indicator data to attribute county-level emissions to the City and the indicator data are also shown in Table 5. Notably, while On-road Transportation emissions increased less than 1% between 2005 and 2012, vehicle miles traveled increased by nearly 7%. The difference reflects that for each vehicle mile traveled, fewer emissions are generated due to improvements in the fuel efficiency of vehicles

Table 13 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	410,696,017	407,207,352	437,503,718	438,021,537	6.7%
Residential Energy					
Electricity (kWh)	88,070,500	91,198,495	89,028,457	89,537,409	1.7%
Natural Gas (therms)	7,945,441	7,925,675	7,683,388	7,362,507	-7.3%
Commercial/Industrial Energy					
Electricity (kWh)	281,182,579	280,318,686	267,280,382	240,483,911	-14.5%
Natural Gas (therms)	4,828,567	6,193,110	5,400,230	5,789,305	19.9%
Solid Waste					
Landfilled (tons)	134,716	104,735	91,309	72,977	-45.8%
ADC (tons) ¹	434	1,398	2,469	3,547	717.3%
Water and Wastewater					
Water (MG)	2720.1	2635.4	2162.4	2247.0	-17.4%
Recycled Water (MG)	0.4	0.3	0.2	0.3	-6.8%
Wastewater (City portion of countywide residents)	0.60%	0.60%	0.60%	0.60%	-1.0%
Off-road sources² (% of LA County emissions attributed to the City)					
Industrial (% Manufacturing jobs)	1.19%	1.24%	1.25%	1.24%	4.4%
Recreation (Population weighted by income)	0.53%	0.52%	0.50%	0.50%	-6.2%
Agriculture (% Ag. Jobs)	0.45%	0.47%	0.54%	0.41%	-9.0%
Construction (% Building permits)	0.23%	0.48%	0.04%	0.54%	132.4%
Lawn & Garden (% Households)	0.64%	0.64%	0.62%	0.62%	-3.2%
Light Commercial (% Other jobs)	0.61%	0.64%	0.64%	0.64%	4.0%

¹ 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.

² Off-road emissions are available at the county level through CARB's OFFROAD model. Emissions attributable to the City were derived using indicator data related to the off-road source. For example, the percentage of households in the City compared to the county was used to attribute the same percentage of lawn & garden equipment emissions to the City.

Municipal Emissions

Emissions from the City's municipal operations account for about 2% of community emissions and have increased 7% from 2005 to 2012, from 7,744 MT CO₂e to 8,267 MT CO₂e. The City's Vehicle Fleet & Equipment is the sector with the largest percentage of emissions in 2005 (53%) and 2012 (56%), and emissions from this sector increased 12% over the period (Figure 11). The second largest-emitting sector for 2005 and 2012 was Buildings & Facilities. The percentage of total emissions from this sector stayed constant at 16% between the two inventory years (49 MT CO₂e increase). The SCE-Owned Outdoor Lights sector increased 6% from 2005 to 2012, with a constant percentage of total emissions between the years (8% of total emissions). Some City-owned Outdoor Lights accounts have been re-categorized to SCE-Owned Outdoor Lights from 2005 to 2012 for improved accuracy of categorization. This change may partially contribute to the increase in SCE-Owned Outdoor Lights emissions. The Solid Waste sector contributed 870 MT CO₂e (11% of total emissions) in 2005 and decreased by 54 MT CO₂e in 2012 (to 816 MT CO₂e, or 11% of total emissions). Emissions from the Employee Commute and City-Owned Outdoor Lights sectors decreased by nearly 1% and 4% from 2005 to 2012 and Water Delivery emissions declined 86% (from 7 MT CO₂e to 1 MT CO₂e). The 2005 and 2012 emissions and changes are detailed in Table 14.

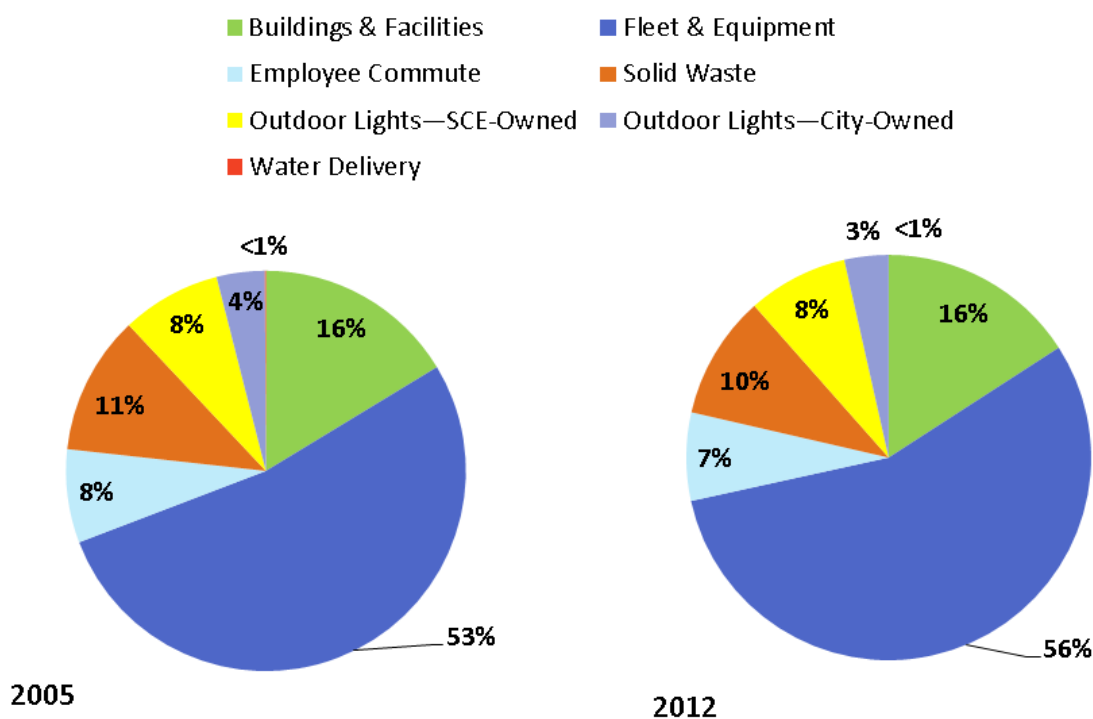


Figure 11 Municipal GHG Emissions by Sector for 2005 and 2012

Table 14 Municipal GHG Emissions by Sector for 2005 and 2012

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	% Change 2005 to 2012
Fleet & Equipment	4,095	4,603	12%
Buildings & Facilities	1,264	1,313	4%
Solid Waste	870	816	-6%
Outdoor Lights—SCE-Owned	623	663	6%
Employee Commute	584	581	-1%
Outdoor Lights—City-Owned	301	290	-4%
Water Delivery	7	1	-86%
Total	7,744	8,267	7%

Figure 12 shows the municipal GHG emissions by sector for all inventory years and activity data are shown in Table 15.

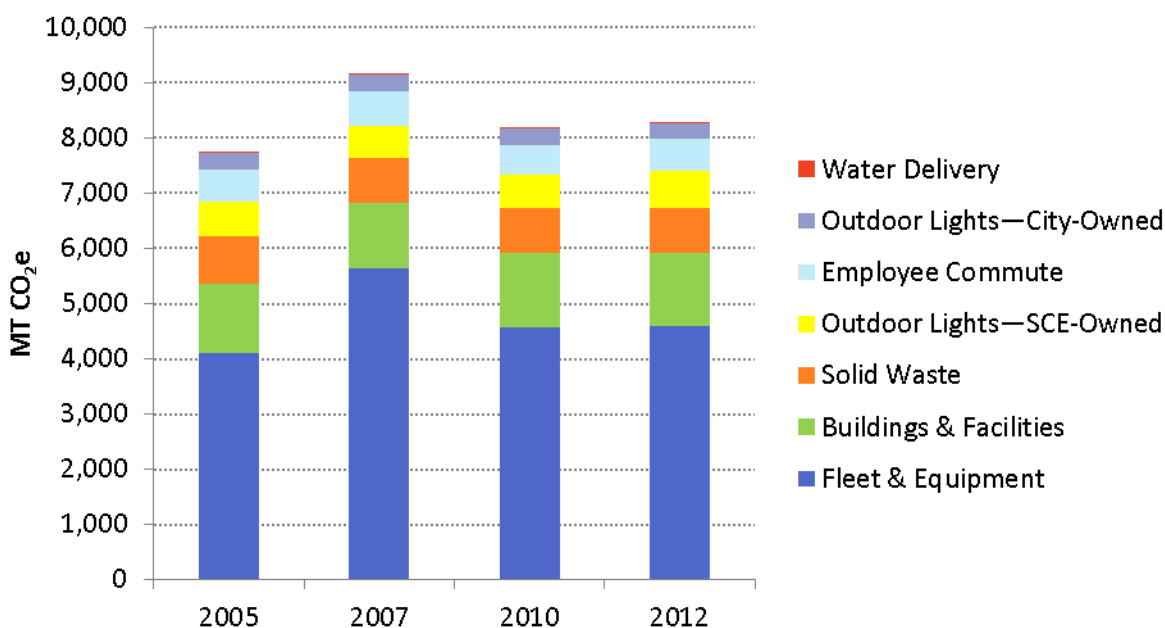
**Figure 12 Municipal GHG Emissions for 2005, 2007, 2010, and 2012**

Table 15 Activity Data used in 2005, 2007, 2010, and 2012 Municipal Inventories

Sector	2005	2007	2010	2012	% Change 2005 to 2012
Buildings & Facilities					
Electricity (kWh)	2,854,017	2,892,013	3,235,307	3,439,676	21%
Natural Gas (therms)	74,581	67,561	77,990	40,045	-46%
Outdoor Lights					
City-Owned (kWh)	990,539	1,040,958	1,017,637	907,175	-8%
SCE-Owned (kWh) ¹	2,052,177	2,040,770	2,102,014	2,073,560	1%
Fleet & Equipment					
City-Owned Fleet					
Gasoline (gallons)	138,491	360,090	241,947	242,939	75%
Diesel (gallons)	277,896	232,064	232,656	235,135	-15%
LPG (gallons)	779	710	883	802	3%
Employee Commute²					
Gasoline (vehicle miles traveled)	1,364,105	1,475,804	1,281,609	1,388,541	2%
Diesel (vehicle miles traveled)	6,022	6,021	0	0	-100%
Full-time Equivalent Employees	453	458	408	442	-3%
Solid Waste³					
Generated Waste (tons)	2,699	2,530	2,530	2,530	-6%
Water Delivery					
Electricity (kWh)	23,144	21,301	4,184	3,040	-87%

Notes: Data for 2005 and 2007 were taken from the Gardena Municipal Greenhouse Gas Emissions Inventory Report (2009).

¹ City-Owned Vehicle Fleet for Gasoline and Diesel includes transit bus fuel. 2010 and 2012 transit bus fuel data were not available. 2007 data were assumed for transit bus fuel for 2010 and 2012.

² Employee Commute survey conducted in 2014 and information was used to estimate employee commute characteristics, adjusted for the number of employees, for 2010 and 2012.

³ Data for 2010 and 2012 were not available. 2007 data were assumed for 2010 and 2012.

Inventory Forecasts

Business-as-Usual Forecasts

The BAU forecasts estimate future emissions using current (2012) consumption patterns and emission factors with the anticipated growth in the City. Anticipated growth is estimated using data from regional planning scenarios developed by the Southern California Association of Governments (SCAG), the City, and other relevant sources. The most relevant growth factors are used to project emissions by sector. Compound annual growth rates were developed using the growth projections from 2012 to 2020 and from 2021 to 2035, as shown Table 16.

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

Table 16 Growth Factors for 2012, 2020, and 2035

Sector	Demographic Indicator	2012	2020	2035	2012-2020 CAGR	2020-2035 CAGR
Transportation	Vehicle Miles Traveled	438,021,537	384,357,899	406,458,483	-1.62%	0.37%
Solid Waste, Water, Wastewater, Off-road Sources	Service Population (Population + Jobs)	88,180	88,600	96,900	0.06%	0.60%
NA ¹	Population	59,124	59,700	66,200	0.12%	0.69%
Commercial/ Industrial Energy	Jobs	29,056	28,900	30,700	-0.07%	0.40%
Residential Energy	Households	20,586	21,000	23,200	0.25%	0.67%
Municipal Jobs	Municipal Emissions ²	348FT/187PT	400FT/200PT	500FT/300PT	1.56%	1.76%

¹ Not Applicable. Population data are shown for informational purposes but are not used for forecasting any sector.

² The number of jobs in the City is used as an indicator for all municipal operation emissions.

FT: Full-time employees; PT: Part-time employees

CAGR: Compound annual growth rate.

Community Business-as-Usual Forecast

The City's BAU emissions in 2020 are estimated to be 406,678 MT CO₂e, or an 8.2% decrease from baseline (2005) emissions. By 2035, emissions are estimated to decrease 1.8% from the baseline level to 435,074 MT CO₂e (Table 17).

Table 17 Community BAU Forecast

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	2020 (MT CO ₂ e)	% Change 2012-2020	2035 (MT CO ₂ e)	%Change 2012-2035
On-Road Transportation	214,764	216,034	202,778	-6%	214,438	-1%
Commercial Energy	111,097	107,688	107,615	<1%	114,317	6%
Residential Energy	69,005	67,783	69,434	2%	76,708	13%
Solid Waste	32,789	18,654	18,844	1%	20,609	10%
Water	14,424	8,273	8,357	1%	9,140	10%
Off-Road Sources	795	1,836	2,062	12%	2,529	38%
Wastewater	232	179	181	1%	197	10%
Total	443,106	420,447	406,678	-3%	435,074	4%
% Change from 2005		-5.1%	-7.6%		-1.2%	

Municipal Business-as-Usual Forecast

The City is anticipating growth in city services by 2020 or 2035 from current (2012) levels; staff is expected to increase by nearly 60 full-time equivalent employees by 2020 and another 150 employees by 2035. Therefore, the activity data for all sectors are assumed to increase from 2012 (Table 18). In 2020, municipal emissions are estimated to be 21% above baseline emissions and in 2035 emissions are estimated to be 57% above those in 2005.

Table 18 Municipal BAU Forecast

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	2020 (MT CO ₂ e)	% Change 2012-2020	2035 (MT CO ₂ e)	% Change 2012-2035
Vehicle Fleet	4,095	4,603	5,223	13%	6,790	48%
Buildings & Facilities	1,264	1,313	1,490	13%	1,937	48%
Outdoor Lights	924	953	1,081	13%	1,406	48%
Solid Waste	870	816	926	13%	1,204	48%
Employee Commute	584	581	659	13%	857	48%
Water Delivery	7	1	1	0%	1	0%
Total	7,744	8,267	9,380	13%	12,195	48%
% Change from 2005		7%	21%		57%	

Adjusted Business-as-Usual Forecasts

State measures have been approved and/or adopted that will reduce GHG emissions in the City. These measures do not require additional local action, but should be accounted for in the City's emissions forecasts to provide a more accurate picture of future emissions and the level of local action needed to reduce emissions to levels consistent with State recommendations. This forecast is called the Adjusted BAU forecast. The legislation is 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. In addition, the State's Advanced Clean Cars program includes additional components that will further reduce GHG emissions statewide, including more stringent fuel efficiency standards for model years 2017–2025 and support infrastructure for the commercialization of zero-emission vehicles. CARB anticipates additional GHG reductions of 3% by 2020, 27% by 2035, and 33% by 2050¹. 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

¹ CARB Advanced Clean Cars Summary Sheet

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. The City is supplied by Golden State Water and the reductions in GHG emissions from SB X7-7 were calculated by applying the reduction goals established by Golden State Water to the City's population in 2020 and 2035.

Community Adjusted Business-as-Usual Forecast

The City's Adjusted BAU emissions in 2020 are estimated to be 36,997 MT CO₂e in 2020 and 326,781 MT CO₂e in 2035 (Table 19). This change represents a 17% reduction from 2005 by 2020 and 26% reduction 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 Non-residential Energy will increase. Emissions from Solid Waste, Water, and Wastewater are expected to increase over time but account for less than 10% of total emissions.

Table 19 Community Adjusted BAU Emissions

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	2020 (MT CO ₂ e)	2020 % of Total	2035 (MT CO ₂ e)	2035 % of Total
Transportation & Mobile Sources	215,559	217,870	164,594	45%	111,371	34%
Commercial Energy	111,097	107,688	107,615	29%	113,005	35%
Residential Energy	69,005	67,783	69,328	19%	75,871	23%
Solid Waste	32,789	18,654	18,844	5%	20,609	6%
Water & Wastewater	14,656	8,452	5,616	2%	5,925	2%
Total	443,106	420,447	365,997	100%	326,781	100%
% Change from 2005		-5%	-17%		-26%	

Municipal Adjusted Business-as-Usual Forecast

The City's Municipal Adjusted BAU emissions in 2020 are estimated to be 8,967 MT CO₂e, which is 16% above the 2005 baseline level (Table 20). By 2035, the level of reductions is anticipated to be 51% above 2005 levels, or 11,657 MT CO₂e. 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 City's Vehicle Fleet and Employee Commute sectors.

Table 20 Municipal Adjusted BAU Emissions

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	2020 (MT CO ₂ e)	2020 % of Total	2035 (MT CO ₂ e)	2035 % of Total
Vehicle Fleet	4,095	4,603	4,856	54%	6,312	54%
Buildings & Facilities	1,264	1,313	1,490	17%	1,937	17%
Outdoor Lights	924	953	1,081	12%	1,406	12%
Solid Waste	870	816	926	10%	1,204	10%
Employee Commute	584	581	613	7%	797	7%
Water Delivery	7	1	1	0%	1	0%
Total	7,744	8,267	8,967	100%	11,657	100%
% Change from 2005		7%	16%		51%	

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. 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, the City will determine the level of reductions that it can and should achieve. The recommended targets provided below are guidance based on consistency with the State’s goals.

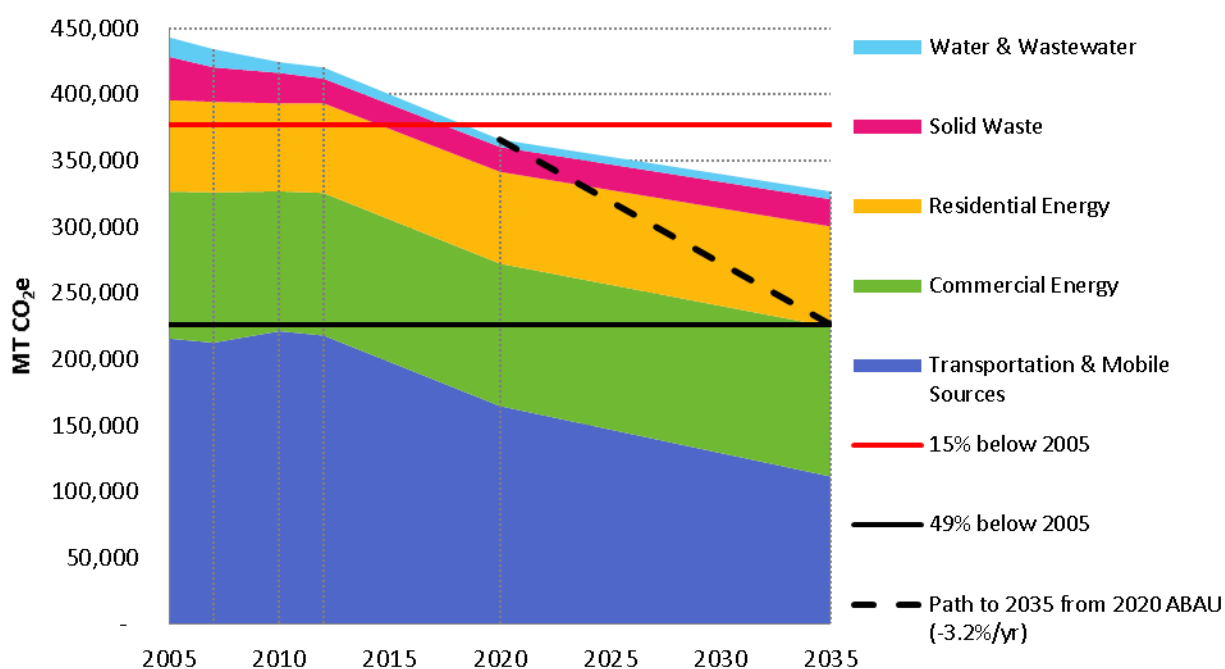
Recommended Community Targets

In 2020, it is anticipated that the City would meet the reduction target through existing efforts. In 2035, the City would need to reduce 100,797 MT CO₂e emissions below the 2035 Adjusted BAU scenario to meet the State-aligned target (Table 21 and Figure 13). To sustain the progress achieved to date and continue progress beyond 2020, the City would need to implement new reduction measures or augment existing efforts. Early implementation of measures demonstrates the City’s commitment to the EECAP and allows the City to phase implementation of new strategies so that ongoing reductions may be achieved. Ongoing implementation would also provide additional reductions that further help mitigate climate change and provide additional coverage if the State measures do not achieve their anticipated reductions.

² 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.

Table 21 State-Aligned Community GHG Reduction Targets

Sector	2005	2012	2020	2035
BAU Emissions (MT CO ₂ e)	443,106	420,447	409,271	437,938
Adjusted BAU Emissions (MT CO ₂ e)	443,106	420,447	365,997	326,781
State-Aligned Target (% change from 2005)			-15%	-49%
State-Aligned Target (% change from 2012)			-10%	-46%
State-Aligned Emissions Goal (MT CO ₂ e)			376,640	225,984
Reductions from Adjusted BAU needed to meet the Target (MT CO ₂ e)			Target Met	100,797

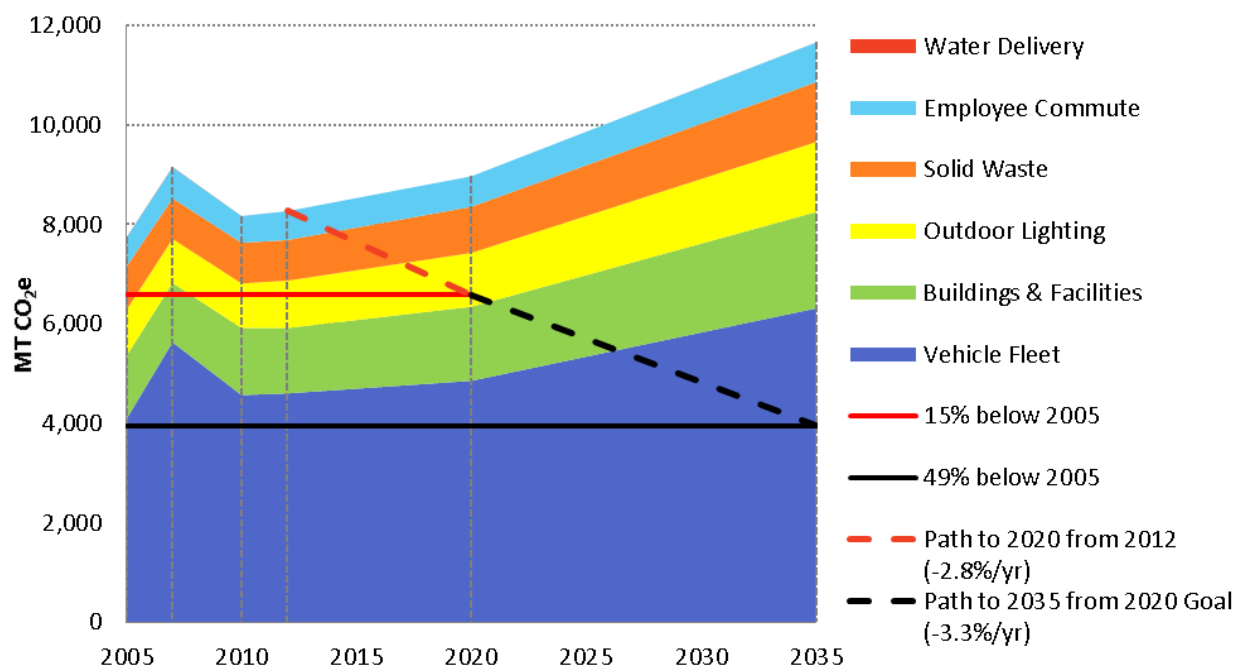
**Figure 13 Community Emissions Inventories, Projections, and Targets**

Recommended Municipal Targets

In 2020, the City will need to reduce its emissions by 2,385 MT CO₂e from the 2020 Adjusted BAU forecast to achieve a reduction goal consistent with the State (Table 22 and Figure 14). The City will need to implement additional measures to continue to achieve GHG reductions beyond 2020. By 2035, the City will need to reduce municipal operation emissions by 7,708 MT CO₂e from the 2035 Adjusted BAU forecast to meet a 49% reduction goal (below 2005 levels).

Table 22 State-Aligned Municipal GHG Reduction Targets

Sector	2005	2012	2020	2035
BAU Emissions (MT CO ₂ e)	7,744	8,267	9,380	12,195
Adjusted BAU Emissions (MT CO ₂ e)	7,744	8,267	8,967	11,657
State-Aligned Target (% change from 2005)			-15%	-49%
State-Aligned Target (% change from 2012)			-20%	-52%
State-Aligned Emissions Goal (MT CO ₂ e)			6,582	3,949
Reductions from Adjusted BAU needed to meet the Target (MT CO ₂ e)			2,385	7,708

**Figure 14 Municipal Emissions Inventories, Projections, and Targets**



Chapter 3

Energy Profile

Key Findings

Community

- Energy accounted for 42% of all community GHG emissions in 2012.
- Residents emit more GHGs from natural gas consumption than electricity consumption.
- Energy use is declining in Residential natural gas and Commercial/Industrial electricity.

Municipal

- Energy accounted for 27% of all municipal GHG emissions in 2012.
- Buildings & Facilities and City-owned Outdoor Lights account for the majority of electricity use in municipal operations.

The EECAP ultimately will focus on increasing energy efficiency and reducing GHG emissions from energy; therefore, it is important for the City to understand its current energy consumption to make informed decisions for reducing energy-related emissions.

Community Energy Use

Community energy use consists of electricity and natural gas. Emissions from Commercial/Industrial and Residential energy use account for about 42% of the total community emissions in 2005 and 2012. Table 23 shows the breakdown in activity (kWh or therms) and GHG emissions by sector and energy source.

Table 23 Activity Data and GHG Emissions of Energy in 2005 and 2012 (Community)

Sector	2005		2012		% Change in Activity 2005-2012	% Change in Emissions 2005-2012
	Activity (kWh or therms)	Emissions (MT CO ₂ e)	Activity (kWh or therms)	Emissions (MT CO ₂ e)		
Commercial/ Industrial						
Electricity	281,182,579	85,421	240,483,911	76,903	-14.5%	-10.0%
Natural Gas	4,828,567	25,676	5,789,305	30,785	19.9%	19.9%
Residential						
Electricity	88,070,500	26,755	89,537,409	28,633	1.7%	7.0%
Natural Gas	7,945,441	42,250	7,362,507	39,150	-7.3%	-7.3%
Total (MT CO ₂ e)		180,102		175,471		-2.6%

Commercial electricity use decreased 14.5% between 2005 and 2012; however, emissions decreased by 10%. Residential electricity use increased 1.7% but emissions increased by 7%. The difference between the change in activity data and emissions data are 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, Southern California Edison (SCE) generated electricity that resulted in an emission factor of 669.7 CO₂e. In 2012, SCE's electricity generation resulted in an emission factor of 705.0 CO₂e.

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.

Unlike electricity, the emission factor for natural gas is estimated on a national basis and remains fairly constant over time. Therefore, the natural gas GHG emissions follow the same trend as usage. In Gardena, Commercial/Industrial natural gas consumption (therms) increased by about 20% from 2005 to 2012; therefore the emissions also increased by about 20%. Residential natural gas therms used and GHG emissions declined nearly 7% from 2005 to 2012. Figure 15 shows the trend in electricity and natural gas emissions from 2005 to 2012 for the Commercial/Industrial and Residential sectors.

Energy Indicators

Increasing energy efficiency may be best achieved through targeted strategies. The following indicators from SCAG may be useful in identifying opportunities for energy conservation measures:

- The average household size is 2.8.
- Approximately 25 percent of households are single-person households.
- Approximately 48 percent of households are owner-occupied.
- 652 single-family housing permits were issued between 2000 and 2012.
- 86 multi-family housing permits were issued between 2000 and 2012.
- Approximately 51 percent of residential units are single family homes.
- The median home sales price is \$290,000.
- Job sectors with the highest share of jobs were Manufacturing, Education, Leisure, Transportation, and Retail, accounting for 69 percent of jobs.



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.

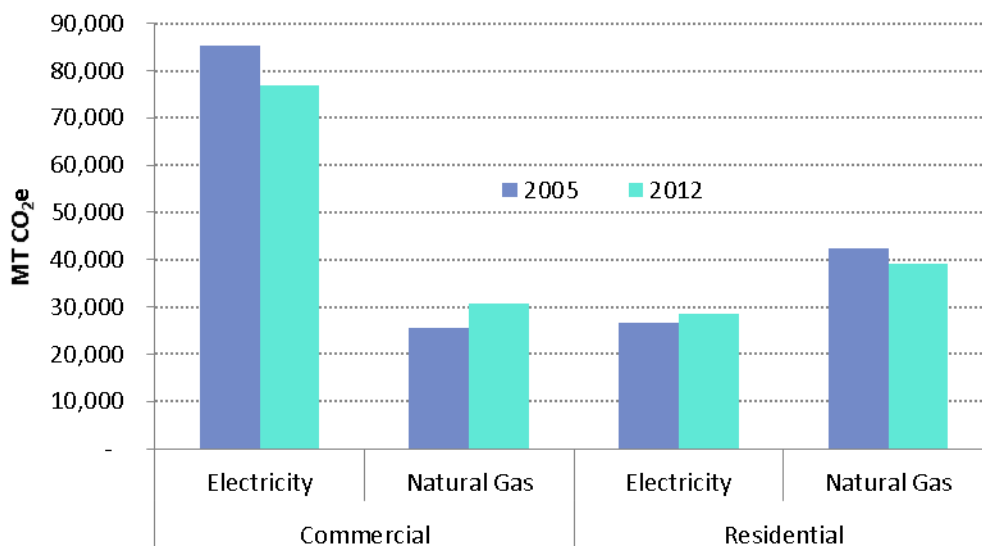


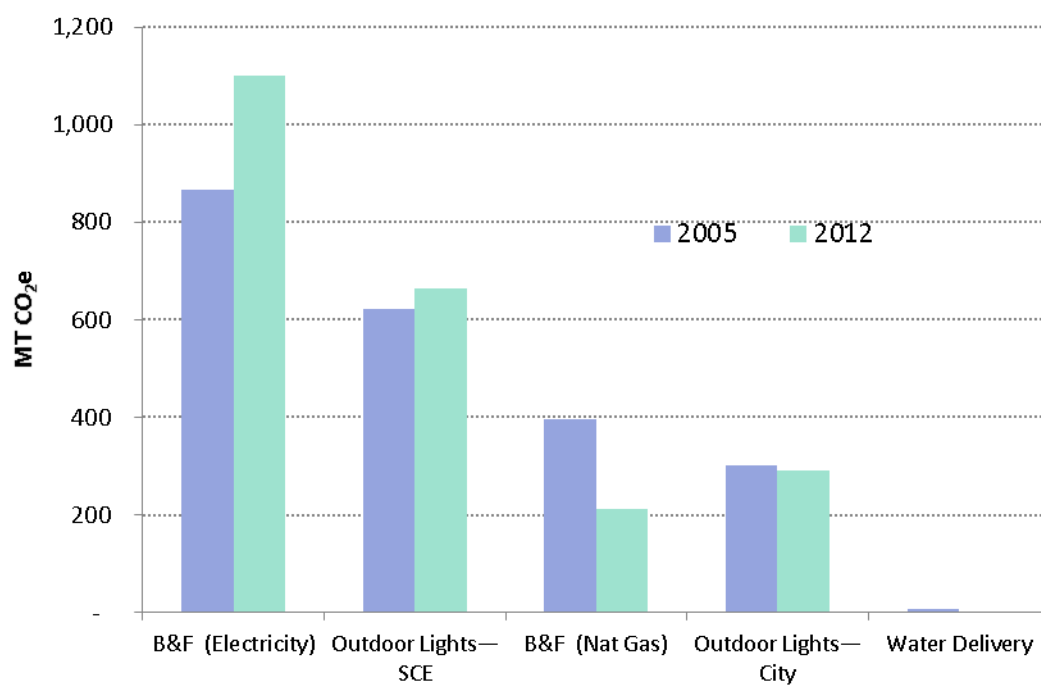
Figure 15 GHG Emissions for Community Electricity and Natural Gas, by Sector

Municipal Energy Use

As with the community emissions, the EECAP will focus on increasing energy efficiency and reducing GHG emissions from energy within municipal operations. The City has more direct control over energy-related emissions than other sectors, such as Employee Commute. Municipal energy use includes Buildings & Facilities, SCE-Owned Outdoor Lights, City-Owned Outdoor Lights, and Water Delivery. Energy accounted for 28% of total emissions in 2005 and 27% in 2012. Overall, emissions from energy increased 3% from 2005 to 2012; electricity-based emissions increased 14% while natural gas related emissions decreased 46% (Table 11). Electricity emissions declined for each sector except SCE-Owned Outdoor Lights and Buildings & Facilities. Table 24 and Figure 16 show the trends in electricity and natural gas emissions from 2005 to 2012 for the municipal energy sector.

Table 24 Activity Data and GHG Emissions of Energy in 2005 and 2012 (Municipal)

Sector	2005		2012		% Change in Activity 2005-2012	% Change in Emissions 2005-2012
	Activity (kWh or therms)	Emissions (MT CO ₂ e)	Activity (kWh or therms)	Emissions (MT CO ₂ e)		
Buildings & Facilities						
Electricity	2,854,017	867	3,439,676	1,100	21%	27%
Natural Gas	74,581	397	40,045	213	-46%	-46%
Outdoor Lights—SCE Owned						
Electricity	2,052,177	623	2,073,560	663	1%	6%
Outdoor Lights—City Owned						
Electricity	990,539	301	907,175	290	-8%	-4%
Irrigation						
Electricity	23,144	7	3,040	0.97	-87%	-86%
Total (MT CO ₂ e)		2,195		2,267	8%	3%



Note: B&F indicates Buildings and Facilities.

Figure 16 GHG Emissions for Municipal Electricity and Natural Gas, by Sector

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Chapter 4

Energy Efficiency Strategies

Key Findings

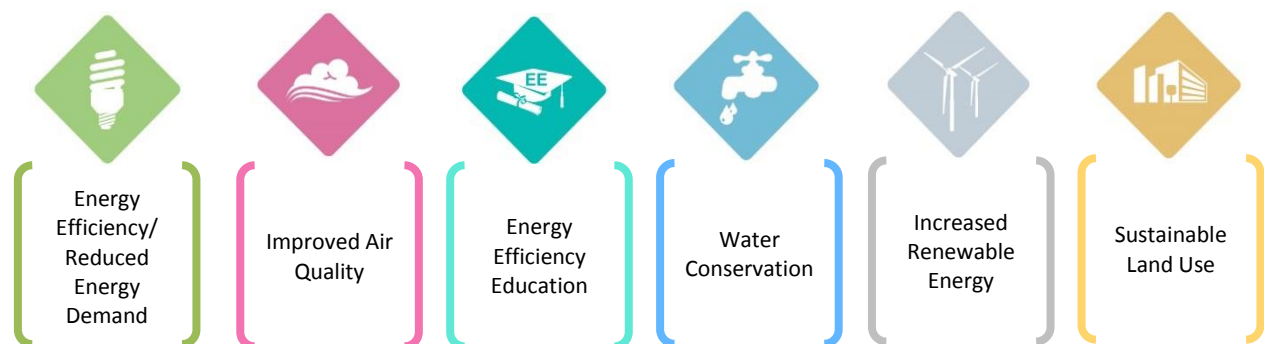
Community

- The City plans to implement energy efficiency (EE) strategies which increase EE in both existing and new residential and commercial development, increase EE through water efficiency, and decrease energy demand through reducing the urban heat island effect.
- The City, through its partnership with the South Bay COG, will obtain educational content, energy audit services, and assistance identifying potential funding sources to help implement strategies.
- These actions combined with state measures will lead to a 24% reduction from 2005 levels by 2020 and 58% reduction from 2005 levels by 2035.

Municipal

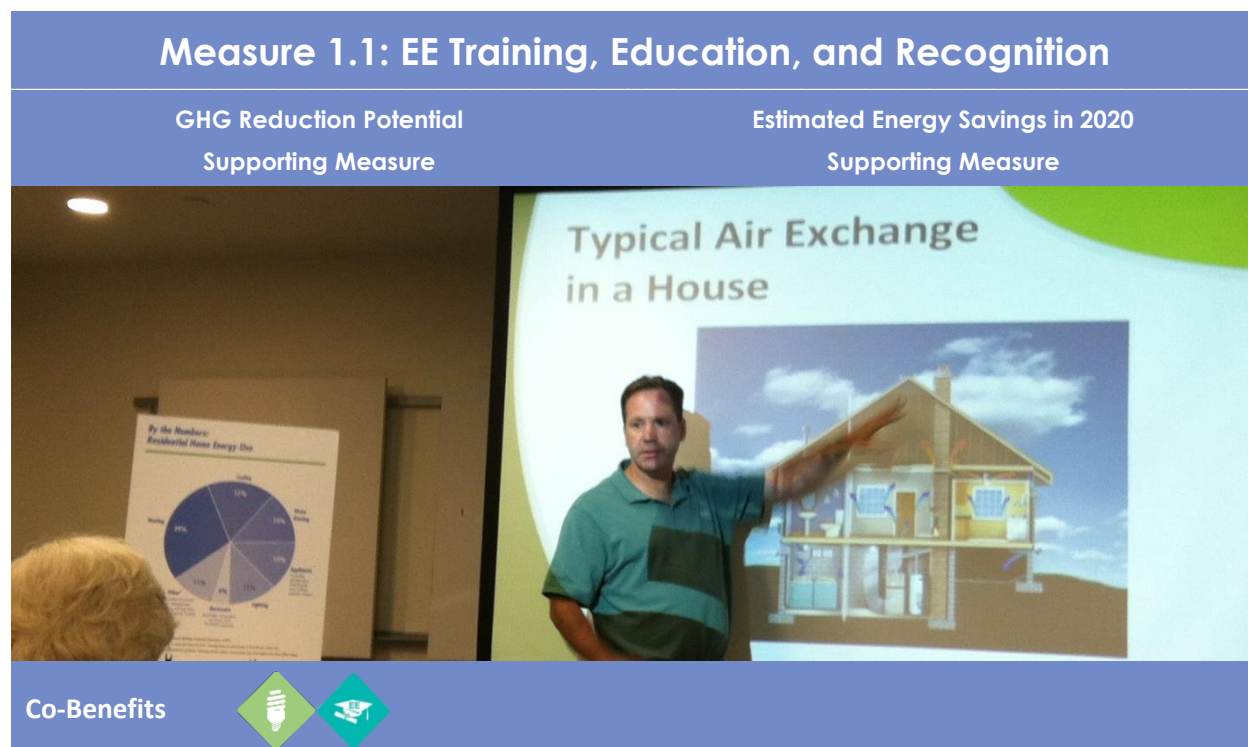
- The City plans to implement EE strategies which increase EE in municipal buildings and City infrastructure, promote EE through education, outreach, and planning efforts, and reduce energy consumption in the long term.
- The City, through its partnership with the South Bay COG, will obtain recognition for EE achievements and energy audit services.
- These actions combined with state measures will result in an 8% increase from 2005 levels by 2020 and 27% increase from 2005 levels by 2035.

The City will achieve significant GHG emissions reductions through legislation adopted and implemented at the State level and quantified in Chapter 3. This Chapter summarizes existing programs and the proposed reduction measures to be implemented by the City or SBCCOG to further reduce GHG emissions. Each measure includes the energy (kilowatt hours and/or therms) savings, GHG reduction potential, and additional community co-benefits. The co-benefits describe the additional community benefits from implementing the reduction measure beyond the GHG emissions reduced. The following icons are used to indicate the co-benefits for each measure:



Community Energy Efficiency Strategies

Goal 1: Increase Energy Efficiency (EE) in Existing Residential Units



Opportunities for residents to improve energy efficiency in their homes range from changes to behavior that they can start today to physical modifications or improvements they can make to their homes. This measure will provide City staff with a framework to educate community members about behavioral and technological changes that can increase energy efficiency.

Actions:

- Post links on website/social media and provide materials at public events
- Email list for email blasts of new information or trainings
- Establish an annual EE Fair
- Create a resource center
- Hire/Designate Energy Advocate
- Partner with South Bay Cities Council of Governments (SBCCOG) and Utilities to obtain educational content

Measure 1.2: Increase Participation in Existing EE Programs

GHG Reduction Potential

2020 – 43 MTCO₂e

2035 – 202 MTCO₂e

GHG Reduction Potential

67,128 kWh

3,958 Therms



Co-Benefits



The City will work to increase residents' participation in existing energy efficiency programs that are low-cost or even provide a financial benefit to the resident. As part of the South Bay Energy Efficiency Partnership with SCE and SCG, the City will continue outreach efforts that are largely led by SBCCOG to promote energy awareness and existing programs and incentives that are offered for energy efficiency. Some examples of programs and resources are listed below:

- **Rebate programs** through SCE and SCG for appliances, air conditioner alternatives, electric water heaters, light bulbs, space heaters, water heaters, pool heaters, showerheads, washers, and insulation.
- **Demand Response programs** through SCE that provide on-bill credits including the Summer Discount Plan and Save Power Days Program.
- **Technical and financial assistance programs** through SCG's Direct Install Weatherization Program for income-qualified renters and homeowners.

As programs change over time, continued and up-to-date outreach is necessary. The actions detailed below would provide a variety of channels for ongoing communication to the City's residents.

Action:

- Partner with SBCCOG and Utilities for outreach events

Measure 1.3: Establish, Promote, or Require Home Energy Evaluations

GHG Reduction Potential

Supporting Measure

Estimated Energy Savings in 2020

Supporting Measure



Co-Benefits



Home energy evaluations are necessary to identify cost-effective opportunities for energy saving and for residents to take practical actions to achieve energy efficiency. Home energy evaluations can be established or promoted by a variety of existing programs.

Actions:

- Require third-party inspector to verify Title 24 or greater compliance to home upgrades (Alternative: Enhanced enforcement of Title 24 compliance)
- Promote home energy audits through programs such as Energy Upgrade California or other State programs
- Establish free "Energy Checkup" program with the assistance of the SBCCOG if funding can be obtained.

Measure 1.4: Promote, Incentivize, or Require Residential Home Energy Renovations

GHG Reduction Potential

2020 – 10,225 MTCO₂e

2035 – 48,567 MTCO₂e

GHG Reduction Potential

22,323,399 kWh

580,331 Therms



Co-Benefits



Approximately 79 percent of residential buildings in the City were built before the adoption of Title 24. Buildings built before adoption of Title 24 are not energy efficient, and renovations would achieve higher energy efficiency. Many programs and incentives across the state or country help promote home energy renovations, including city-supervised funding, permit process improvements and city ordinance.

Actions:

- Promote existing incentivized programs such as Energy Upgrade California
- Promote a green building program
- Promote Financing Programs such as PACE (Properly Assessed Clean Energy)
- Develop City-based revolving loan fund

Goal 2: Increase Energy Efficiency in New Residential Development

Measure 2.1: Encourage or Require EE Standards Exceeding Title 24

GHG Reduction Potential

2020 – 154 MTCO₂e

2035 – 730 MTCO₂e

GHG Reduction Potential

203,138 kWh

16,704 Therms



Co-Benefits



This measure will develop City staff to become resources in encouraging and implementing energy efficiency building measures beyond that required in current Title 24 Standards. As part of the 2010 California Green Building Standards (CALGreen), a two-tiered system was designed to allow local jurisdictions to adopt codes that go beyond state standards. The two tiers contain measures that are more stringent and achieve an increased reduction in energy usage by 15% (Tier 1) or 30% (Tier 2) beyond Title 24. This measure will also ensure that as Title 24 Standards are updated, City staff are well-informed and can implement updates quickly and effectively.

Actions:

- Educate City staff, developers, etc., on future Title 24 updates and the additional energy efficiency opportunities for new residential development
- Promote Tier 1, Tier 2, Green Building Ratings such as LEED, Build It Green/Green Point Rating System, or Energy Star certified buildings

Goal 3: Increase Energy Efficiency in Existing Commercial Units

Measure 3.1: EE Training and Education

GHG Reduction Potential
Supporting Measure

Estimated Energy Savings in 2020
Supporting Measure



Co-Benefits



Education is at the core of attaining energy efficiency goals. Creating a specific education measure will emphasize the critical role of education in achieving energy efficiency. An education measure will also provide City staff with a framework to interact with and educate community members about behavioral and technological changes that can increase energy efficiency.

Actions:

- Post links on website/social media and provide materials at public events
- Email list for e-mail blasts of new information or trainings
- Establish an annual EE Fair
- Create a resource center
- Partner with SBCCOG and Utilities to obtain educational content

Measure 3.2: Increase Participation in Existing EE Programs

GHG Reduction Potential

2020 – 608 MTCO₂e

2035 – 2,886 MTCO₂e

Estimated Energy Savings in 2020

1,656,905 kWh

14,603 Therms



Co-Benefits



The City will work to increase businesses' participation in existing energy efficiency programs that are low-cost or provide a financial benefit to the business. As part of the South Bay Energy Efficiency Partnership with SCE and SCG, the City will continue outreach efforts to promote the energy awareness and existing programs and incentives that are offered for energy efficiency. These outreach efforts are largely led by the SBCCOG. Some examples of programs and resources are listed below.

- **Rebate programs** through SCE and SCG for appliances, air conditioner alternatives, electric water heaters, light bulbs, space heaters, water heaters, and insulation.
- **Demand Response programs** through SCE that provide on-bill credits including the Summer Discount Plan and Save Power Days Program.

As programs change over time, continuous and up-to-date outreach will be necessary. The actions detailed below would provide a variety of channels for ongoing communication to the City's businesses.

Action:

- Partner with SBCCOG and Utilities for outreach events

Measure 3.3: Incentivize or Require Non-residential Energy Audits

GHG Reduction Potential

2020 – 995 MTCO₂e

2035 – 4,726 MTCO₂e

Estimated Energy Savings in 2020

2,222,071 kWh

53,493 Therms



Co-Benefits



Commercial energy audits are necessary to identify cost-effective opportunities for energy savings and for business owners to take practical actions to achieve energy efficiency. The audits can be established or promoted through various existing programs.

Actions:

- Require third-party inspector to verify Title 24 or greater compliance to upgrades
- Promote energy audits such as through Energy Upgrade California or other state programs
- Require early adoption of AB 1103 for small buildings (5,000-10,000 square feet)

Measure 3.4: Promote or Require Commercial Energy Retrofits

GHG Reduction Potential

2020 – 16,797 MTCO₂e

2035 – 79,786 MTCO₂e

Estimated Energy Savings in 2020

40,492,888 kWh

723,663 Therms



Co-Benefits



As most commercial buildings were built before the adoption of Title 24, most of the facilities and equipment are not energy efficient. Therefore, retrofits are necessary to achieve higher energy efficiency. Many programs and incentives across the State or country help promote non-residential energy retrofits, including city-supervised funding, permit process improvements, and city ordinance.

Actions:

- Promote existing incentivized programs such as Energy Upgrade California
- Promote a green building program
- Promote Financing Programs such as PACE (Properly Assessed Clean Energy)

Goal 4: Increase Energy Efficiency in New Commercial Development

Measure 4.1 Encourage or Require EE Standards Exceeding Title 24

GHG Reduction Potential

Not Applicable

Estimated Energy Savings in 2020

Not Applicable



Co-Benefits



No new commercial development is projected so this measure will not have GHG reduction and energy savings associated with it. However, this measure still provides city planners with a unique opportunity to inform potential developers of new energy efficiency opportunities and encourage them to adopt these technologies in new development. This measure will develop City staff to be resources in encouraging and implementing energy efficiency beyond that required by current Title 24 Standards. This will also ensure that as Title 24 Standards are updated, City staff are well-informed and can implement updates quickly and effectively.

Actions:

- Educate City staff, developers, etc., on future Title 24 updates and the additional energy efficiency opportunities for new commercial development
- Promote Tier 1, Tier 2, Green Building Ratings such as LEED, Build It Green/Green Point Rating System, or Energy Star certified buildings

Goal 5: Increase Energy Efficiency through Water Efficiency (WE)

Measure 5.1: Promote or Require WE through SBX7-7

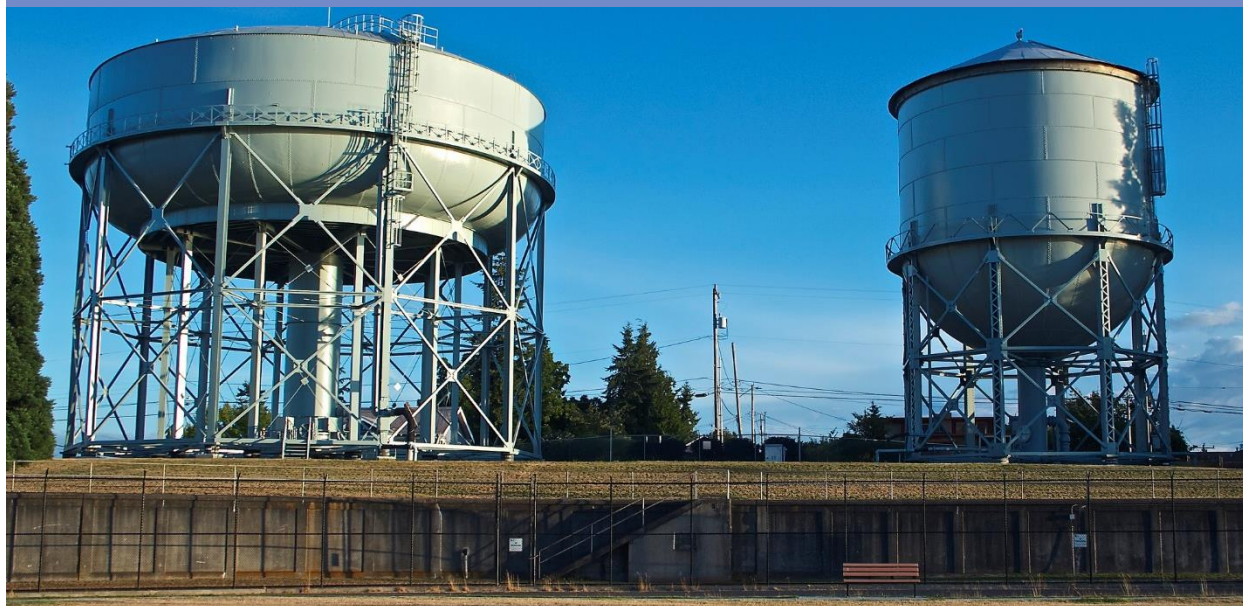
GHG Reduction Potential

2020 – 796 MTCO₂e

2035 – 3,783 MTCO₂e

Estimated Energy Savings in 2020

2,490,654 kWh



Co-Benefits



SB X7-7, or The Water Conservation Act of 2009, requires all water suppliers to increase water use efficiency. The legislation set an overall goal of reducing per capita urban water consumption by 20 percent from a baseline level by 2020. This goal can be met by taking a variety of actions, including targeted public outreach and promoting water efficiency measures such as low-irrigation landscaping. Additional water conservation information, resource materials, education, and incentives are available through the West Basin Water District.

Actions:

- Post links on website/social media and provide materials at public events
- Require low-irrigation landscaping
- Partner with SBCCOG and Water District to obtain educational content
- Partner with SBCCOG and Water District for outreach events

Measure 5.2: Promote WE Standards Exceeding SB X7-7

GHG Reduction Potential

2020 – 2 MT CO₂e

2035 – 10 MT CO₂e

Estimated Energy Savings in 2020

6,445 kWh



Co-Benefits



In addition to SB X7-7, more actions are being studied or have been taken to exceed water efficiency standards. These efforts include education and outreach practices that could be combined with residential and commercial EECAP actions that emphasize the reuse of recycled/gray water and promote harvesting rainwater. Approximately 1,873 kWh can be saved for every acre foot (AF) of water use replaced by recycled water.³

Actions:

- Staff time dedicated to work with HOAs, businesses, and other groups for outreach
- Allow recycled or grey water uses for non-municipal uses
- Work with Water District to increase recycled water potential
- Promote rainwater harvesting rebates and demonstrations

³ California Sustainability Alliance, The Role of Recycled Water in Energy Efficiency and Greenhouse Gas Reduction, May 2, 2008.

Goal 6: Decrease Energy Demand through Reducing Urban Heat Island Effect

Measure 6.1: Promote Tree Planting for Shading and EE

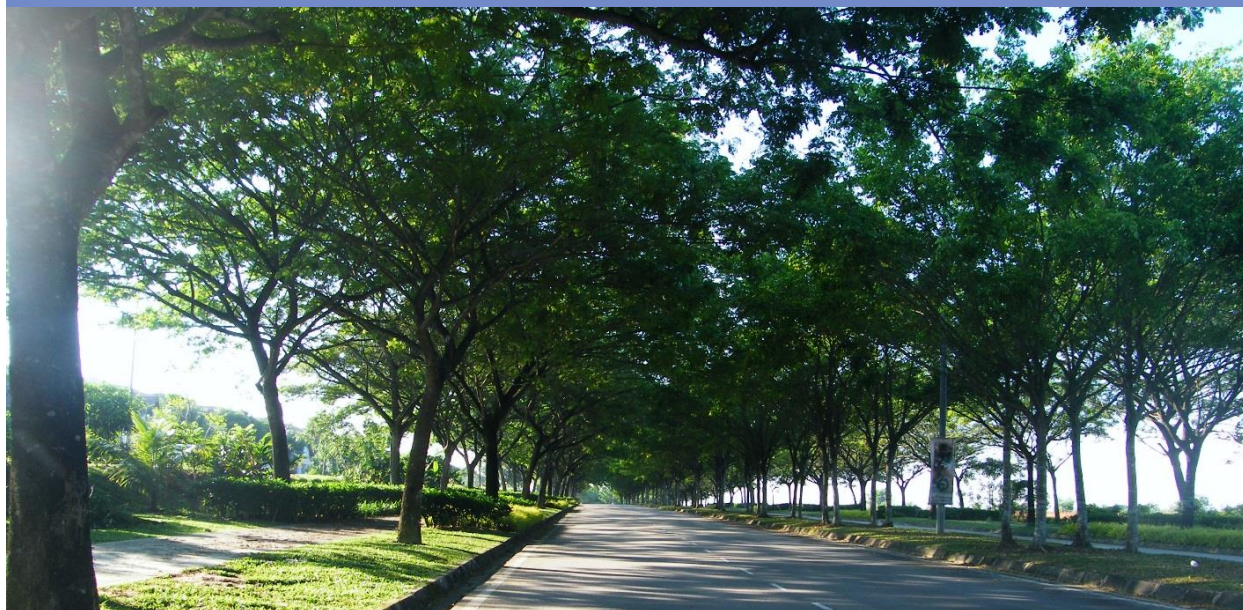
GHG Reduction Potential

2020 – 323 MTCO₂e

2035 – 1,534 MTCO₂e

Estimated Energy Savings in 2020

1,010,123 kWh



Co-Benefits



Trees and plants naturally help cool an environment by providing shade and evapotranspiration (the movement of water from the soil and plants to the air), making vegetation a simple and effective way to reduce urban heat islands. Shaded surfaces may be 20–45°F (11–25°C) cooler than the peak temperatures of un-shaded materials. In addition, evapotranspiration, alone or in combination with shading, can help reduce peak summer temperatures by 2–9°F (1–5°C). Furthermore, trees and plants that directly shade buildings can reduce energy use by decreasing demand for air conditioning.

Actions:

- Encourage tree planting at plan check
- Work with community to develop a tree-planting group
- Develop a City tree planting program

Measure 6.2: Incentivize or Require Light-Reflecting Surfaces

GHG Reduction Potential Measure Under Consideration	Estimated Energy Savings in 2020 Measure Under Consideration
	
Co-Benefits 	

Replacing surface areas with light-reflecting materials can decrease heat absorption and lower outside air temperature. Both roofs and pavements are ideal surfaces for taking advantage of this advanced technology.

Cool roof is built from materials with high thermal emittance and high solar reflectance—or albedo—to help reflect sunlight (and the associated energy) away from a building. These properties help roofs to absorb less heat and stay up to 50–60°F (28–33°C) cooler than conventional materials during peak summer weather. Cool roofs may be installed on low-slope roofs (such as the flat or gently sloping roofs typically found on commercial, industrial, and office buildings) or the steep-sloped roofs used in many residences and retail buildings.

Cool pavement is built from materials that reflect more solar energy, enhance water evaporation, or have been otherwise modified to remain cooler than conventional pavements. This pavement can be created with existing paving technologies as well as newer approaches such as the use of coatings, permeable paving, or grass paving. Cool pavements save energy by lowering the outside air temperature, allowing air conditioners to cool buildings with less energy, and reducing the need for electric street lighting at night.

Action:

- Pass an ordinance requiring or incentivizing cool roofs

Summary of Community Reductions

By implementing these local reduction measures, the City would reduce its community GHG emissions associated with energy use by approximately 7% compared to the 2020 business-as-usual (BAU) emissions and 32% compared to the 2035 BAU emissions. Figure 17 depicts the sectors where the anticipated reductions will take place with the corresponding potential decreases, and Table 25 summarizes the energy efficiency strategies and the potential GHG reductions.

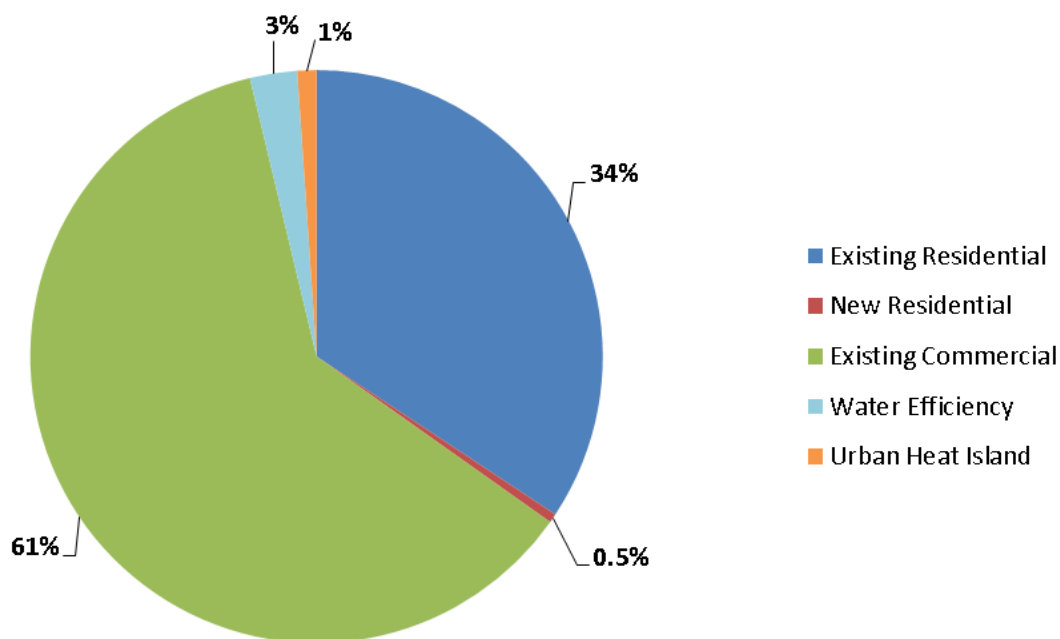


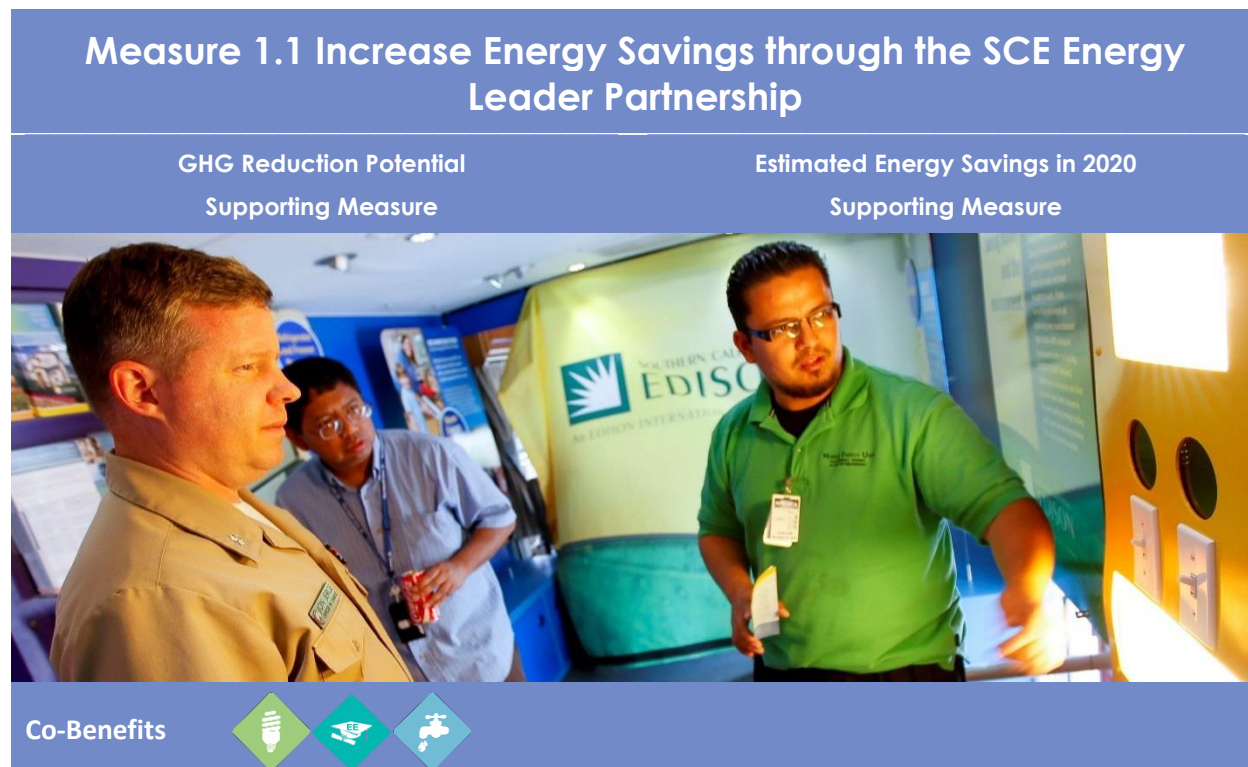
Figure 17 Local Reduction Quantification by Goal

Table 25 Community Energy Efficiency Strategies and GHG Reduction Potential

		2020 Reductions			2035 Reductions		
Measure No.	Measures	MT CO ₂ e	kWh	Therms	MT CO ₂ e	kWh	Therms
Goal 1: Increase Energy Efficiency (EE) in Existing Residential Units							
Measure 1.1	EE Training and Education	Supporting Measure					
Measure 1.2	Increase Participation in Existing EE Programs	43	67,128	3,958	202	318,860	18,798
Measure 1.3	Establish, Promote, or Require Home Energy Evaluations	Supporting Measure					
Measure 1.4	Promote, Incentivize, or Require Residential Home Energy Renovations	10,225	22,323,399	580,331	48,567	106,036,146	2,756,575
Goal 2: Increase Energy Efficiency in New Residential Development							
Measure 2.1	Encourage or Require EE Standards Exceeding Title 24	154	203,138	16,704	730	964,903	79,342
Goal 3: Increase Energy Efficiency in Existing Commercial Units							
Measure 3.1	EE Training and Education	Supporting Measure					
Measure 3.2	Increase Participation in Existing EE Programs	608	1,656,905	14,603	2,886	7,870,298	69,365
Measure 3.3	Promote or Require Non-Residential Energy Audits	995	2,222,071	53,493	4,726	10,554,839	254,093
Measure 3.4	Promote or Require Commercial Energy Retrofits	16,797	40,492,888	723,663	79,786	192,341,218	3,437,400
Goal 4: Increase Energy Efficiency in New Commercial Development							
Measure 4.1	Encourage or Require EE Standards Exceeding Title 24	No new commercial development is projected, therefore no GHG reduction or energy savings were quantified.					
Goal 5: Increase Energy Efficiency through Water Efficiency (WE)							
Measure 5.1	Promote or Require WE through SBX7-7	796	2,490,654	-	3,783	11,830,607	-
Measure 5.2	Promote WE Standards Exceeding SB X7-7	2	6,445	-	10	30,613	-
Goal 6: Decrease Energy Demand through Reducing Urban Heat Island Effect							
Measure 6.1	Promote Tree Planting for Shading and EE	323	1,010,123	-	1,534	4,798,084	-
Measure 6.2	Incentivize or Require Light-Reflecting Surfaces	Unable to quantify GHG reduction potential due to unknown variables.					
Total		29,942	70,472,751	1,392,752	142,224	334,745,568	6,615,573

Municipal Energy Efficiency Strategies

Goal 1: Participate in Education, Outreach, and Planning Efforts for Energy Efficiency



The Southern California Edison (SCE) Energy Leader Partnership (ELP) Program is a framework that offers enhanced rebates and incentives to cities that achieve measurable energy savings, reduce peak-time electricity demand, and plan for energy efficiency. This program also provides resources to cities to identify energy efficiency projects and technical assistance to implement them. The ELP has a tiered incentive structure with threshold criteria required to trigger advancement to the next level of participation. The City is currently at the Valued Partner Level and is anticipated to achieve the Silver Level by the end of 2015.

Goal 2: Increase Energy Efficiency in Municipal Buildings

Measure 2.1: Conduct Municipal Energy Audit

GHG Reduction Potential
Supporting Measure

Estimated Energy Savings in 2020
Supporting Measure



Co-Benefits



Knowledge of building energy use is an effective way to determine energy inefficiencies and opportunities for retrofits and upgrades. Initial energy benchmarking was conducted for the buildings and facilities within the City in order to provide a baseline for comparison. Annual review of energy use within each building should be conducted to see trends and determine if the energy efficiency retrofits are effective. These annual reviews of energy use can also assist in determining when calibrating HVAC equipment, or other maintenance is required to keep the building at peak efficiency. Energy audits are a comprehensive review of both energy use and key components of the building. Energy audits provide an improved understanding of energy use, reveal energy inefficiencies of the building or building energy appliances, and offer recommendations on how to improve or correct the energy inefficiencies through retrofits or upgrades. Therefore, energy audits should be conducted on a routine basis of every 3 to 5 years.



LEED—Leadership in Energy & Environmental Design—is a rating system for buildings, homes, and communities developed by the U.S. Green Building Council (USGBC). Under this measure, the City could improve energy efficiency by requiring LEED certification, or certification through another green building rating system, for its municipal buildings.

Measure 2.3: Participate in Demand Response Programs

GHG Reduction Potential
Supporting Measure

Estimated Energy Savings in 2020
Supporting Measure



Co-Benefits



Electricity is supplied to buildings immediately upon demand. During hours of peak demand, such as the late afternoon, the electricity grid is often put under stress to supply the increased demand. Demand Response Programs offer incentives (e.g. discounted rates and bill credits) to electricity consumers to reduce their energy demand, or shift their demand to off-peak hours, in response to grid stress.

Measure 2.4: Participate in Direct Install Program

GHG Reduction Potential

2020 – 51 MTCO₂e

2035 – 159 MTCO

Estimated Energy Savings in 2020

157,954 kWh



Co-Benefits



SCE offers a Direct Install Program to reduce energy costs and save money. The program is funded by the utility ratepayers and includes a free assessment of the building by a contractor and installation of free energy-efficient replacement equipment. Examples of the energy-efficient equipment include fluorescent lighting, LED signs, window film, and programmable thermostats. In 2014, eight municipal buildings participated in this program and saved over \$22,000 as a result.

Measure 2.5: Adopt a Procurement Policy for EE Equipment

GHG Reduction Potential

2020 – 98 MTCO₂e

2035 – 309 MTCO₂e

Estimated Energy Savings in 2020

214,051 kWh

5,594 Therms



Co-Benefits



Energy efficient procurement policies can reduce government facility energy costs by about 5 to 10 percent.⁴ As municipal appliances wear out, the City would replace them with Energy Star or energy efficient equipment. Energy Star offers an appliance calculator to estimate money and energy saved by purchasing its products. Since the city has moderately reduced its energy consumption through other measures, it is assumed that the reduction potential of the procurement policy would be approximately 7.5 percent.

⁴ Lawrence Berkeley National Laboratory (LBNL), Potential Energy, Cost, and CO₂ Saving from Energy-Efficient Government Purchasing, 2002.

Measure 2.6: Install Cool Roofs

GHG Reduction Potential
Measure Under Consideration

Estimated Energy Savings in 2020
Measure Under Consideration



Co-Benefits



Surfaces with low albedo, or solar reflectance, amplify urban heat island effect. Many surfaces in an urban environment consist of building roofs. Roofs affect not only the temperature of the surrounding urban environment, but also the interior temperature of the attached building below. Upgrading roofs to materials with high albedo can reduce outdoor and indoor temperatures, thereby also reducing demand on energy for air conditioning. Replacing a 1,000 sq. ft. dark roof with a white roof can offset approximately 10 MT CO₂e.⁵

⁵ Calthorpe Associates, Cambridge Systematics, Davis Energy Group, and Local Government Commission, Energy Aware Planning Guide, 2009.

Measure 2.7: Require New or Retrofitted Buildings to Exceed Title 24

GHG Reduction Potential
Measure Under Consideration

Estimated Energy Savings in 2020
Measure Under Consideration



Co-Benefits



California's current energy efficiency standards for buildings, called the 2013 Title 24 Standards, became effective July 1, 2014 and include significant changes to energy efficiency requirements in new development. Title 24 Standards are scheduled for updates and improvements every three years with the ultimate goal of zero net energy commercial buildings by 2030.⁶ Because of the update schedule, rulemaking process, and applicability dates, it is possible to implement proposed or adopted energy efficiency mandates before they are legally required. The City can implement early adoption of the energy efficiency mandates by requiring all new municipal buildings to exceed Title 24 by a specific amount, such as a percentage of energy savings above the requirement.

⁶ <http://www.cpuc.ca.gov/NR/ronlyres/C27FC108-A1FD-4D67-AA59-7EA82011B257/0/3.pdf>

Measure 2.8: Increase Recycled Water Use

GHG Reduction Potential

2020 – 53 MTCO₂e

2035 – 168 MTCO₂e

Estimated Energy Savings in 2020

166,693 kWh



Co-Benefits



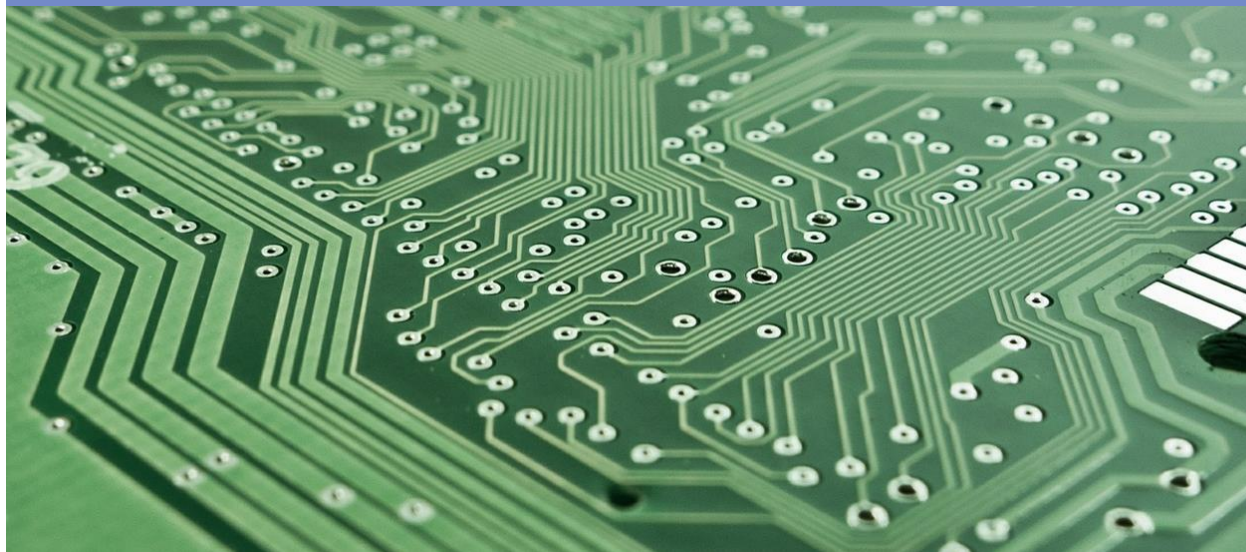
The West Basin Municipal Water District (WBMWD) uses its Edward C. Little Water Recycling Facility to provide its cities with recycled water. One of its five types of “designer” or custom-made recycled water includes Tertiary Water (Title 22), used for irrigation. A new 1.25-mile recycled water pipeline will be in service in Gardena in the near future. The project will save the City approximately 29 million gallons of water annually. Approximately 1,873 kWh can be saved for every acre foot (AF) of water use replaced by recycled water.⁷

⁷ California Sustainability Alliance, The Role of Recycled Water in Energy Efficiency and Greenhouse Gas Reduction, May 2, 2008.

Measure 2.9: Utilize an Energy Management System

GHG Reduction Potential
Supporting Measure

Estimated Energy Savings in 2020
Supporting Measure



Co-Benefits



Detailed information about facility energy consumption, including hourly energy profiles and energy consumption of individual building systems, can be monitored on a regular basis through an energy management system. This tool allows City staff to observe “real-time” energy consumption and analyzes building energy consumption trends using utility bill information. Using this tool, the long-term impacts of efficiency projects can be monitored.

Goal 3: Increase Energy Efficiency in City Infrastructure

Measure 3.1: Retrofit Traffic Signals and Outdoor Lighting

GHG Reduction Potential

2020 – 390 MTCO₂e

2035 – 1,226 MTCO₂e

Estimated Energy Savings in 2020

1,219,387 kWh



Co-Benefits



Since 2001, SCE has offered its municipalities rebates on LED Traffic Signal Lamps. The program is part of a statewide effort to conserve energy and promote energy efficiency. Retrofitting a standard incandescent traffic signal with LED lamps using the SCE rebate can result in a payback of less than one year. Other outdoor lights (e.g. streetlights, park lighting, etc.) can also be retrofitted.

Measure 3.2: Upgrade or Incorporate Water-Conserving Landscape

GHG Reduction Potential Measure Under Consideration	Estimated Energy Savings in 2020 Measure Under Consideration
	
Co-Benefits 	

The City can reduce water consumption and associated energy use by converting traditional landscaping to water conserving landscaping. An average acre of lawn in the United States uses about 652,000 gallons of water a year.⁸ The City can participate in SoCal WaterSmart's Public Agency Landscape (PAL) program to receive a no-cost landscape irrigation audit and incentives to replace older landscape equipment with new, water-efficient models.⁹

⁸ ICLEI, Climate and Air Pollution Planning Assistant (CAPPA), 2009.

⁹ http://socalwatersmart.com/commercial/?page_id=3091

Measure 3.3: Plant Trees for Shade and Carbon Sequestration

GHG Reduction Potential
Measure Under Consideration

Estimated Energy Savings in 2020
Measure Under Consideration



Co-Benefits



Trees and vegetation naturally help cool an environment by providing shade and evapotranspiration (the movement of water from the soil and plants to the air) and reduce GHG emissions by sequestering carbon dioxide (CO₂). Trees planted near pavement can reduce surface temperatures of streets and parking lots, and trees planted strategically near windows or roofs of buildings can effectively reduce interior temperatures. The City could plant trees in City-owned spaces to reduce urban heat island effect and building energy use and increase carbon sequestration.

Goal 4: Reduce Energy Consumption in the Long Term

Measure 4.1: Develop an Energy Reinvestment Fund

GHG Reduction Potential
Supporting Measure

Estimated Energy Savings in 2020
Supporting Measure



Co-Benefits



An Energy Reinvestment Fund can be created with a portion of the documented savings achieved through these energy efficiency strategies. These funds are then reinvested in future energy efficiency improvements, thereby providing a means for leveraging greater and greater energy savings.

Summary of Municipal Reductions

By implementing these local reduction measures, the City would reduce its municipal GHG emissions associated with energy use by approximately 6% compared to the 2020 business-as-usual (BAU) emissions and 15% compared to the 2035 BAU emissions. Table 26 summarizes the strategies and the potential GHG reductions for municipal operations.

Table 26 Municipal Energy Efficiency Strategies and GHG Reduction Potential

		2020 Reductions			2035 Reductions		
Measure No.	Measures	MT CO ₂ e	kWh	Therms	MT CO ₂ e	kWh	Therms
Goal 1: Participate in Education, Outreach, and Planning for Energy Efficiency							
Measure 1.1	Increase Energy Savings through the SCE Energy Leader Partnership	Supporting Measure					
Goal 2: Increase Energy Efficiency in Municipal Buildings							
Measure 2.1	Conduct Municipal Building Energy Audit	Supporting Measure					
Measure 2.2	Require Green Building Certification	Under Consideration					
Measure 2.3	Participate in Demand Response Programs	Supporting Measure					
Measure 2.4	Participate in Direct Install Program	51	157,954	-	159	496,427	-
Measure 2.5	Adopt a Procurement Policy for Energy Efficient Equipment	98	214,051	5,594	309	672,733	17,580
Measure 2.6	Install Cool Roofs	Under Consideration					
Measure 2.7	Require New or Retrofitted Buildings to Exceed Title 24	Under Consideration					
Measure 2.8	Increase Recycled Water Use	53	166,693	-	168	523,891	-
Measure 2.9	Utilize an Energy Management System	Supporting Measure					
Goal 3: Increase the Energy Efficiency in City Infrastructure							
Measure 3.1	Retrofit Traffic Signals and Outdoor Lighting	390	1,219,387	-	1,226	3,832,358	-
Measure 3.2	Upgrade or Incorporate Water-Conserving Landscape	Under Consideration					
Measure 3.3	Plant Trees for Shade and Carbon Sequestration	Under Consideration					
Goal 4: Reduce Energy Consumption in the Long Term							
Measure 4.1	Develop an Energy Reinvestment Fund	Supporting Measure					
Total		592	1,758,085	5,594	1,860	5,525,409	17,580

Comparison to Targets

Community

By 2020, the statewide and local measures together would reduce the City's community GHG emissions from the 2020 BAU condition by approximately 18% or 73,216 MT CO₂e (from 409,271 MT CO₂e to 336,055 MT CO₂e). This reduction is equivalent to a 24% decrease below the 2005 levels, which exceeds the 15% reduction target of the year 2020, as depicted in Figure 18. Implementation of additional measures beyond 2020 would result in the City exceeding its community-wide GHG reduction target of 49% below 2005 levels by 2035. Table 27 summarizes the baseline 2005 emissions, the projected 2020 and 2035 BAU emissions, the 2020 and 2035 reduction targets, the reductions from state and local measures, and whether additional reductions are needed.

Table 27 Community Emissions and Targets

	2005 MT CO ₂ e	2020 MT CO ₂ e	2035 MT CO ₂ e
BAU Emissions	443,106	409,271	437,938
Reduction Target	—	376,640	225,984
State Measure Reductions	—	43,274	111,157
Local Measure Reductions	—	29,942	142,224
Additional Reductions Needed	—	Target Met	Target Met

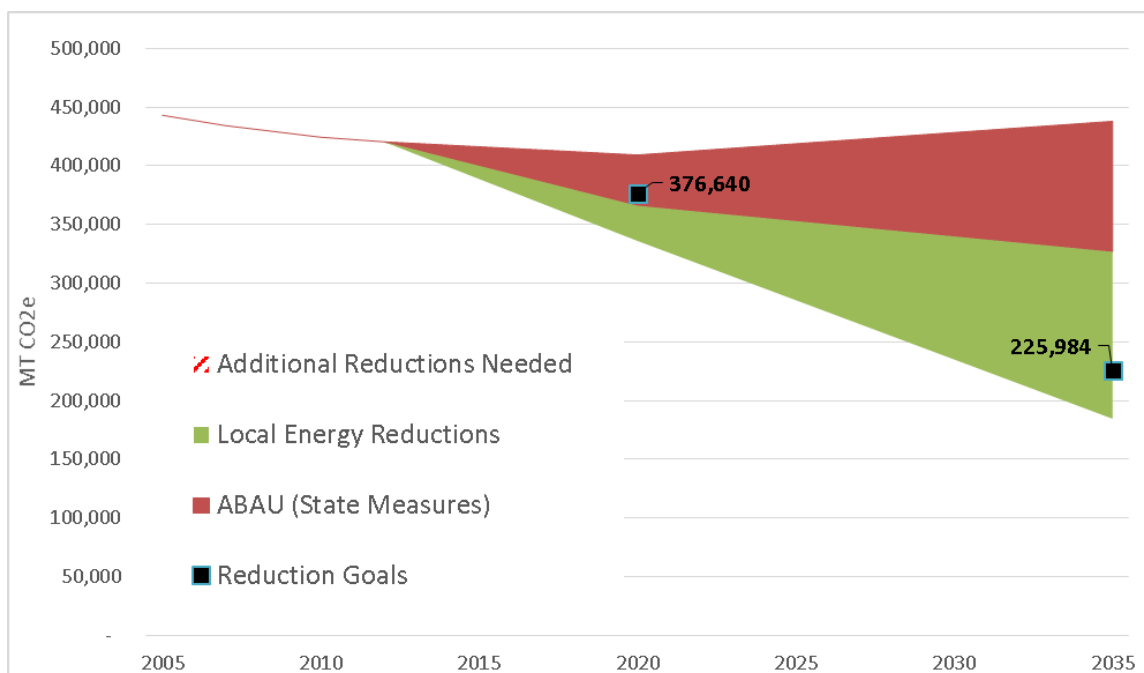


Figure 18 State and Local Reductions Comparison with Targets (Community)

The City of Gardena will meet their reduction goals in 2020 and 2035 with the help of both state and local reduction measures.

Municipal

By 2020, the statewide and local measures together would reduce the City's municipal GHG emissions from the 2020 BAU condition by approximately 11% or 1,005 MT CO₂e (from 9,380 MT CO₂e to 8,375 MT CO₂e). This reduction is equivalent to an 8% increase above the 2005 levels, which does not meet the 15% reduction target of the year 2020, as depicted in Figure 19. Furthermore, energy reduction measures through 2035, as selected by the City, would result in reductions below the 49% reduction target (from 2005 levels) and would require additional reduction measures in order to achieve the 2035 reduction. Table 28 summarizes the baseline 2005 emissions, the projected 2020 and 2035 BAU emissions, the 2020 and 2035 reduction targets, the reductions from state and local measures, and whether additional reductions are needed.

Table 28 Municipal Emissions and Targets

	2005 MT CO ₂ e	2020 MT CO ₂ e	2035 MT CO ₂ e
BAU Emissions	7,744	9,380	12,195
Reduction Target	—	6,582	3,949
State Measure Reductions	—	413	538
Local Measure Reductions	—	592	1,860
Additional Reductions Needed	—	1,793	5,848

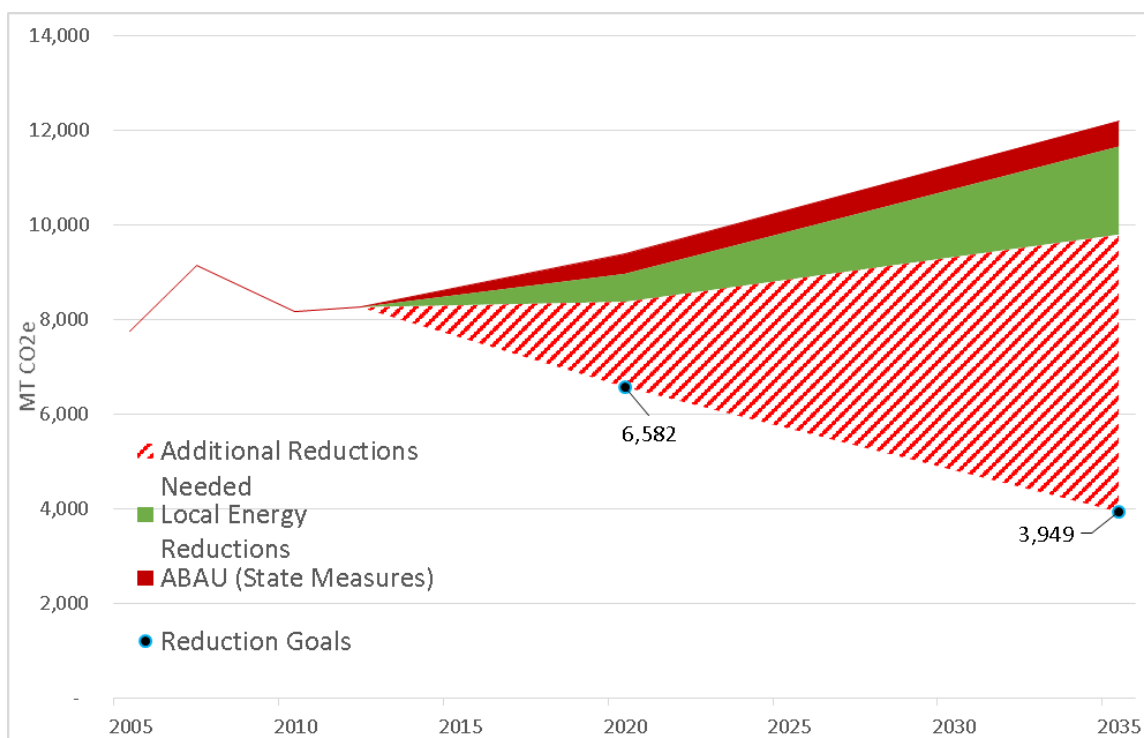


Figure 19 State and Local Reductions Comparison with Targets (Municipal)

The City of Gardena will need additional reductions to meet their 2020 and 2035 reduction targets.



Chapter 5

Implementation

This section describes implementation steps for the EECAP to support achievement of the GHG reduction goals and energy efficiency for the community at large. Success in meeting the GHG emission reduction goal will depend on cooperation, innovation, and participation by the City, residents, businesses, and other local governmental entities. This section outlines key steps that the City would follow for the implementation of this EECAP.



Step 1—Administration and Staffing

The City would implement the following key internal administration and staffing actions:

1. Create an Energy Efficiency Team to support and guide the City's efforts to conserve energy and reduce emissions.
2. Designate an Implementation Administrator to oversee, direct and coordinate implementation of the EECAP as well as monitor and report the energy efficiency and GHG reduction efforts.

The City Energy Efficiency Team (Team) would be responsible for the implementing the EECAP, coordinating among all involved City departments, and recommending modifications and changes to the EECAP over time. The Team would include the following all departments and divisions to ensure coordinated leadership in plan implementation.

Step 2—Financing and Budgeting

Successful implementation of the EECAP will require a strong commitment from the City and community. Local, regional, state, and federal public sources of funding will be needed along with the substantial involvement of the private sector. The following financing options should be explored by the City:

- **State and federal grants and low-interest loans**—A variety of grant and loan programs exist in various sectors.
- **Support from local businesses, non-profits, and agencies**—Opportunities for public/private partnerships (like the SCE partnerships) exist to provide cooperation on many aspects of the EECAP including energy and water efficiency retrofits and raising public awareness regarding conservation strategies.
- **Self-funding and revolving fund programs**—Innovative programs to fund renewable energy investments.

- **Agreements with private investors**—Energy service companies and other private companies can finance up-front investments in energy efficiency and then be reimbursed through revenues from energy savings.
- **Local funding**—Various local governments have used targeted finance instruments for renewable energy resource development and energy efficiency improvement projects.

Given that financing is the key to implementing many measures, a review of current and potential funding sources was completed for the different sectors covered in the EECAP and is presented below to help early phase implementation. It is likely that there will be stronger legislation aimed at energy efficiency and renewable energy generation that will further curb GHG emissions. Such requirements are likely to influence energy prices (for electricity and natural gas), and may make currently cost-ineffective measures more economically feasible and allow the financing of a broader range of plan measures.

Energy Efficiency and Renewable Energy Financing

HERO Program. SBCCOG, in partnership with Renovate America, Inc. is offering homeowners and businesses in SBCCOG participating jurisdictions an opportunity to finance energy and water efficiency projects in their properties. The HERO Program is a Property Assessed Clean Energy (PACE) financing program and allows property owners to finance energy efficiency improvement projects and to repay the financing through special assessments on their property taxes. A wide range of products is eligible under the HERO program. Lighting upgrades, building insulation improvements, water efficiency enhancement, renewable energy production, water heating technologies, and mechanical system upgrades are a few to name. For a complete list of eligible products under the HERO program, visit the website at <http://heroprogram.com> and www.commercialhero.com.

Federal Tax Credits for Energy Efficiency. On October 3, 2008, former President Bush signed into law the “Emergency Economic Stabilization Act of 2008.” This bill extended the Production Tax Credit for solar energy systems and fuel cells to 2016. New tax credits were established for small wind energy systems. Tax deductions for owners and designers of energy efficient commercial buildings were also extended. See http://www.energystar.gov/index.cfm?c=products.pr_tax_credits.

Southern California Edison Energy Efficiency/Renewable Energy Incentives

- Residential and commercial customers can qualify for a variety of rebate programs through SCE.
- SCE offers savings to customers who purchase qualified energy efficient appliances, heating and cooling systems, pool pumps, Energy Star, CFLs lighting fixtures and other energy efficient technologies.
- Multifamily residential developments can benefit from a variety of SCE’s rebate programs. Using energy efficient products and technologies such as high-performance dual-pane windows, Energy Star labeled ceiling fans; Energy Star CFLs, proper insulation, energy efficient electric storage water heaters, refrigerators, LED lights, and cold vending machine controls would save both money and energy.
- SCE will provide free evaluation of mobile homes and provides free supply and installation of the energy upgrades that is recommended by their energy specialist.

- SCE and SCG residents can benefit from incentives up to \$4,000 for detached single-family residential energy upgrades.
- SCE offers incentives, through utility rebate programs, for non-residential customers. This rebate is regardless of size and energy usage. Express efficiency rebates for lighting, refrigeration, and air conditioning technologies are available. In addition, SCE has a Custom Contracting Program in which non-residential users have the option of designing an energy retrofit conservation measure. Incentives are based on the type of measure installed and the reduction in energy usage over a 12-month period.

See <http://energy.gov/savings/sce-non-residential-energy-efficiency-programs>

- SCE's Self-Generation Incentive Program (SGIP) provides financial incentives for the installation of new, qualifying customer self-generation equipment for their own on-site usage. Technologies currently eligible for SGIP incentives are generation related to wind, fuel cell, waste heat capture, and conventional CHP. The SGIP program is designed with business and large institutional customers in mind. Rebates for renewable generation—such as wind turbines or fuel cell—that generate less than 30 kilowatts of energy are available through the California Energy Commission's [Emerging Renewables Program](#). Fuel cells of any size using non-renewable fuels may receive incentives under the SGIP program. See <http://www.sce.com/b-rs/sgip/about-the-program.htm>.

Southern California Gas Company

- The SGIP offers savings based on GHG emissions reductions and energy efficiency audits. Eligible technologies include but are not limited to renewable and waste energy capture technologies, conventional combined heat and power systems, emerging technologies such as fuel cells, biogas, and advanced energy storage.
- The SCG On-Bill Financing program offers qualified business customers zero percent financing from \$5,000 to \$100,000 per meter for qualifying electric and natural gas equipment. All government customers may receive from \$5,000 to \$250,000 per meter, and government can borrow up to \$1,000,000 for one service account. The funds may be used for a wide variety of efficiency improvement projects, and the monthly loan payments will be added directly to the customer's bill. Monthly energy savings help to offset the monthly loan charges.
- SCG offers rebates on various types of energy efficient equipment such as pipe insulation, steam traps, boilers, and other equipment. A full list of the eligible equipment can be found at SCG's website at <http://www.socalgas.com/for-your-business/rebates/industry/government/>.
- Commercial customers can benefit from rebates and incentives for energy efficient equipment such as pipe and tank insulation, water heaters, steam traps, pool heaters, boilers, commercial cooking equipment, and other technologies.
- Single-family residential solar water heating systems qualify for up to \$1,875 and commercial/multi-family customers can save up to \$500,000 under the California Solar Initiative—Thermal Program. For a complete list and up-to-date savings, visit the SCG website at <http://www.socalgas.com/for-your-business/rebates/>.

California Energy Commission Energy Efficiency Financing. The CEC offers energy efficiency financing and low interest loans (up to 15 years) to cities and counties for installing energy-saving projects. Examples of projects include lighting systems, pumps and motors, streetlights and LED traffic signals, automated energy management systems/controls, building insulation, energy generation including renewable and combined heat and power projects, heating and air conditioning modifications, and wastewater treatment equipment. The CEC also offers the Energy Partnership Program Technical Assistance Grant, which would provide the City with up to \$10,000 of technical assistance services, including a feasibility of energy efficiency opportunities for City facilities to maximize energy cost savings and GHG emissions reductions. See <http://www.energy.ca.gov/efficiency/financing/>.

California Energy Commission Bright Schools Program. This is a collaborative project of the CEC, California Conservation Corps, local utility companies, and other qualifying energy service companies to assist schools in undertaking energy efficiency projects. Project staff will guide schools through identifying and determining a project's feasibility, securing financing for the project, and purchasing and installing the new energy efficient equipment. See <http://www.energy.ca.gov/efficiency/brightschoools/index.html>.

California Solar Initiative (CSI). In January 2006, the California Public Utilities Commission adopted the CSI to provide more than \$3 billion in incentives for solar-energy projects with the objective of providing 3,000 megawatts of solar capacity by 2016. In December 2011, the Commission increased the CSI budget by \$200 million in order to cover a budget shortfall. The action implements SB 585 signed by former Governor Jerry Brown on Sept. 22, 2011. The CSI program is administered by Pacific Gas & Electric, Southern California Edison, and CCSE for the SDG&E territory. The CSI incentive for non-residential buildings includes a transition to performance-based and expected performance-based incentives, with the aim of promoting effective system design and installation. The applicable rebate programs for municipal facilities include: (1) the general CSI Program of solar rebates for public agencies; (2) the CSI-Thermal Program for solar hot water rebates for municipal facilities; and (3) the CSI Research, Development, Demonstration, and Deployment Program. See <http://energycenter.org/csi>.

Water Conservation and Treatment Financing

Clean Water State Revolving Funds (CWSRF). CWSRFs fund water quality protection projects for wastewater treatment, nonpoint source pollution control, and watershed and estuary management. CWSRFs have funded over \$74 billion, providing over 24,688 low-interest loans to date.

CWSRF's offer:

- **Low interest rates, flexible terms**—Nationally, interest rates for CWSRF loans average 2.3%, compared to market rates that average 5%. For a CWSRF program offering this rate, a CWSRF funded project would cost 22% less than projects funded at the market rate. CWSRFs can fund 100% of the project cost and provide flexible repayment terms up to 20 years.
- **Funding for nonpoint source pollution control and estuary protection**—CWSRFs provided more than \$167 million in 2009 to control pollution from nonpoint sources and for estuary protection, more than \$3 billion to date.

- **Assistance to a variety of borrowers**—The CWSRF program has assisted a range of borrowers including municipalities, communities of all sizes, farmers, homeowners, small businesses, and nonprofit organizations.
- **Partnerships with other funding sources**—CWSRFs collaborate with banks, nonprofits, local governments, and other federal and state agencies to provide the best water quality-financing source for their communities.

See <http://www.epa.gov/owm/cwfinance/cwsrf/index.htm>

SoCal Water Smart. The SoCal Water Smart program offers rebates to customers of the Metropolitan Water District’s member agencies for installing water-saving appliances. Qualifying products include high-efficiency clothes washers, rotating nozzles, and weather-based irrigation controllers. See <http://socalwatersmart.com/home>.

Step 3—Measure Implementation

After taking into account the reductions in energy and water usage and the GHG emissions resulting from statewide measures, the City would need to implement the local measures to reach its reduction targets for 2020 and 2035.

The City would develop an implementation schedule for the reduction measures. Prioritization would be based on the following factors:

- | | |
|----------------------------|--------------------------|
| ■ Cost effectiveness | ■ Level of City Control |
| ■ GHG reduction efficiency | ■ Ease of implementation |
| ■ Availability of funding | ■ Time to implement |

Because the goals of this EECAP are aggressive, success in meeting the goals depends on some flexibility in the GHG reduction actions. The City is committed to flexibility in implementing the reduction measures and meeting the goals of the EECAP. The goals of each reduction measure can often be achieved through a variety of means, especially those related to building energy efficiency. For example, the City would adopt energy efficient design requirements for new development. Compliance with the energy efficient design programs can be achieved through many combinations of actions including, but not limited to, installing energy efficient appliances, lighting, and HVAC systems; installing solar water heaters; siting and orienting buildings to optimize conditions for natural heating, cooling, and lighting; installing top-quality windows and insulation; and incorporating natural shading, skylights, and reflective surfaces. Possible sources of funding to implement these measures are presented in Chapter 3.

Step 4—Public Participation

The residents and businesses in the City are integral to the success of GHG reduction efforts. Their involvement is essential in order to reach the reduction goals because the EECAP depends on a combination of state and local government efforts, public and private sources of finance, and the voluntary commitment, creativity, and participation of the community at large. The City will need to strike a balance between development and environmental stewardship to keep the economy strong and, at the same time, protect the environment. Education programs should be developed for

stakeholders such as businesses, business groups, residents, developers, and property owners outlining the benefits of the EECAP's cost-saving measures to encourage participation in efforts to reduce GHG emissions in all possible sectors.

Step 5—Monitoring

The City will use a system for monitoring the reductions in energy use from local and statewide measures. If promising new strategies emerge, the City will evaluate how to incorporate these strategies into the EECAP. Further, state and federal action would also result in changes that would influence the level of the City's GHG emissions.

A customized emissions inventory software package developed through the State Energy Efficiency Collaborative (SEEC) has been established for City's use in tracking emissions. The EECAP Implementation Coordinator would be responsible for maintaining records of reduction measure implementation and insuring that the periodic updates to the emissions inventory are completed using the emission inventory worksheet. A simple energy efficiency measure-tracking tool will be provided to track the implementation of the measures. In this way, the City can see (1) emissions estimates without implementation of the EECAP; (2) emissions estimates predicted with full implementation of the EECAP; and (3) progress-to-date as data are entered annually. This will demonstrate progress toward the goal and identify whether adjustments need to be made to programs to meet the reduction goal.

Step 6—Beyond Energy

The EECAP is focused on energy efficiency. However, land use, transportation, and waste are also important sectors in the City's emissions profile that could also be targeted for emissions reduction strategies. The SBCCOG has secured funding through the California Strategic Growth Council to develop GHG reduction measures for the land use, transportation, and waste sectors that will further the City's GHG reduction potential and commitment to a lower-emissions future.

Chapter 6

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Appendix A

Inventory, Forecasting, and Target-Setting Report



City of Gardena

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

January 2014

Prepared for:



Prepared by:

ATKINS

3570 Carmel Mountain Road, Suite 300
San Diego, California 92130

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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 ₂ e	Carbon Dioxide Equivalents
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 ₂ O	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

- The City of Gardena decreased emissions 5.1% from 2005 to 2012, from 443,106 MT CO₂e to 420,447 MT CO₂e.
- Commercial Energy, Residential Energy, Solid Waste, Water, and Wastewater sector emissions decreased while On-road Transportation and Off-road Sources sectors increased emissions from 2005 to 2012.
- Energy-related emissions account for 42% of the total community emissions.
- Under the Adjusted Business-as-Usual (BAU) forecast, emissions will be 363,510 MT CO₂e in 2020 and 324,068 MT CO₂e in 2035. These emissions levels are 18% lower in 2020 than 2005 and 27% lower than 2005 by 2035.
- The City should choose a reduction target that is feasible and ambitious. The State recommends a 15% reduction below 2005 levels by 2020, which would be achieved under the Adjusted BAU scenario.
- To continue reductions consistent with the State's long-term emissions reduction goal of lowering emissions 80% below 1990 levels by 2050, the City would need to reduce emissions in 2035 by 98,084 MT CO₂e from an Adjusted BAU forecast. This is a 30% reduction from the Adjusted BAU emissions level and would achieve a 49% reduction from 2005 levels.

Municipal

- Municipal emissions have increased 7% from 2005 to 2012, from 7,744 MT CO₂e to 8,267 MT CO₂e.
- Emissions in all sectors decreased between 2005 and 2012 except for the Buildings & Facilities, Vehicle Fleet & Equipment, and SCE-Owned Outdoor Lights.
- Municipal energy use accounts for approximately 2% of all emissions.
- Under the Adjusted BAU forecast, emissions will be 8,967 MT CO₂e in 2020 and 11,657 MT CO₂e in 2035. These emissions levels are 16% higher in 2020 than 2005 and 51% higher than 2005 by 2035.
- The City will need to reduce emissions by 2,385 MT CO₂e from the Adjusted BAU emissions level to meet a 15% reduction target from 2005 levels. By 2035, the City will need to reduce emissions by 7,708 MT CO₂e from the Adjusted BAU emissions level to meet a 49% reduction target from 2005 levels.

Introduction

The Greenhouse Gas (GHG) Inventories, Long-Term Forecasts, and Target-Setting (IFT) Report contains the first steps toward the City of Gardena (City) identifying energy-efficiency measures in an Energy Efficiency Climate Action Plan (EECAP). The inventories describe historic energy use and GHG emissions and the forecasts describe projected future emissions in the City. The target-setting section describes GHG reduction recommendations that are consistent with State goals and may assist the City in establishing local GHG reduction targets. The inventories and recommended reduction targets will help the City in the next step of the EECAP, which is to identify energy efficiency and GHG reduction measures that are relevant, meaningful, and feasible.

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

- Historic GHG emissions in **community inventories** and **municipal inventories** for 2005, 2007, 2010, and 2012;
- Future GHG emissions for 2020 and 2035 under a **business-as-usual** forecast scenario and **adjusted business-as-usual** forecast scenario; and
- Recommended GHG **reduction targets** for 2020 and 2035.

Table 1. Key Terms in the Report¹

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

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

GHG Emissions Inventories

GHG emissions inventories are the foundation of planning for future reductions. Establishing an existing inventory of emissions helps to identify and categorize the major sources of emissions currently being produced. In this report, four years of historic inventories are presented to show not only the major sources of emissions in the City, but also how those sources vary over time. For both the community and municipal inventories, the years 2005, 2007, 2010, and 2012 are presented. The 2005 inventory (for both community and municipal operations) is considered the **baseline year**. A baseline year is established as a starting point against which other inventories may be compared and targets may be set, and is generally the earliest year with a full emissions inventory. The most recent inventory (2012) has the most relevant data for planning purposes, while the interim years (2007 and 2010) provide context and may help identify trends or anomalies.

Emissions Reporting

The primary GHGs from the community and municipal operations are from carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). Because each of these gases has a different capacity for trapping heat in the atmosphere, known as its global warming potential (GWP), a method of reporting is needed to be able to compare gases in the same terms. As a result, emissions are reported in carbon dioxide equivalents, or CO₂e, with each GHG normalized and calculated relative to CO₂ using its GWP. Table 2 describes the GHGs analyzed in this report, their symbol, GWP, and primary community sources of emissions. While N₂O has the highest GWP and may be considered the most dangerous on a per-molecule basis, CO₂ is by far the most prevalent, accounting for 88% of statewide emissions in 2005 (CARB 2011).

Table 2. GHGs Analyzed in the Inventories

Greenhouse Gas	Symbol	Global Warming Potential	Primary Community Sources
Carbon Dioxide	CO ₂	1	Fossil fuel combustion
Methane	CH ₄	25	Fossil fuel combustion, landfills, wastewater treatment
Nitrous Oxide	N ₂ O	298	Fossil fuel combustion, wastewater treatment

Source: IPCC Fourth Assessment Report, 2007.

Emissions Sectors

The inventories identify the major sources of GHGs emissions caused by activities in sectors that are specific to community or municipal activities. A **sector** is a subset of the economy, society, or municipal operations whose components share similar characteristics. An emissions sector can also contain subsectors that provide more specificity about the source of emissions (e.g., natural gas and electricity are subsectors of the energy sector).

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

The following subsections describe the sectors used in the community and municipal inventories. It is important to note that both inventories capture similar types of information but may be categorized differently. For example, energy is reported in both the community and municipal inventory, but community level energy emissions are reported as “Residential” and “Non-residential”, whereas municipal energy emissions are more logically reported as “Buildings & Facilities” and “Outdoor Lights”.²

Community Sectors

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

- **Energy** in the Community Inventory is further broken down into two sectors:
 - **Commercial/Industrial Energy** includes emissions from electricity and natural gas consumption in non-residential buildings and facilities (including outdoor lighting) in the City.
 - **Residential Energy** includes emissions from electricity and natural gas consumption in residential buildings in the City.
- **On-road Transportation** includes emissions from vehicle fuel use in trips wholly within the City (in-boundary) and trips that either originate or end in the City (cross-boundary). Emissions from in-boundary trips are fully accounted for in the inventory, whereas only half of the emissions from cross-boundary trips are accounted for. Trips that pass-through the City are not accounted for in the inventory because the City has little or no control of these emissions. As a result, this methodology reflects only trips or parts of trips within City borders that the City has the ability to affect.
- **Solid Waste** includes emissions from waste that is generated in the community and sent to landfills.
- **Water** includes emissions from the electricity used to source, treat, and deliver imported water in the community that is not accounted for in the community utility data.
- **Wastewater** includes emissions from treating wastewater generated in the community.

² Outdoor Lights are further categorized as SCE-owned or City-owned as described later.

- **Off-road Sources** include emissions from operating equipment for construction, commercial, light industrial and agricultural activities; lawn and garden equipment; and recreational vehicles such as all-terrain vehicles.

Cap-and-Trade Covered Entities

The City is home to residential, commercial, and industrial users, each of which uses energy. Industrial users include major industrial facilities that emit substantial GHGs that are regulated under the State's Cap-and-Trade Program. These facilities are known as "covered entities" and derive energy for their industrial uses largely from natural gas, and to a lesser extent, electricity and other energy sources. The emissions associated with covered entities are already regulated at the State level and therefore, the City does not have significant local control over the GHG emissions. The current protocol recommends excluding the covered entities' GHG emissions from the City's inventories. In an effort to be consistent with protocol, data were reviewed to determine to what extent covered entities are included.

Data provided by SCG and SCE for this inventory report are protected under privacy restrictions which fall under the 15/15 rule.³ 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, leading to the conclusion that once the 15/15 rule was applied, major natural gas users, including covered entities, were likely removed from the total natural gas data. If additional information becomes available that either allows the City to better separate out the energy usage from covered entities or provides better clarity of the current data aggregation, SBCCOG recommends that the City 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.

Municipal Sectors

Sources of municipal emissions are divided into the following sectors:

- **Energy** in the municipal inventory is further broken down into four sectors:
 - **Buildings & Facilities** includes energy use by the government, including electricity and natural gas.
 - **SCE-Owned Outdoor Lights** includes energy for streetlights on fixtures owned by SCE and outdoor lighting.
 - **City-Owned Outdoor Lights** includes energy for streetlights on fixtures owned by the City, traffic control signals, and outdoor lighting.

³The 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.

- **Water Delivery** includes energy for sewer pumping and irrigation.
- **Vehicle Fleet & Equipment** includes emissions from vehicles owned or operated by the government or contracted by the City for services such as street cleaning. It also includes equipment, such as emergency generators.
- **Employee Commute** includes emissions from fuel use in vehicle trips by municipal employees commuting to and from work in the City.
- **Solid Waste** includes emissions from waste generated by municipal employees or at municipally owned facilities.

Calculation Methodology

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

Community Emissions

The community inventory includes the GHG emissions that result from activities within City boundaries. This section presents the findings of the community inventory for four years: 2005 (baseline year), 2007, 2010, and 2012. It also provides more specific detail and findings on the energy sectors, which will form the basis of the reduction targets and reduction measures the City identifies in the EECAP.

2005—2012 Emissions Summary

- **The City of Gardena reduced emissions 5% from 2005 to 2012, from 443,106 MT CO₂e to 420,447 MT CO₂e.**
- **Commercial Energy, Residential Energy, Solid Waste, Water, and Wastewater sector emissions decreased while On-road Transportation and Off-road Sources sectors increased emissions from 2005 to 2012.**

As shown in Figure 1 and Table 3, the Transportation sector was the largest contributor to emissions in both 2005 (49%) and 2012 (51%) by producing 214,764 MT CO₂e in 2005 and 216,034 MT CO₂e in 2012. This change represents a 0.6% increase in emissions from 2005 to 2012. Commercial/Industrial energy is the second-largest contributor to emissions, adding 25% and 26% in 2005 and 2012 respectively. While the proportion of emissions did not change significantly over time, the total emissions decreased by 3% from 2005 to 2012, from 111,097 MT CO₂e to 107,688 MT CO₂e. The proportion of emissions from the Residential sector was also steady, at 16% in 2005 and 2012, although total emissions decreased by almost 2%, from 69,005 MT CO₂e in 2005 to 67,783 MT CO₂e in 2012. Solid waste comprised 7% of the total (32,789 MT CO₂e) in 2005, but was reduced to 5% of the total (18,654 MT CO₂e) in 2012. Water, Wastewater, and Off-road sources made up the remaining emissions in each year. Water and Wastewater emissions declined from 2005 to 2012; however, Off-Road Sources increased 131% (from 795 to 1,836 MT CO₂e) in the same period. Off-road sources comprise a very small percentage of overall emissions, but are variable primarily due to construction-related emissions, which are based on the level of development estimated in the City each year.

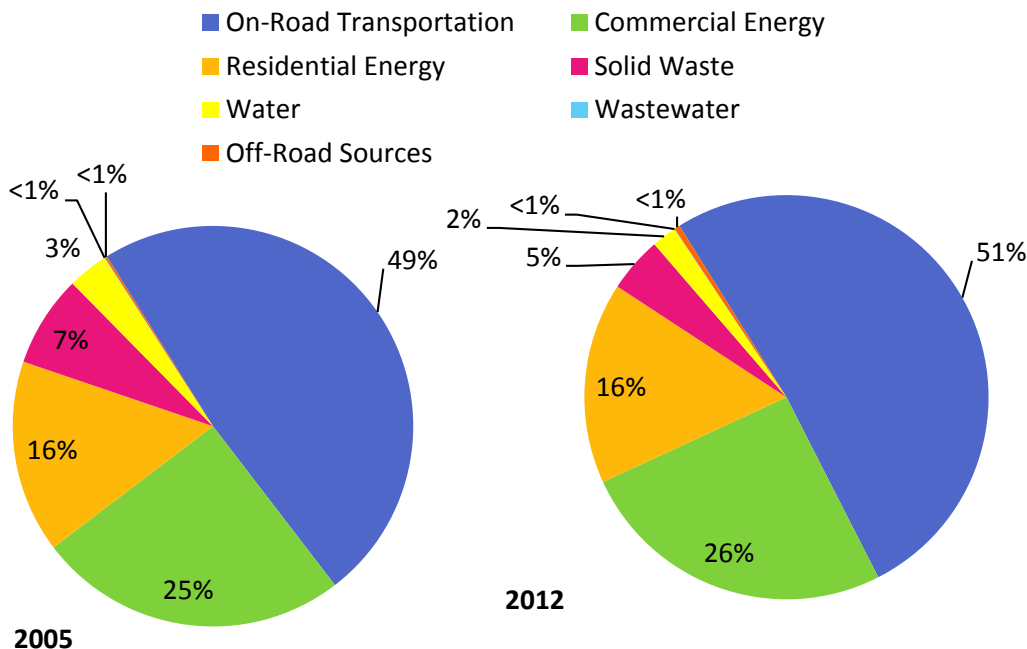


Figure 1. Community-Wide GHG Emissions by Sector for 2005 and 2012

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

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	% Change 2005 to 2012
On-Road Transportation	214,764	216,034	0.6%
Commercial Energy	111,097	107,688	-3.1%
Residential Energy	69,005	67,783	-1.8%
Solid Waste	32,789	18,654	-43.1%
Water	14,424	8,273	-42.6%
Off-Road Sources	795	1,836	130.9%
Wastewater	232	179	-22.8%
Total	443,106	420,447	-5.1%

2005, 2007, 2010, and 2012 Inventories

Figure 2 and Table 4 show the GHG emissions by sector for all inventory years. Emissions are variable among the inventory years, and may reflect changes in the economy, weather, and programs implemented to reduce emissions. Table 4 also lists the percentage of each sector relative to total emissions and shows that the proportion of each sector does not vary greatly by year.

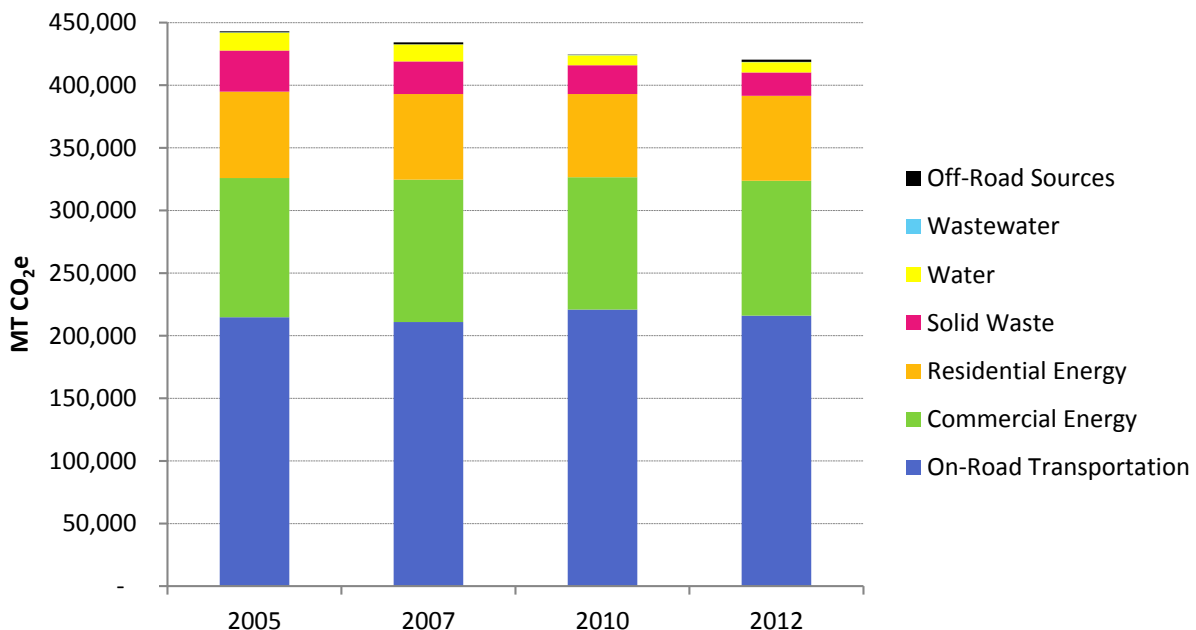
**Figure 2. Community GHG Emissions for 2005, 2007, 2010, and 2012**

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

Sector	2005 (MT CO ₂ e)	% of Total	2007 (MT CO ₂ e)	% of Total	2010 (MT CO ₂ e)	% of Total	2012 (MT CO ₂ e)	% of Total
On-road Transportation	214,764	48%	210,940	49%	220,883	52%	216,034	51%
Commercial/ Industrial Energy	111,097	25%	113,621	26%	105,652	25%	107,688	26%
Residential Energy	69,005	16%	68,396	16%	66,483	16%	67,783	16%
Solid Waste	32,789	7%	26,041	6%	22,950	5%	18,654	4%
Water	14,424	3%	13,550	3%	7,962	2%	8,273	2%
Off-Road Sources	795	<1%	1,521	<1%	308	<1%	1,836	<1%
Wastewater	232	<1%	180	<1%	179	<1%	179	<1%
Total	443,106		434,249		424,417		420,447	
% Change from 2005	--		-2.0%		-4.2%		-5.1%	

Activity data can provide more insight into behavioral changes in the community, as these data are not affected by emission factors. Table 5 summarizes activity data for each sector and subsector. The activity data show that vehicle miles traveled, Residential electricity, Commercial/Industrial natural gas, and solid waste (ADC) increased from 2005 to 2012, while Residential natural gas, Non-Residential electricity, landfilled solid waste, and water decreased from 2005 to 2012. Wastewater and Off-road emissions use indicator data to attribute county-level emissions to the City and the indicator data are also shown in Table 5. Notably, while On-road Transportation emissions increased less than 1% between 2005 and 2012, vehicle miles traveled increased by nearly 7%. The difference reflects that for each vehicle mile traveled, fewer emissions are generated due to improvements in the fuel efficiency of vehicles.

Demographic data also help provide perspective to changes in emissions over time. Table 6 shows the number of households, jobs, population, and service population (jobs + population) for each inventory year. Energy emissions in particular often reflect trends in demographic data. For example, the decrease in Commercial Energy emissions from 2005 to 2012 mirrors the decrease in jobs over the same period.

Table 5. 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	410,696,017	407,207,352	437,503,718	438,021,537	6.7%
Residential Energy					
Electricity (kWh)	88,070,500	91,198,495	89,028,457	89,537,409	1.7%
Natural Gas (therms)	7,945,441	7,925,675	7,683,388	7,362,507	-7.3%
Commercial/Industrial Energy					
Electricity (kWh)	281,182,579	280,318,686	267,280,382	240,483,911	-14.5%
Natural Gas (therms)	4,828,567	6,193,110	5,400,230	5,789,305	19.9%
Solid Waste					
Landfilled (tons)	134,716	104,735	91,309	72,977	-45.8%
ADC (tons) ¹	434	1,398	2,469	3,547	717.3%
Water and Wastewater					
Water (MG)	2720.1	2635.4	2162.4	2247.0	-17.4%
Recycled Water (MG)	0.4	0.3	0.2	0.3	-6.8%
Wastewater (City portion of countywide residents)	0.60%	0.60%	0.60%	0.60%	-1.0%
Off-road sources² (% of LA County emissions attributed to the City)					
Industrial (% Manufacturing jobs)	1.19%	1.24%	1.25%	1.24%	4.4%
Recreation (Population weighted by income)	0.53%	0.52%	0.50%	0.50%	-6.2%
Agriculture (% Ag. Jobs)	0.45%	0.47%	0.54%	0.41%	-9.0%
Construction (% Building permits)	0.23%	0.48%	0.04%	0.54%	132.4%
Lawn & Garden (% Households)	0.64%	0.64%	0.62%	0.62%	-3.2%
Light Commercial (% Other jobs)	0.61%	0.64%	0.64%	0.64%	4.0%

1 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.

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

Table 6. Demographic Data for 2005, 2007, 2010, and 2012

	2005	2007	2010	2012	% Change 2005-2012
Population	59,277	59,095	58,854	59,124	-0.3%
Households	20,442	20,596	20,588	20,586	5.2%
Jobs	30,362	31,780	28,728	29,056	-4.3%
Service Population (Population + Jobs)	89,639	90,875	87,582	88,180	-1.6%

Source: SCAG

Energy

The EECAP ultimately will focus on increasing energy efficiency and reducing GHG gases from energy; therefore, it is important for the City to understand its current energy consumption to make informed decisions for reducing energy-related emissions. Energy use consists of electricity and natural gas. Emissions from Commercial/Industrial and Residential energy use account for about 42% of the total community emissions in 2005 and 2012. Table 7 shows the breakdown in activity (kWh or therms) and GHG emissions by sector and energy source.

Table 7. 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 (kWh or therms)	Emissions (MT CO ₂ e)	Activity (kWh or therms)	Emissions (MT CO ₂ e)		
Commercial/ Industrial						
Electricity	281,182,579	85,421	240,483,911	76,903	-14.5%	-10.0%
Natural Gas	4,828,567	25,676	5,789,305	30,785	19.9%	19.9%
Residential						
Electricity	88,070,500	26,755	89,537,409	28,633	1.7%	7.0%
Natural Gas	7,945,441	42,250	7,362,507	39,150	-7.3%	-7.3%
Total (MT CO ₂ e)		180,102		175,471		-2.6%

Commercial electricity use decreased 14.5% between 2005 and 2012; however, emissions decreased by 10%. Residential electricity use increased 1.7% but emissions increased by 7%. The difference between the change in activity data and emissions data are 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, Southern California Edison (SCE) generated electricity that resulted in an emission factor of 669.7 CO₂e. In 2012, SCE's electricity generation resulted in an emission factor of 705.0 CO₂e. 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 the same trend as usage. In Gardena, Commercial/Industrial natural gas consumption (therms) increased by about 20% from 2005 to 2012; therefore the emissions also increased by about 20%. Residential natural gas therms used and GHG emissions declined nearly 7% 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.

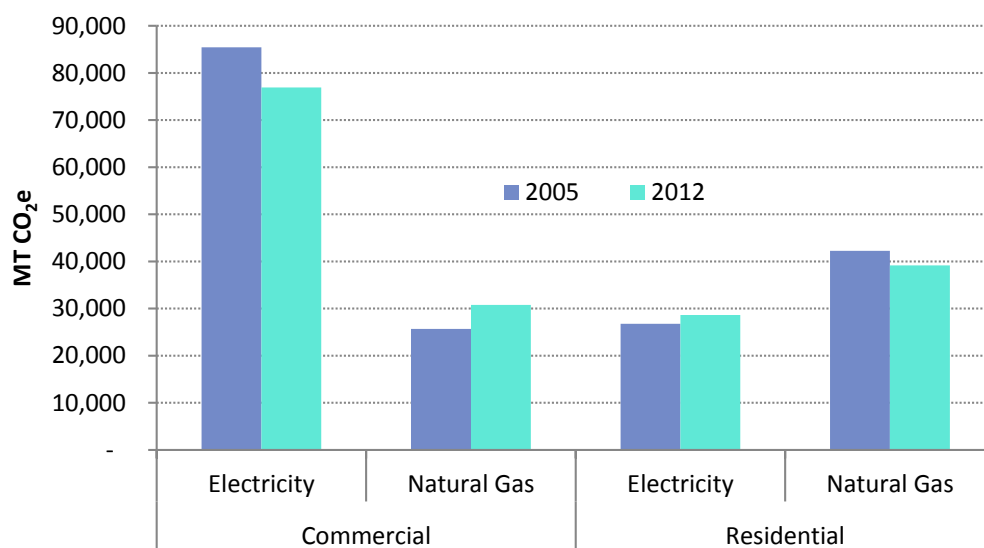


Figure 3. GHG Emissions for Community Electricity and Natural Gas, by Sector

Municipal Emissions

As described earlier, a municipal GHG emissions inventory is a subset of the community inventory. The municipal inventory includes emissions from activities conducted as part of government operations in the City. While emissions from government operations are normally a fraction of the overall community emissions, the City has the most direct control over municipal emissions and the City can demonstrate leadership in the community by adopting and implementing energy and GHG reduction strategies. This section presents the findings of the municipal inventory for 2005 (the baseline year), 2007, 2010, and 2012. It also provides more specific detail and findings on the energy sectors, which will form the basis of the reduction measures the City identifies in the EECAP.

2005—2012 Emissions Summary

- **Municipal emissions have increased 7% from 2005 to 2012, from 7,744 MT CO₂e to 8,267 MT CO₂e.**
- **Emissions in all sectors decreased except for the Vehicle Fleet & Equipment, SCE-Owned Outdoor Lights, and Buildings & Facilities.**
- **Solid Waste sector showed the greatest overall reductions (54 MT CO₂e reductions); however, the City lowered emissions in multiple sectors, including Employee Commute and City-Owned Outdoor Lights.**
- **Emissions from municipal operations account for approximately 2% of community emissions.**

The City's Vehicle Fleet & Equipment is the sector with the largest percentage of emissions in 2005 (53%) and 2012 (56%), and emissions from this sector increased 12% over the period (Figure 4). The second largest-emitting sector for 2005 and 2012 was Buildings & Facilities. The percentage of total emissions from this sector stayed constant at 16% between the two inventory years (49 MT CO₂e increase). The SCE-Owned Outdoor Lights sector increased 6% from 2005 to 2012, with a constant percentage of total emissions between the years (8% of total emissions). Some City-owned Outdoor Lights accounts have been re-categorized to SCE-Owned Outdoor Lights from 2005 to 2012 for improved accuracy of categorization. This change may partially contribute to the increase in SCE-Owned Outdoor Lights emissions. The Solid Waste sector contributed 870 MT CO₂e (11% of total emissions) in 2005 and decreased by 54 MT CO₂e in 2012 (to 816 MT CO₂e, or 11% of total emissions). Emissions from the Employee Commute and City-Owned Outdoor Lights sectors decreased by nearly 1% and 4% from 2005 to 2012 and Water Delivery emissions declined 86% (from 7 MT CO₂e to 1 MT CO₂e). The 2005 and 2012 emissions and changes are detailed in Table 8.

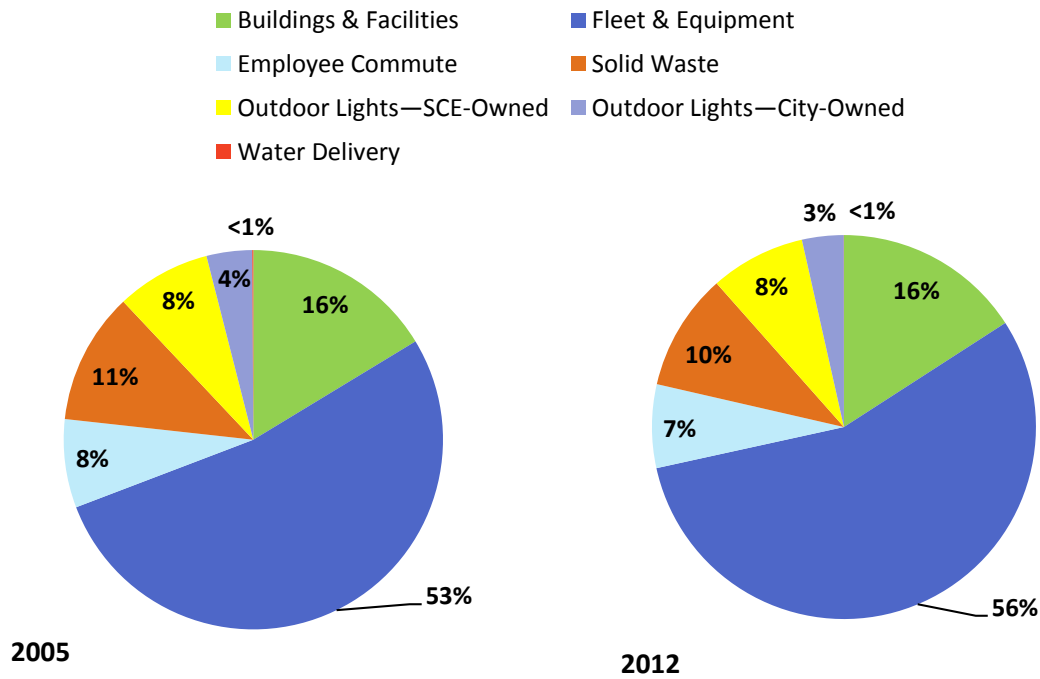


Figure 4. Municipal GHG Emissions by Sector for 2005 and 2012

Table 8. Municipal GHG Emissions by Sector for 2005 and 2012

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	% Change 2005 to 2012
Fleet & Equipment	4,095	4,603	12%
Buildings & Facilities	1,264	1,313	4%
Solid Waste	870	816	-6%
Outdoor Lights—SCE-Owned	623	663	6%
Employee Commute	584	581	-1%
Outdoor Lights—City-Owned	301	290	-4%
Water Delivery	7	1	-86%
Total	7,744	8,267	7%

Note: City-Owned Outdoor Lights includes streetlights, traffic signals, and area lights. SCE-Owned Outdoor Lights includes streetlights and outdoor lights. Water Delivery includes sewer pumping and irrigation.

2005, 2007, 2010, and 2012 Inventories

Figure 5 and Table 9 show the municipal GHG emissions by sector for all four inventory years. Emissions peaked in 2007 (9,155 MT CO₂e) and were the lowest in 2005 (7,744 MT CO₂e).

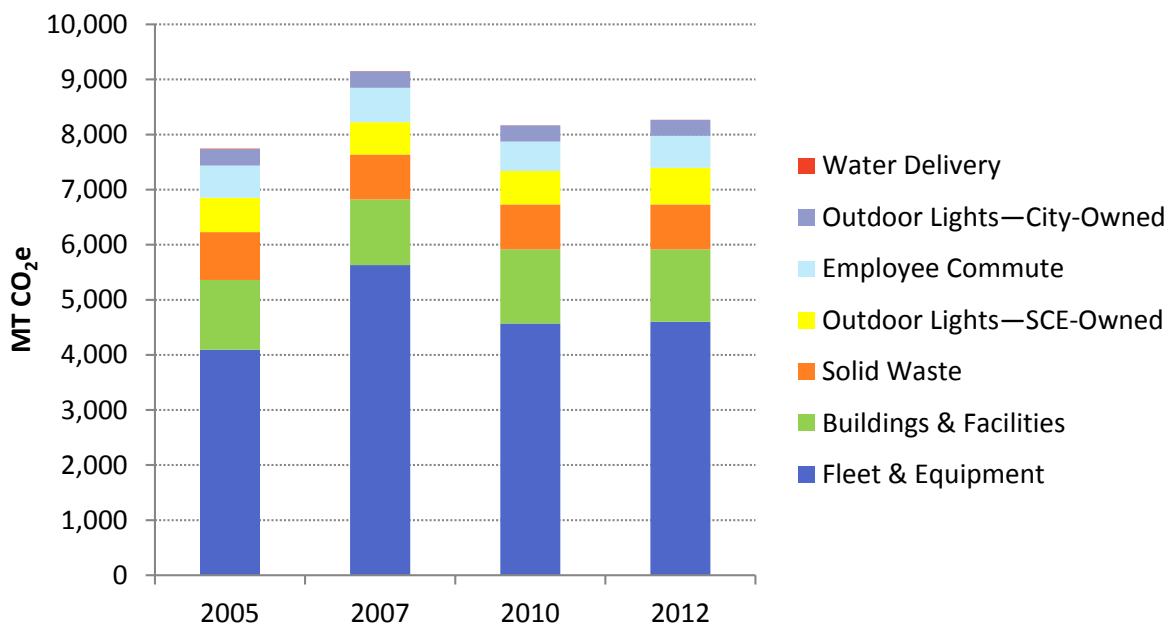


Figure 5. Municipal GHG Emissions for 2005, 2007, 2010, and 2012

Table 9. Municipal GHG Emissions for 2005, 2007, 2010, and 2012

Sector	2005 (MT CO ₂ e)	% of Total	2007 (MT CO ₂ e)	% of Total	2010 (MT CO ₂ e)	% of Total	2012 (MT CO ₂ e)	% of Total
Fleet & Equipment	4,095	53%	5,630	61%	4,569	56%	4,603	56%
Buildings & Facilities	1,264	16%	1,191	13%	1,347	16%	1,313	16%
Solid Waste	870	11%	816	9%	816	10%	816	10%
Outdoor Lights— SCE-Owned	623	8%	587	6%	60	7%	663	8%
Employee Commute	584	8%	625	7%	537	7%	581	7%
Outdoor Lights— City-Owned	301	4%	300	3%	293	4%	290	4%
Water Delivery	7	0%	6	0%	1	0%	0.97	0%
Total	7,744		9,155		8,168		8,267	

Table 10 summarizes activity data for each sector and subsector.

Table 10. Activity Data used in 2005, 2007, 2010, and 2012 Municipal Inventories

Sector	2005	2007	2010	2012	% Change 2005 to 2012
Buildings & Facilities					
Electricity (kWh)	2,854,017	2,892,013	3,235,307	3,439,676	21%
Natural Gas (therms)	74,581	67,561	77,990	40,045	-46%
Outdoor Lights					
City-Owned (kWh)	990,539	1,040,958	1,017,637	907,175	-8%
SCE-Owned (kWh)	2,052,177	2,040,770	2,102,014	2,073,560	1%
Fleet & Equipment					
City-Owned Fleet¹					
Gasoline (gallons)	138,491	360,090	241,947	242,939	75%
Diesel (gallons)	277,896	232,064	232,656	235,135	-15%
LPG (gallons)	779	710	883	802	3%
Employee Commute²					
Gasoline (vehicle miles traveled)	1,364,105	1,475,804	1,281,609	1,388,541	2%
Diesel (vehicle miles traveled)	6,022	6,021	0	0	-100%
# Full-time equivalent employees	453	458	408	442	-3%
Solid Waste³					
Generated Waste (tons)	2,699	2,530	2,530	2,530	-6%
Water Delivery					
Electricity (kWh)	23,144	21,301	4,184	3,040	-87%

Notes: Data for 2005 and 2007 were taken from the Gardena Municipal Greenhouse Gas Emissions Inventory Report (2009).

1 City-Owned Vehicle Fleet for Gasoline and Diesel includes transit bus fuel. 2010 and 2012 transit bus fuel data were not available. 2007 data were assumed for transit bus fuel for 2010 and 2012.

2 Employee Commute survey conducted in 2014 and information was used to estimate employee commute characteristics, adjusted for the number of employees, for 2010 and 2012.

3 Data for 2010 and 2012 were not available. 2007 data were assumed for 2010 and 2012.

Energy

As with the community emissions, the EECAP will focus on increasing energy efficiency and reducing GHG gases from energy within municipal operations. The City has more direct control over energy-related emissions than other sectors, such as employee commute. Municipal energy use includes Buildings & Facilities, SCE-Owned Outdoor Lights, City-Owned Outdoor Lights, and Water Delivery. Energy accounted for 28% of total emissions in 2005 and 27% in 2012. While both electricity and natural gas are used in Building & Facilities, Outdoor Lights and Water Delivery only use electricity. Overall, emissions from energy increased 3% from 2005 to 2012; electricity-based emissions increased 14% while natural gas related emissions decreased 46% (Table 11). Electricity emissions declined for each sector except SCE-Owned Outdoor Lights and Buildings & Facilities. As with community energy, municipal

emissions use electricity emission factors that vary with SCE's annual power generation mix while natural gas emission factors are constant over time.

Table 11. 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 (kWh or therms)	Emissions (MT CO ₂ e)	Activity (kWh or therms)	Emissions (MT CO ₂ e)		
Buildings & Facilities						
Electricity	2,854,017	867	3,439,676	1,100	21%	27%
Natural Gas	74,581	397	40,045	213	-46%	-46%
Outdoor Lights—SCE-owned						
Electricity	2,052,177	623	2,073,560	663	1%	6%
Outdoor Lights—City-owned						
Electricity	990,539	301	907,175	290	-8%	-4%
Water Delivery						
Electricity	23,144	7	3,040	0.97	-87%	-86%
Total (MT CO ₂ e)		2,195		2,267	8%	3%

Figure 6 shows the trend in electricity and natural gas emissions from 2005 to 2012 for the municipal energy sectors.

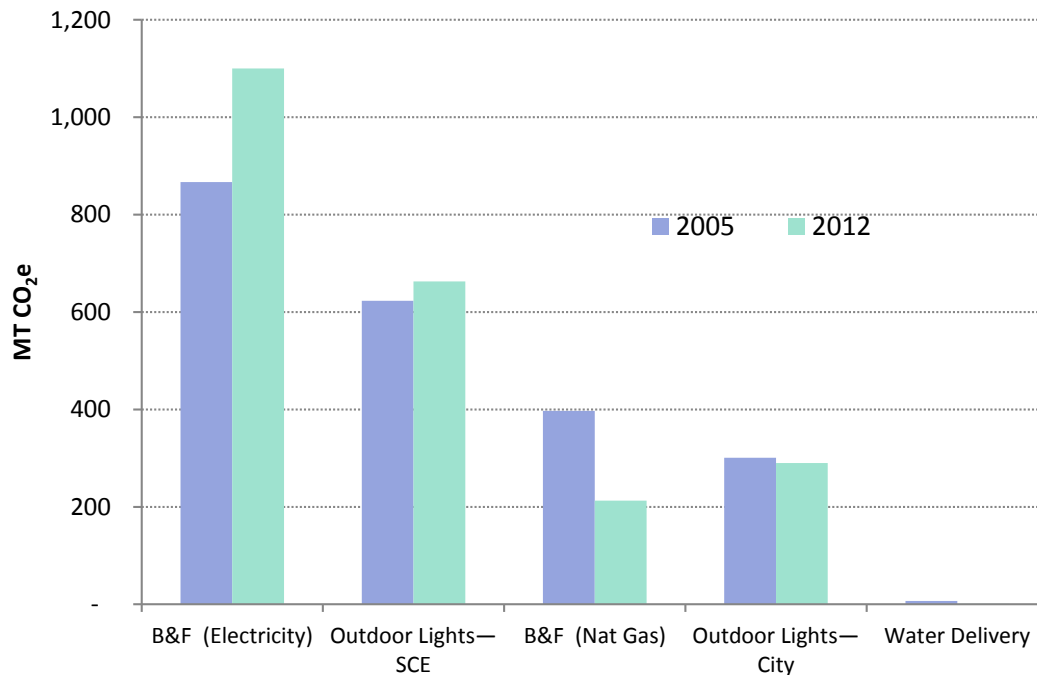


Figure 6. GHG Emissions for Municipal Electricity and Natural Gas, by Sector

Inventory Forecasts

GHG emissions are forecast using two scenarios: a Business-as-Usual (BAU) and an Adjusted BAU scenario. The BAU scenario describes emissions based on projected growth in population and employment and does not consider policies that will reduce emissions in the future (that is, the policies 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 City can see the effect that existing policies may have on future emissions and be better able to determine how local measures can provide additional reductions. 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 City 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 City. Anticipated growth is estimated using data from regional planning scenarios developed by the Southern California Association of Governments (SCAG), the City, and other relevant sources (Table 12). 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 Table 12.

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

Community Business-as-Usual Forecast

- **BAU community emissions are expected to decrease nearly 8% from baseline levels by 2020 and 1% by 2035.**

The City's BAU emissions in 2020 are estimated to be 406,678 MT CO₂e, or an 8.2% decrease from baseline (2005) emissions. By 2035, emissions are estimated to decrease 1.8% from the baseline level to 435,074 MT CO₂e (Table 13).

Table 12. Growth Factors for 2012, 2020, and 2035

Sector	Demographic Indicator	2012	2020	2035	2012-2020 CAGR ¹	2020-2035 CAGR ¹
Transportation	Vehicle Miles Traveled	438,021,537	384,357,899	406,458,483	-1.62%	0.37%
Solid Waste, Water, Wastewater, Off-Road Sources	Service Population (Population + Jobs)	88,180	88,600	96,900	0.06%	0.60%
NA ²	Population	59,124	59,700	66,200	0.12%	0.69%
Commercial/Industrial Energy	Jobs	29,056	28,900	30,700	-0.07%	0.40%
Residential Energy	Households	20,586	21,000	23,200	0.25%	0.67%
Municipal Jobs	Municipal Emissions ³	348 F/T 187 P/T	400 F/T 200 P/T	500 F/T 300 P/T	1.56%	1.76%

Source: SCAG 2012

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

1 Compound annual growth rate.

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

3 The number of jobs in the City is used as an indicator for all municipal operation emissions

Table 13. Community BAU Forecast

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	2020 (MT CO ₂ e)	% Change 2012-2020	2035 (MT CO ₂ e)	%Change 2012-2035
On-Road Transportation	214,764	216,034	202,778	-6%	214,438	-1%
Commercial Energy	111,097	107,688	107,615	<1%	114,317	6%
Residential Energy	69,005	67,783	69,434	2%	76,708	13%
Solid Waste	32,789	18,654	18,844	1%	20,609	10%
Water	14,424	8,273	8,357	1%	9,140	10%
Off-Road Sources	795	1,836	2,062	12%	2,529	38%
Wastewater	232	179	181	1%	197	10%
Total	443,106	420,447	406,678	-3%	435,074	4%
% Change from 2005		-5.1%	-7.6%		-1.2%	

Municipal Business-as-Usual Forecast

- **BAU municipal emissions are expected to be 21% above baseline levels in 2020 and 57% above baseline levels in 2035.**

The City is anticipating growth in city services by 2020 or 2035 from current (2012) levels; staff is expected to increase by nearly 60 full-time equivalent employees by 2020 and another 150 employees by 2035. Therefore, the activity data for all sectors are assumed to increase from 2012. In 2020, municipal emissions are estimated to be 21% above baseline emissions and in 2035 emissions are estimated to be 57% above those in 2005.

Table 14. Municipal BAU Forecast

	2005 (MT CO₂e)	2012 (MT CO₂e)	2020 (MT CO₂e)	% Change 2012-2020	2035 (MT CO₂e)	% Change 2012-2035
Vehicle Fleet	4,095	4,603	5,223	13%	6,790	48%
Buildings & Facilities	1,264	1,313	1,490	13%	1,937	48%
Outdoor Lights	924	953	1,081	13%	1,406	48%
Solid Waste	870	816	926	13%	1,204	48%
Employee Commute	584	581	659	13%	857	48%
Water Delivery	7	1	1	0%	1	0%
Total	7,744	8,267	9,380	13%	12,195	48%
% Change from 2005		7%	21%		57%	

Adjusted Business-as-Usual Forecasts

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

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

Assembly Bill (AB) 1493 and Advanced Clean Cars. AB 1493 directed 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. In addition, the State's Advanced Clean Cars program includes additional components that will further reduce GHG emissions statewide, including more stringent fuel efficiency standards for model years 2017–2025 and support infrastructure for the commercialization of zero-emission vehicles. CARB

anticipates additional GHG reductions of 3% by 2020, 27% by 2035, and 33% by 2050⁴. 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. The City is supplied by Golden State Water and the reductions in GHG emissions from SB X7-7 were calculated by applying the reduction goals established by Golden State Water to the City’s population in 2020 and 2035.

Community Adjusted Business-as-Usual Forecast

- **Emissions are expected to decrease under the Adjusted BAU forecast and will be 17% lower in 2020 than 2005 and 26% lower than 2005 levels by 2035.**

The City’s Adjusted BAU emissions in 2020 are estimated to be 36,997 MT CO₂e in 2020 and 326,781 MT CO₂e in 2035 (Table 15). This change represents a 17% reduction from 2005 by 2020 and 26% reduction 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 Non-residential Energy will increase. Emissions from Solid Waste, Water, and Wastewater are expected to increase over time but account for less than 10% of total emissions.

⁴ [CARB Advanced Clean Cars Summary Sheet](#)

Table 15. Community Adjusted BAU Emissions

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	2020 (MT CO ₂ e)	2020 % of Total	2035 (MT CO ₂ e)	2035 % of Total
Transportation & Mobile Sources	215,559	217,870	164,594	45%	111,371	34%
Commercial Energy	111,097	107,688	107,615	29%	113,005	35%
Residential Energy	69,005	67,783	69,328	19%	75,871	23%
Solid Waste	32,789	18,654	18,844	5%	20,609	6%
Water & Wastewater	14,656	8,452	5,616	2%	5,925	2%
Total	443,106	420,447	365,997	100%	326,781	100%
% Change from 2005		-5%	-17%		-26%	

Municipal Adjusted Business-as-Usual Forecast

- Under an Adjusted BAU forecast, the City's emissions will be 16% above 2005 levels in 2020. By 2035, the emissions will be 51% above 2005 levels.

The City's Municipal Adjusted BAU emissions in 2020 are estimated to be 8,967 MT CO₂e, which is 16% above the 2005 baseline level (Table 16). By 2035, the level of reductions is anticipated to be 51% above 2005 levels, or 11,657 MT CO₂e. 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 City's Vehicle Fleet and Employee Commute sectors.

Table 16. Municipal Adjusted BAU Emissions

Sector	2005 (MT CO ₂ e)	2012 (MT CO ₂ e)	2020 (MT CO ₂ e)	2020 % of Total	2035 (MT CO ₂ e)	2035 % of Total
Vehicle Fleet	4,095	4,603	4,856	54%	6,312	54%
Buildings & Facilities	1,264	1,313	1,490	17%	1,937	17%
Outdoor Lights	924	953	1,081	12%	1,406	12%
Solid Waste	870	816	926	10%	1,204	10%
Employee Commute	584	581	613	7%	797	7%
Water Delivery	7	1	1	0%	1	0%
Total	7,744	8,267	8,967	100%	11,657	100%
% Change from 2005		7%	16%		51%	

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 2020⁵. 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, the City will determine the level of reductions that it can and should achieve. The recommended targets provided below are guidance based on consistency with the State’s goals.

Recommended Community Targets

In 2020, it is anticipated that the City would meet the reduction target through existing efforts. In 2035, the City would need to reduce 100,797 MT CO₂e emissions below the 2035 Adjusted BAU scenario to meet the State-aligned target (Table 17 and Figure 7).

Table 17. State-Aligned GHG Reduction Targets

Sector	2005	2012	2020	2035
BAU Emissions (MT CO ₂ e)	443,106	420,447	409,271	437,938
Adjusted BAU Emissions (MT CO ₂ e)	443,106	420,447	365,997	326,781
State-Aligned Target (% change from 2005)			-15%	-49%
State-Aligned Target (% change from 2012)			-10%	-46%
State-Aligned Emissions Goal (MT CO ₂ e)			376,640	225,984
Reductions from Adjusted BAU needed to meet the Target (MT CO ₂ e)			Target Met	100,797

⁵ 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.

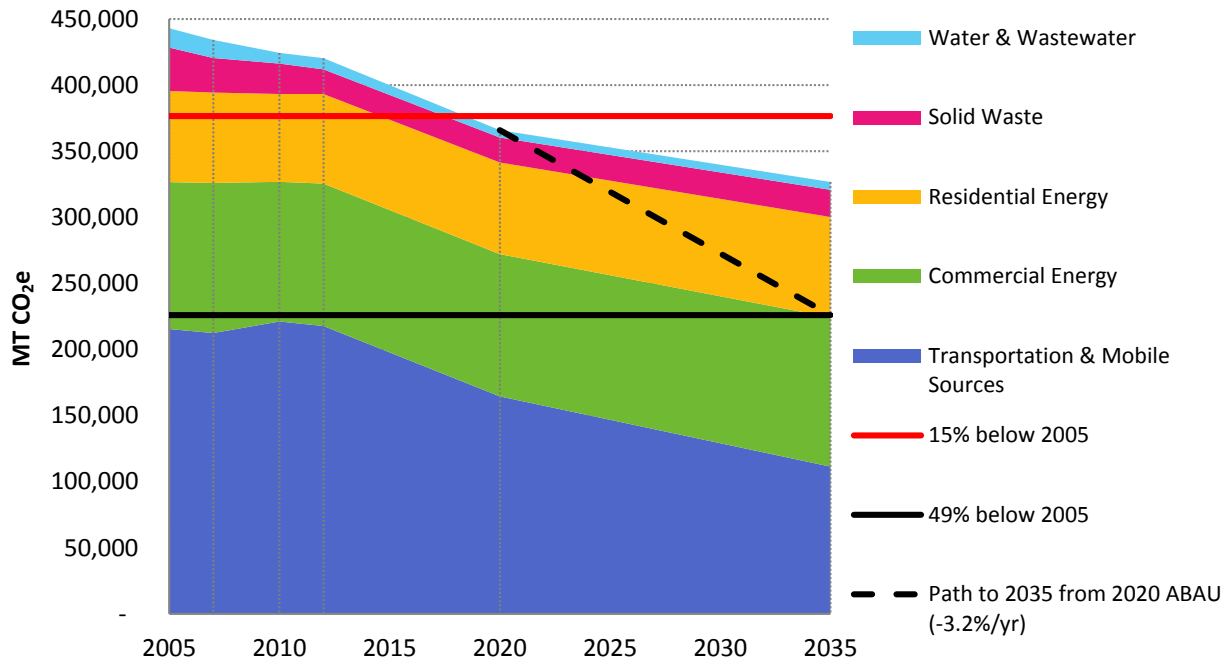


Figure 7. Community Emissions Inventories, Projections, and Targets

Recommended Municipal Targets

In 2020, the City will need to reduce its emissions by 2,385 MT CO₂e from the 2020 Adjusted BAU forecast to achieve a reduction goal consistent with the State (Table 18 and Figure 8). The City will need to implement additional measures to continue to achieve GHG reductions beyond 2020. By 2035, the City will need to reduce municipal operation emissions by 7,708 MT CO₂e from the 2035 Adjusted BAU forecast to meet a 49% reduction goal (below 2005 levels).

Table 18. State-Aligned Municipal GHG Reduction Targets

	2005	2012	2020	2035
BAU Emissions (MT CO ₂ e)	7,744	8,267	9,380	12,195
Adjusted BAU Emissions (MT CO ₂ e)	7,744	8,267	8,967	11,657
State-Aligned Target (% change from 2005)			-15%	-49%
State-Aligned Target (% change from 2012)			-20%	-52%
State-Aligned Emissions Goal (MT CO ₂ e)			6,582	3,949
Reductions from Adjusted BAU needed to meet the Target (MT CO ₂ e)			2,385	7,708

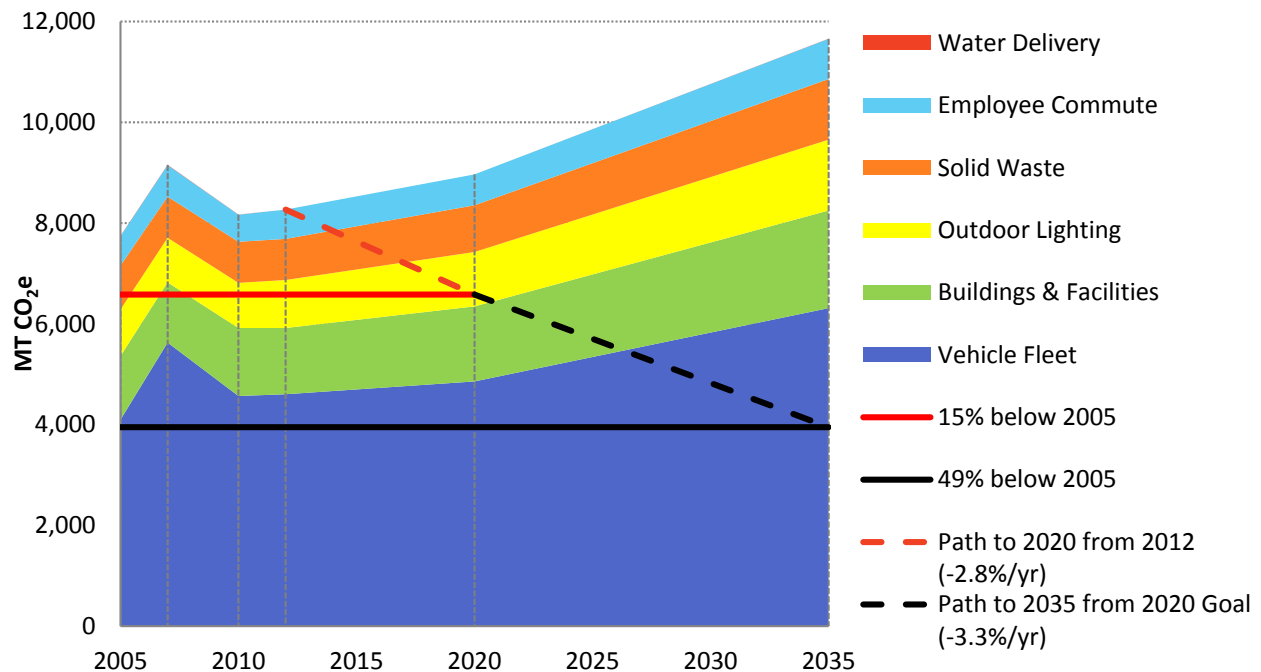


Figure 8. Municipal Emissions Inventories, Projections, and Targets

Conclusions and Next Steps

This Report presents the City's community and municipal inventories, forecasts, and recommended reduction targets. It is the foundation of the EECAP and provides the City a first look at what will be needed to meet emissions reductions that are aligned with the State and to mitigate the City's impacts on climate change. This Report also helps to guide the City in determining feasible energy efficiency reduction opportunities by detailing energy-related emissions, including electricity and natural gas from Residential and Non-residential sectors.

The next steps in the EECAP process are to review the information provided in this Report and to determine preliminary GHG reduction targets for the community and municipal operations. The South Bay Cities Council of Governments will also begin to work with the City to identify local and subregional energy efficiency measures that could be implemented to reach the City's emissions targets.

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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 (CO₂e): This is a common unit for normalizing greenhouse gases with different levels of heat trapping potential. For carbon dioxide itself, emissions in tons of CO₂ and tons of CO₂e are the same, whereas one ton of nitrous oxide emissions equates to 298 tons of CO₂e and one ton of methane equates to 25 tons of CO₂e. 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 CO₂ 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 CO₂.

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 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.

Global Warming Potential Factors

The inventories include the three GHGs most relevant to community and municipal emissions: CO₂, CH₄, and N₂O. 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 CO₂-equivalent, or CO₂e 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 CO₂. For example, the GWP factor of CH₄ is 25 because one metric ton (MT) of CH₄ has 25 times the heat-trapping capacity as one MT CO₂ (over a 100-year period). IPCC periodically updates the GWP factors of GHGs based on new science and updated background mixing ratios of CO₂. CO₂ always has a GWP factor of 1 and the other GHGs are calculated relative to CO₂. 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 CO₂e.

Table B-1. Global Warming Potentials

	CO ₂	CH ₄	N ₂ O
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's 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's previous inventory report. 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	Golden State Water Company	
Vehicle Miles Traveled	Southern California Association of Governments (SCAG)	Origin-destination approach, described below
Demographic Data	SCAG	
Vehicle Fleet	City	
Employee Commute	City	
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.

Cap-and-Trade Entities

The City has major industrial facilities within its 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 CO₂e 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 CO₂e. 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 CO₂e.

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 City does not have significant local control over the GHG emissions. The current protocol recommends excluding the covered entities’ GHG emissions from the 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 this inventory report 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, 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 City to better separate out the energy usage from covered entities or provides better clarity of the current data aggregation, SBCCOG recommends that the City 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.

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.

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.

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	410,696,017	407,207,352	437,503,718	438,021,537	6.7%
Residential Energy					
Electricity (kWh)	88,070,500	91,198,495	89,028,457	89,537,409	1.7%
Natural Gas (therms)	7,945,441	7,925,675	7,683,388	7,362,507	-7.3%
Commercial/Industrial Energy					
Electricity (kWh)	281,182,579	280,318,686	267,280,382	240,483,911	-14.5%
Natural Gas (therms)	4,828,567	6,193,110	5,400,230	5,789,305	19.9%
Solid Waste					
Landfilled (tons)	134,716	104,735	91,309	72,977	-45.8%
ADC (tons) ¹	434	1,398	2,469	3,547	717.3%
Water and Wastewater					
Water (MG)	2720.1	2635.4	2162.4	2247.0	-17.4%
Recycled Water (MG)	0.4	0.3	0.2	0.3	-6.8%
Wastewater (City portion of countywide residents)	0.60%	0.60%	0.60%	0.60%	-1.0%
Off-road sources² (% of LA County emissions attributed to the City)					
Industrial (% Manufacturing jobs)	1.19%	1.24%	1.25%	1.24%	4.4%
Recreation (Population weighted by income)	0.53%	0.52%	0.50%	0.50%	-6.2%
Agriculture (% Ag. Jobs)	0.45%	0.47%	0.54%	0.41%	-9.0%
Construction (% Building permits)	0.23%	0.48%	0.04%	0.54%	132.4%
Lawn & Garden (% Households)	0.64%	0.64%	0.62%	0.62%	-3.2%
Light Commercial (% Other jobs)	0.61%	0.64%	0.64%	0.64%	4.0%

1 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.

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

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

Off-road Class	GHG Type	2005 (MT CO ₂ e /yr)	2007 (MT CO ₂ e /yr)	2010 (MT CO ₂ e /yr)	2012 (MT CO ₂ e /yr)
Agricultural Equipment	CO ₂	921.79	910.27	893.24	882.09
	CH ₄	0.19	0.17	0.14	0.12
	N ₂ O	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 ₂ O	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 ₂ O	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 ₂ O	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 ₂ O	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 ₂ O	0.52	0.57	0.64	0.68

Municipal Activity Data

Municipal 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. City staff completed ridership surveys in 2014 through SurveyMonkey.com. The City had 61 responses to the survey, representing 11.4% of employees. The results were used with the total number of City employees in 2010 and 2012 to estimate employee commutes in 2010 and 2012. Employee commute vehicle miles traveled by fuel type for 2005 and 2007 were taken from the City's previous GHG inventories.

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)	2,854,017	2,892,013	3,235,307	3,439,676	21%
Natural Gas (therms)	74,581	67,561	77,990	40,045	-46%
Streetlights & Outdoor Lights					
City-Owned Electricity (kWh)	990,539	1,040,958	1,017,637	907,175	-8%
SCE-Owned (kWh)	2,052,177	2,040,770	2,102,014	2,073,560	1%
Fleet & Equipment					
City-Owned Fleet¹					
Gasoline (gallons)	138,491	360,090	241,947	242,939	75%
Diesel (gallons)	277,896	232,064	232,656	235,135	-15%
LPG (gallons)	779	710	883	802	3%
Employee Commute²					
Gasoline (vehicle miles traveled)	1,364,105	1,475,804	1,281,609	1,388,541	2%
Diesel (vehicle miles traveled)	6,022	6,021	0	0	-100%
# Full-time equivalent employees	453	458	408	442	-3%
Solid Waste³					
Generated Waste (tons)	2,699	2,530	2,530	2,530	-6%
Water Delivery					
Electricity (kWh)	23,144	21,301	4,184	3,040	-87%

Notes: Data for 2005 and 2007 were taken from the Gardena Municipal Greenhouse Gas Emissions Inventory Report (2009).

1 City-Owned Vehicle Fleet for Gasoline and Diesel includes transit bus fuel. 2010 and 2012 transit bus fuel data were not available. 2007 data were assumed for transit bus fuel for 2010 and 2012, and is likely underestimated.

2 Employee Commute survey conducted in 2014 and information was used to estimate employee commute characteristics, adjusted for the number of employees, for 2010 and 2012.

3 Data for 2010 and 2012 were not available. 2007 data were assumed for 2010 and 2012.

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 CO₂ content per output of electricity on an intermittent basis. The CO₂-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 CO₂ factors for 2005 and 2007 through the Climate Registry, and a CO₂e 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 ₂ O	Proxy Year	Data Source
2005	665.72	0.03	0.011	NA	CO ₂ : Climate Registry. CH ₄ and N ₂ O: U.S. Community Protocol
2007	630.89	0.029	0.010	NA	CO ₂ : Climate Registry. CH ₄ and N ₂ O: U.S. Community Protocol
2010	630.89	0.029	0.010	2007	CO ₂ : Climate Registry. CH ₄ and N ₂ O: 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 CO₂e; therefore, there are no CH₄ and N₂O 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 ₂ O	Data Source
kg /MMBtu	53.02	0.005	0.0001	U.S. Community Protocol

Transportation and Mobile Sources

EMFAC Model

CO₂ 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 CO₂ exhaust, which includes emissions from vehicles in motion, idling, and ignition. While

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>.

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 CO₂ 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 CO₂ emission factor using EMFAC CO₂ emissions³ and gallons of fuel consumed for Los Angeles County;
3. Calculate the average grams CO₂/mile traveled factor weighted by vehicle class miles traveled for Los Angeles County.

EMFAC does not provide emissions for CH₄ and N₂O; 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 ₂ O	CO ₂	CH ₄	N ₂ O
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. CO₂ emissions are estimated using a default emission factor of 8.78 and 10.21 kg/gallon for gasoline and diesel, respectively⁴ and fuel economy, which is based on EMFAC outputs for each inventory year and vehicle class. Vehicle miles traveled are converted to CH₄ and N₂O emissions using emission factors from the Community Protocol. Table B-9 shows the miles per gallon and grams (CH₄ and N₂O) per mile used to estimate emissions from employee commute by vehicle class.

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.

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

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 CO₂ emissions. Vehicle miles traveled are used to estimate CH₄ and N₂O. The factors used for the 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 ₂ O/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 ₂ O/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 ₂ O/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
	g N ₂ O/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 ₂ O/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 ₂ O/mi	0.005	0.005	0.005	0.005

Note: MPG is miles per gallon and is derived from EMFAC at the county level. CH₄ and N₂O 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 CO₂, CH₄, and N₂O 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 the City's portion of emissions for each category and Table B-11 shows City-specific data. City- and county-level 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	City	61	60	5,465	20,442	24,836	59,277	42,508
	County	13,562	25,623	461,099	3,178,736	4,045,922	9,816,200	48,606
	%	0.45%	0.23%	1.19%	0.64%	0.61%		0.53%
2007	City	63.56	98	5,720	20,596	25,996	59,095	44,182
	County	13,562	20,303	461,099	3,224,053	4,045,922	9,780,800	51,439
	%	0.47%	0.48%	1.24%	0.64%	0.64%		0.52%
2010	City	57,456	3	4,510	21,472	24,160	58,854	46,818
	County	10,598	7,466	362,157	3,454,093	3,758,244	9,818,605	56,000
	%	0.54%	0.04%	1.25%	0.62%	0.64%		0.50%
2012	City	44	103	4,566	21,501	24,446	59,124	44,659
	County	10,798	18,926	369,005	3,454,093	3,829,313	9,889,632	53,880
	%	0.41%	0.54%	1.24%	0.62%	0.64%		0.50%

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 the City 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 ₂ O	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 CH₄ and N₂O 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. The City is 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 CH₄ and N₂O emissions

for stationary emissions. Although CO₂ emissions are also produced, the fuel source is considered a biofuel, and the resulting CO₂ emissions are considered “biogenic” and are not reported⁵.

Process emissions include N₂O 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 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. Because the City is largely residential, a factor of 1.0 was applied to these emissions.

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). The City’s portion was determined by estimating the proportion of the population served by JWPCP. The ClearPath tool requires the daily N load in kg N per day. This is calculated using the factors listed in Table B-4 and the Community Protocol Equation WW.12:

$$\text{Daily N Load for the City (kg N/day)} = \text{Effluent} \times \text{Effluent Nitrogen Content} \times \text{gallons/liter} \\ \times \text{City Population/Service Population},$$

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.

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

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 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 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.

Business-as-Usual Forecasts

The BAU scenario uses current (2012) consumption patterns and predicted growth in the City 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 the 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 the 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 the City, also accounts for legislation that will reduce emissions in the future, regardless of City actions. Table B-17 summarizes the legislation that will reduce the City's 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 the 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 the City to 2020 and 2035. The rate of reductions was applied to the 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 the 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 buildings⁹; therefore, 16.8% reduction in electricity consumption may be expected in new commercial development.

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.

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; 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. For the City's water provider, Golden State Water Company, the level of implementation was estimated using an annualized reduction rate from the Company's baseline water consumption rate (126 gallons per capita per day, GPCD) to the target water consumption rate (119 GPCD).

Target Setting

The state-aligned targets are provided to assist the City in determining appropriate emission reduction goals. Recommended targets 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 City's baseline year is 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 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.

**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 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 C: 2005 and 2007 Inventory Updates

The South Bay Cities Council of Governments (SBCCOG) previously conducted emissions inventories for the community and municipal operations. This section details the approach used in the previous inventories, updates, and comparisons of previous and updated inventories.

Description of Previous Inventories

Community Inventory

SBCCOG conducted community inventories for the years 2005 and 2007 and projected emissions for 2020. Activities inventoried were on- and off-road transportation, electricity and natural gas usage, solid waste and wastewater generation. Emissions for 1990 were estimated to show likely trends in activity but the data is not as reliable as for the 2005 and 2007 inventories and therefore are excluded from further analysis.

Municipal Inventory

SBCCOG conducted municipal inventories for the years 2005 and 2007 and projected emissions for 2012 and 2015. Activities inventoried were building and facility energy consumption, including streetlights, park lights, and traffic signals; employee commute-related emissions; vehicle fleet emissions; and waste production in City facilities. As with the community inventories, 1990 emissions were inventoried but are not as accurate and are therefore excluded from further analysis.

Methodology for Revising and Developing New Inventories

There are many approaches to conducting a GHG emissions inventory, and the approach used in California is evolving.

Protocols

The Local Government Operations Protocol (LGOP), adopted by the California Air Resources Board (CARB) in 2008 and serving as a national standard for quantifying and reporting GHG emissions from local government operations, is the foundation of both previous and revised municipal inventories, and revision to the inventories is made according to additional guidance developed after 2007.

The previous community inventories, which were conducted with the best available approach at that time, followed the methodology in the draft International Local Government GHG Emissions Analysis Protocol (IEAP), a common international framework. Since then, other guidance documents recommend variations in methodology and are the current standard of practice in California. In 2012, a Community Protocol was released that provided guidance to U.S. cities conducting a communitywide inventory. In 2013, the Association of Environmental Professionals Climate Change Committee released a California Supplement to the Community Protocol, providing more detailed guidance for inventories being conducted in California. Other guidance regarding Global Warming Potential (GWP) factors and emission factors has also been updated. The following describe the revisions to the 2005 and 2007 inventories to conform to current methodologies.

Demographics

The Southern California Association of Governments (SCAG) completes a growth forecast every four years as part of their Regional Transportation Plan (RTP) process, which also includes historical data. The previous inventories included demographic information from the 2008 RTP. The inventories were updated to reflect any changes to 2005 and 2007 demographics found in the most recent (2012) RTP (Table C-1).

Table C-1. Demographic Information

Year	Previous Inventory Data ⁴			Current Data ^{1,2,3}		
	Population	Jobs	Households	Population	Jobs	Households
2005	61,050	30,362	20,557	59,277	30,362	20,442
2007	61,603	30,413	20,759	59,095	31,780	20,596
2010	N/Av	N/Av	N/Av	58,854	28,728	20,588
2012	N/Av	N/Av	N/Av	59,124	29,056	20,586
2020	67,708	31,478	22,639	59,700	28,900	21,000
2035	N/Av	N/Av	N/Av	66,200	30,700	23,200

N/Av: Data not available.

Sources:

1. Southern California Association of Governments. Population, Household, and Employment Integrated Growth Forecast. <http://gisdata.scag.ca.gov/Pages/SocioEconomicLibrary.aspx> (Accessed March 27, 2014). – (Population: 1990, 2005 & 2007).
2. Southern California Association of Governments. Regional Transportation Plan 2012 - 2035. Adopted April 2012. – (Population: 2010, 2012, Population, Jobs, Households: 2020 & 2035).
3. Southern California Association of Governments. Local Profile. (Households, 2005, 2007, 2010, 2012; Jobs 2007, 2010, 2012) <http://www.scag.ca.gov/Documents/Gardena.pdf> Accessed April 11, 2014.
4. 2011 Gardena Inventory Report.

Global Warming Potentials

The GWP factors were updated to be consistent with CARB's Scoping Plan Update recommendations. The previous inventory used the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report GWP factors. The State currently uses the Fourth Assessment Report GWP factors (C-2).

Table C-2. 100-Year Global Warming Potentials

Gas	Previous GWP	Updated GWP
CO ₂	1	1
CH ₄	21	25
N ₂ O	310	298

Previous GWP is based on the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report, 1995. Updated GWP is based on the IPCC Fourth Assessment Report, 2007.

Emission Factors

Emission factors are used to estimate the amount of GHGs per unit of activity. For example, electricity would have a higher emission factor, or GHG output per kWh, if the electricity was generated from coal sources versus solar panels. Emission factors were updated to reflect the best available data to date. Previous emission factors are presented in the previous inventory reports. Emission factors used in the current inventories are presented in Appendix B.

Water Sector

The Community Protocol recommends including emissions related to the energy required to source, distribute, and treat water, known as the “embedded energy” in water. The previous inventories, which did not include a water sector, were updated to include the energy embedded in water. Calculation details are provided in Appendix B.

Off-road categories

The previous inventories included off-road emission sources from construction, lawn and garden, industrial, and light commercial equipment. In general, off-road sources are not known at the city level and are apportioned to cities from data available at the county level using the state-developed OFFROAD model. The off-road sources were previously allocated to cities based on population. Current protocol recommends allocating off-road sources according to known and applicable indicators as described in Table C-3. For example, the emissions from landscape equipment uses the number of households in the City compared to the total households in the county. The current inventories also include emissions from recreational vehicles, such as all-terrain vehicles. While many jurisdictions do not allow off-road activity within its city boundaries, emissions are attributed to the owner’s city of residence. Recreational vehicles are allocated to cities based on the relative population and median income of the city compared to the county. These account for (1) areas with greater populations generally have greater recreational vehicles than areas with smaller populations and (2) income disparities among cities. Recreational vehicles are generally a luxury item and therefore population alone may not accurately account for ownership (and therefore emissions) of this subsector.

Table C-3. Off-Road Emissions Indicators

Subsector	Indicator ¹
Industrial Equipment	Industrial Jobs
Agricultural Equipment	Agricultural Jobs
Recreational Vehicles	Population adjusted for income level
Landscape Equipment	Households

¹ All data are relative to LA County.

Comparison of Previous Inventories with Revised and New Inventories

Community

Table C-4 details the activity data used for the 2005 and 2007 inventories.

Table C-4. Activity Data used in 2005 and 2007 Community Inventories

Sector	2005		2007	
	Previous	Revised	Previous	Revised
Electricity (kWh)	369,293,079	369,253,079	371,517,181	371,517,181
On-Road Transportation (vehicle miles traveled)	410,696,017	410,696,017	407,207,351	407,207,352
Natural Gas (therms)	16,757,928	12,774,008	16,912,274	14,118,785
Solid Waste (tons)	134,716	135,150	104,736	106,133
Water (MG)	N/Av	2,720	N/Av	2,635
Recycled Water (MG)	N/Av	0.4	N/Av	0.3
Wastewater	N/Av	*	N/Av	*
Off-Road Transportation	N/Av	*	N/Av	*

N/Av: Data not available.

*See Appendix B for methodology

Table C-5 shows the 2005 and 2007 GHG emissions by sector based on the updates described in the previous section.

Table C-5. Previous and Revised Community GHG Emissions for 2005 and 2007

Sector	2005		2007	
	Previous (MT CO ₂ e)	Revised (MT CO ₂ e)	Previous (MT CO ₂ e)	Revised (MT CO ₂ e)
On-Road Transportation	236,870	214,764	231,376	210,940
Electricity	112,174	112,176	106,941	106,940
Natural Gas	89,096	67,926	89,917	75,077
Solid Waste	24,662	32,789	18,509	26,041
Wastewater	N/Av	232	N/Av	180
Water	N/Av	14,424	N/Av	13,550
Off-Road Transportation	1,716	795	1,783	1,521
Total	464,518	443,106	448,526	434,249

N/Av: Data not available


Municipal

Municipal activity data did not change for 2005 and 2007; however, some of the emissions factors and the GWP factors have changed, which affect the emissions associated with the activity data. Table C-6 shows the 2005 and 2007 GHG emissions by sector based on the updates described in the previous section.

Table C-6. Previous and Revised Municipal GHG Emissions for 2005 and 2007

Sector	2005		2007	
	Previous (MT CO ₂ e)	Revised (MT CO ₂ e)	Previous (MT CO ₂ e)	Revised (MT CO ₂ e)
Electricity	1,798	1,791	1,757	1,719
Vehicle Fleet	4,070	4,095	5,604	5,630
Employee Commute	740	584	811	625
Natural Gas	576	397	503	359
Solid Waste	684	870	642	816
Water	N/Av	7	N/Av	6
Total	7,868	7,744	9,317	9,155

N/Av: Data not available

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Appendix B

Greenhouse Gas Reduction Quantification Methodology

Appendix B: Greenhouse Gas Reduction Quantification Methodology

Community Reduction Measures

This section provides a detailed overview of the calculations and assumptions used to quantify greenhouse gas (GHG) emissions reductions for each of the community GHG reduction measures. The following information is provided for each measure.

- **Measure Description:** Describes the background and general information for each measure.
- **Action(s):** Details actions for the City to choose from to implement the measure and achieve the goal.
- **Assumptions:** Includes all assumptions used in calculating emissions reductions.

Each measure is classified as either a *quantifiable* measure or an *enhancing* measure. Both have *participation rates* that indicate the City's level of interest and commitment to implementing the specific measure. In addition, participation rates are influenced by measures which provide financial incentives since this typically increases public participation. Quantifiable measures also have unit savings that build upon population, housing units, or water usage, etc. The GHG reduction for each quantifiable measure is calculated by multiplying the participation rate by unit savings, number of units, and emission factors. Enhancing measures boost quantifiable measures by the percentage of the sum of enhancing measures' participation rates within the goal, but the enhanced participation rate cannot exceed the high end of the range.

The chosen participation rates of all measures are assumed to be achieved by 2020, so the rate of increase in annual reduction is calculated by dividing the reduction in 2020 by the number of years between the year that the plan is adopted and the year of 2020, which is four years for this plan. Assuming that the same rate of increase in annual reduction will be implemented between 2020 and 2035, the annual reduction in 2035 is calculated by multiplying the annual increase of reductions by fifteen years and adding this to the 2020 reduction amount.

Goal I: Increase Energy Efficiency in Existing Residential Units

MEASURE I.1: ENERGY EFFICIENCY (EE) TRAINING AND EDUCATION

Measure Description

Opportunities for residents to improve energy efficiency in their homes range from changes to behavior that they can start today to physical modifications or improvements they can make to their homes. Education of both the public and municipal employees is at the core of attaining energy efficiency goals. While most of the other measures include an outreach component, creating a specific education measure will emphasize the critical role of education in achieving energy efficiency. An education measure will also provide City staff with a framework to educate community members about behavioral and technological changes that can increase energy efficiency.

Actions

- ☐ Post links on website/social media and provide materials at public events
- ☐ Email list for e-mail blasts of new information or trainings
- ☐ Establish an annual energy efficiency fair
- ☐ Create a resource center
- ☐ Hire/designate Energy Advocate to promote and manage energy efficiency programs

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and studies
- ☐ For media, email and public events promotion the participation rate ranges from 5% to 7.5%
- ☐ For annual energy efficiency fairs the participation rate ranges from 10% to 25%
- ☐ For resource center the participation rate ranges from 10% to 15%
- ☐ For energy advocate the participation rate ranges from 25% to 30%

MEASURE 1.2: INCREASE PARTICIPATION IN EXISTING EE PROGRAMS**Measure Description**

There are many energy efficiency opportunities that are low-cost for residents to initiate and result in cost savings over time. These opportunities are generally from existing programs. In the South Bay, both Southern California Edison (SCE) and Southern California Gas Company (SCG) offer many rebates and other incentives to purchase energy efficient appliances, lighting, and other low cost investments that facilitate energy efficiency. Through this measure, the City will work to increase residents' participation in existing energy efficiency programs that are low-cost or even provide a financial benefit to the resident. As programs change over time, continued and up-to-date outreach is necessary. The action below would provide a variety of channels for ongoing communication to the City's residents.

Actions

- ☐ Partner with SBCCOG and Utilities for outreach events
- ☐ Staff outreach to home owner associations (HOAs) and other housing groups

Assumptions

- ☐ Electricity saving is 1124 kWh per 1,000 service population
- ☐ Natural gas saving is 66 therms per 1,000 service population
- ☐ Participation rates are included within the reduction amounts and are set between 50% and 100%

MEASURE 1.3: ESTABLISH, PROMOTE, OR REQUIRE HOME ENERGY EVALUATIONS**Measure Description**

Home energy evaluations are necessary to identify cost-effective opportunities for energy saving and for residents to take practical actions to achieve energy efficiency. Home energy evaluations can be established or promoted by a variety of existing programs.

Actions

- ☐ Require third-party inspector to verify Title 24 or greater compliance to home upgrades or enhance enforcement of Title 24 compliance
- ☐ Promote home energy audits through programs such as Energy Upgrade California
- ☐ Establish free "Energy Checkup" program

Assumptions

- ☐ Participation rate of energy audits and energy checkup ranges from 25% to 38%

MEASURE 1.4: PROMOTE, INCENTIVIZE, OR REQUIRE HOME ENERGY RENOVATIONS**Measure Description**

Buildings built before adoption of Title 24 are not energy efficient, and renovations would achieve higher energy efficiency. Many programs and incentives across the state or country help promote home energy renovations, including city-supervised funding, permit process improvements and city ordinance.

Actions

- ☐ Promote existing incentivized programs such as Energy Upgrade California
- ☐ Develop or promote a green building program
- ☐ Promote Financing Programs such as PACE (Properly Assessed Clean Energy)
- ☐ Waive or reduce permit fees to facilitate permit processing
- ☐ Establish online permitting to facilitate permit processing
- ☐ Develop City-based revolving loan fund
- ☐ Develop a Point-of-Sale Energy Rating ordinance
- ☐ Develop a Residential Energy Conservation Ordinance (RECO)

Assumptions

- ☐ Independent and voluntary energy efficiency practices and measures participation rates range from 15% to 54%; it applies to total housing market and is percent measures and practices adopted
- ☐ California Solar Initiative (CSI) program participation rate ranges from 1% to 4%
- ☐ Energy reduction from Energy Upgrade California Program is 10% of historic energy use for single family houses and multi-family houses in Climate Zone 13
- ☐ HERO Program or loan fund participation rates range from 1% to 6%. Electricity saving is 4,000 kWh per household, but only applies to houses constructed before 1980
- ☐ Participation rates associated with waived/reduced permit fees or online permitting ranges from 1% to 5%
- ☐ Point-of-Sale energy rating can save 60 kWh of electricity per house sold, and the participation rate ranges from 85% to 100%
- ☐ Participation rate of Residential Energy Conservation Ordinance (RECO) ranges from 5% to 100%, and can save 1,720 kWh of electricity or 924 terms of natural gas per house sold

Goal 2: Increase Energy Efficiency in New Residential Development

MEASURE 2.1: ENCOURAGE OR REQUIRE EE STANDARDS EXCEEDING TITLE 24

Measure Description

City planners have a unique opportunity to encourage/inform developers of new energy efficiency opportunities in new development. This policy will develop City staff to become resources in encouraging and implementing energy efficiency building measures beyond that required in current Title 24 Standards. This policy will also ensure that as Title 24 Standards are updated, City staff are well-informed and can implement updates quickly and effectively.

Actions

- ☐ Educate City staff, developers, etc., on future Title 24 updates and the additional energy efficiency opportunities for new residential development
- ☐ Promote Tier 1, Tier 2, Green Building Ratings such as LEED, Build It Green/Green Point Rating System, or Energy Star certified buildings
- ☐ Waive or reduce permit fees to facilitate permit processing
- ☐ Establish online permitting to facilitate permit processing
- ☐ Create an Energy award program for net-zero-net energy homes
- ☐ Adopt a local ordinance to exceed Title 24 (2013)

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and studies
- ☐ For trainings on Title 24, participation rates range from 50% to 100%, and potential savings from compliance improvement is 14% for both electricity and natural gas. This assumes average new house energy consumption is equal to 2012 residential consumption divided by 2012 residential units.
- ☐ Participation rates for LEED program range from 6.25% to 25%, with 5% energy savings on electricity and natural gas
- ☐ Non-quantifiable actions are assumed to enhance participation rates of the other actions in this measure by 1% to 5%

Goal 3: Increase Energy Efficiency in Existing Commercial Units

MEASURE 3.1: EE TRAINING AND EDUCATION

Measure Description

Education is at the core of attaining energy efficiency goals. Creating a specific education measure will emphasize the critical role of education in achieving energy efficiency. An education measure will also provide City staff with a framework to interact with and educate community members about behavioral and technological changes that can increase energy efficiency.

Actions

- ☐ Post links on website/social media and provide materials at public events
- ☐ Email list for e-mail blasts of new information or trainings

- ☐ Establish an annual energy efficiency fair
- ☐ Create a resource center
- ☐ Hire/designate Energy Advocate to promote and manage energy efficiency programs

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and studies
- ☐ For media, email and public events promotion the participation rate ranges from 5% to 7.5%
- ☐ For annual energy efficiency fairs the participation rate ranges from 10% to 25%
- ☐ For resource center the participation rate ranges from 10% to 15%
- ☐ For energy advocate the participation rate ranges from 25% to 30%

MEASURE 3.2: INCREASE PARTICIPATION IN EXISTING EE PROGRAMS

Measure Description

There are many energy efficiency opportunities that are low-cost for businesses to initiate and result in cost-savings over time. These opportunities are generally from existing programs offered in the South Bay. Both SCE and SCG provide many rebates and other incentives to purchase energy efficient appliances, lighting, and other low cost investments that facilitate energy efficiency. Through Measure 3.2, the City will work to increase businesses' participation in existing energy efficiency programs that are low-cost or even provide a financial benefit to the business. Although these are considered "low-hanging fruit," many business owners may be unaware that the opportunities exist.

Actions

- ☐ Partner with SBCCOG and Utilities for outreach events
- ☐ Staff outreach to business groups

Assumptions

- ☐ Electricity saving is 27,754 kWh per 1,000 service population
- ☐ Natural gas saving is 245 therms per 1,000 service population
- ☐ Participation rates are included within the reduction amounts and are set between 10% and 100%

MEASURE 3.3: PROMOTE OR REQUIRE NON-RESIDENTIAL ENERGY AUDITS

Measure Description

Commercial energy audits are necessary to identify cost-effective opportunities for energy savings and for business owners to take practical actions to achieve energy efficiency. The audits can be established or promoted by various existing programs.

Actions

- ☐ Require third-party inspector to verify Title 24 or greater compliance to upgrades
- ☐ Promote energy audits such as through Energy Upgrade California or other state programs
- ☐ Require early adoption of AB 1103 for small buildings (5,000-10,000 square feet)

Assumptions

- ☐ Participate rate of energy audits ranges from 25% to 38%
- ☐ Buildings that were benchmarked consistently reduced energy use by an average of 2.4% per year, and the participation rate ranges from 10% to 50%

MEASURE 3.4: PROMOTE OR REQUIRE COMMERCIAL ENERGY RETROFITS**Measure Description**

As most commercial buildings in the City were built before the adoption of Title 24, most commercial facilities and equipment are not energy efficient. Therefore, retrofits are necessary to achieve higher energy efficiency. Many programs and incentives across the state or country help promote non-residential energy retrofits, including city-supervised funding, permit process improvements and city ordinance.

Actions

- ☐ Promote existing incentivized programs such as Energy Upgrade California
- ☐ Develop or promote a green building program
- ☐ Promote Financing Programs such as PACE (Properly Assessed Clean Energy)
- ☐ Waive or reduce permit fees to facilitate permit processing
- ☐ Establish online permitting to facilitate permit processing
- ☐ Develop City-based revolving loan fund
- ☐ Develop a Commercial Energy Conservation Ordinance (CECO)

Assumptions

- ☐ Participating buildings in the PACE program typically reduce 25% of energy use, and the participation rate ranges from 2% to 20%
- ☐ Participation rate for Green Building Program ranges from 1% to 5%
- ☐ California Solar Initiative (CSI) program participation rate ranges from 1% to 25%
- ☐ Commercial HERO Program participation rate ranges from 1% to 25%
- ☐ Participation rates associated with waived/reduced permit fees or online permitting ranges from 1% to 5%
- ☐ Participation rate of Commercial Energy Conservation Ordinance (CECO) ranges from 2% to 5% and can save 10% of electricity and natural gas per square feet of commercial buildings

Goal 4: Increase Energy Efficiency in New Commercial Development**MEASURE 4.1: ENCOURAGE OR REQUIRE EE STANDARDS EXCEEDING TITLE 24****Measure Description**

City planners have a unique opportunity to encourage/inform developers of new energy efficiency opportunities in new development. This policy will develop City staff to be resources in encouraging and implementing energy efficiency beyond that required in current Title 24 Standards. This will also ensure that as Title 24 Standards are updated, City staff are well-informed and can implement updates quickly and effectively.

Actions

- ☐ Educate City staff, developers, etc., on future Title 24 updates and the additional energy efficiency opportunities for new commercial development
- ☐ Promote Tier 1, Tier 2, Green Building Ratings such as LEED, Build It Green/Green Point Rating System, or Energy Star certified buildings
- ☐ Waive or reduce permit fees to facilitate permit processing
- ☐ Establish online permitting to facilitate permit processing
- ☐ Create an Energy award program for net-zero-net energy businesses
- ☐ Adopt a local ordinance to exceed Title 24 (2013)

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and studies
- ☐ For trainings on Title 24, participation rate ranges from 50% to 100%, and potential savings from compliance improvement is 14% for both electricity and natural gas. This assumes average new commercial building energy consumption is equal to 2012 commercial consumption divided by 2012 commercial units
- ☐ Participation rates for LEED program range from 6.25% to 25%, with 5% energy savings on electricity and natural gas
- ☐ Non-quantifiable actions are assumed to enhance participation rates of the other actions in this measure by 1% to 5%

Goal 5: Increase Energy Efficiency through Water Efficiency**MEASURE 5.1: PROMOTE OR REQUIRE WATER EFFICIENCY (WE) THROUGH SBX7-7****Measure Description**

SB X7-7, or The Water Conservation Act of 2009, requires all water suppliers to increase water use efficiency. The legislation set an overall goal of reducing per capita urban water consumption by 20 percent from a baseline level by 2020. This goal can be met by taking a variety of actions, including targeted public outreach and promoting water efficiency measures such as low-irrigation landscaping.

Actions

- ☐ Post links on website/social media and provide materials at public events
- ☐ Email list for e-mail blasts of new information or trainings
- ☐ Require low-irrigation landscaping

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and studies
- ☐ For media, email and public events promotion the participation rate ranges from 5% to 7.5%
- ☐ Participation rate for water efficient landscape ordinance ranges from 40% to 90%
- ☐ Assumes half of water consumption is for outdoor use, and a water efficient landscape ordinance can save 20% of outdoor water use, so the overall reduction of water consumption is 10%

MEASURE 5.2: PROMOTE WE STANDARDS EXCEEDING SB X7-7**Measure Description**

In addition to SB X7-7, more actions are being studied or have been taken to exceed water efficiency standards. These efforts include education and outreach practices that could be combined with residential and commercial actions that emphasize the reuse of recycled/grey water and promote harvesting rainwater.

Actions

- ☐ Staff time dedicated to work with HOAs, businesses, and other groups for outreach
- ☐ Allow recycled or grey water uses for non-municipal uses
- ☐ Work with Water District to increase recycled water potential
- ☐ Promote rainwater harvesting rebates and demonstrations

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and range from 25% to 50%
- ☐ Assumes five rain events per year, 100 gallons capacity onsite, and tanks emptied between rain events; 1,000 square feet of roof surface captures 625 gallons of water for every one inch of rainfall
- ☐ Rain harvesting program participation rate ranges from 5% to 50%

Goal 6: Decrease Energy Demand through Reducing Urban Heat Island Effect**MEASURE 6.1: PROMOTE TREE PLANTING FOR SHADING AND EE****Measure Description**

Trees and plants naturally help cool an environment by providing shade and evapotranspiration (the movement of water from the soil and plants to the air), making vegetation a simple and effective way to reduce urban heat islands. Shaded surfaces may be 20–45°F (11–25°C) cooler than the peak temperatures of un-shaded materials. In addition, evapotranspiration, alone or in combination with shading, can help reduce peak summer temperatures by 2–9°F (1–5°C). Furthermore, trees and plants that directly shade buildings can reduce energy use by decreasing demand for air conditioning.

Actions

- ☐ Encourage tree planting at plan check
- ☐ Work with community to develop a tree-planting group
- ☐ Develop a City tree planting program

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and studies, and range from 15% to 80%, and 2% to 50% on energy savings

- ☐ Assume 2.5% reduction in cooling load for residential and nonresidential land uses due to reduced urban temperatures

MEASURE 6.2: INCENTIVIZE OR REQUIRE LIGHT-REFLECTING SURFACES

Measure Description

Replacing surface areas with light-reflecting materials can decrease heat absorption and lower outside air temperature. Both roofs and pavements are ideal surfaces for taking advantage of this advanced technology.

Cool roof is built from materials with high thermal emittance and high solar reflectance—or albedo—to help reflect sunlight (and the associated energy) away from a building. These properties help roofs to absorb less heat and stay up to 50–60°F (28–33°C) cooler than conventional materials during peak summer weather. Cool roofs may be installed on low-slope roofs (such as the flat or gently sloping roofs typically found on commercial, industrial, and office buildings) or the steep-sloped roofs used in many residences and retail buildings.

Cool pavement is built from materials that reflect more solar energy, enhance water evaporation, or have been otherwise modified to remain cooler than conventional pavements. This pavement can be created with existing paving technologies as well as newer approaches such as the use of coatings, permeable paving, or grass paving. Cool pavements save energy by lowering the outside air temperature, allowing air conditioners to cool buildings with less energy, and reducing the need for electric street lighting at night.

Actions

- ☐ Pass an ordinance requiring or incentivizing enhanced cool roofs
- ☐ Pass an ordinance requiring or incentivizing cool pavements

Assumptions

- ☐ Participation rates are extrapolated from research on existing programs and studies, and range from 10% to 50%, and 30% to 100% on energy savings
- ☐ Assumes 20% energy reduction by replacing traditional roofs and pavements with light-reflecting materials

Municipal Reduction Measures

This section provides a detailed overview of the calculations and assumptions used to quantify GHG emissions reductions for each of the municipal GHG reduction measures. The following information is provided for each measure.

- **Measure Description:** Describes the background and general information for each measure.
- **Action(s):** Details actions for the City to choose from to implement the measure and achieve the goal.
- **Assumptions:** Includes all assumptions used in calculating emissions reductions.

Each measure is classified as either a *quantifiable* measure or a *supporting* measure. Quantifiable measures have unit savings that build upon consumption data, energy intensity of water sources, rates of

reduction, etc. The GHG reduction for each quantifiable measure is calculated by multiplying the unit savings, number of units, and emission factors. Supporting measures are presented as best management practices; however, their effects on quantifiable measures were not established.

The rate of increase in annual reduction is calculated by dividing the reduction in 2020 by the number of years between the last inventory year (2012) and the year of 2020, which is seven years for this plan. Assuming that the same rate of increase in annual reduction will be implemented between 2020 and 2035, the annual reduction in 2035 is calculated by multiplying the annual increase of reductions by fifteen years and adding this to the 2020 reduction amount.

Goal 1: Participate in Education, Outreach, and Planning Efforts for Energy Efficiency

MEASURE 1.1: INCREASE ENERGY SAVINGS THROUGH THE SCE ENERGY LEADER PARTNERSHIP

Measure Description

The Southern California Edison (SCE) Energy Leader Partnership (ELP) Program is a framework that offers enhanced rebates and incentives to cities that achieve measurable energy savings, reduce peak-time electricity demand, and plan for energy efficiency. This program also provides resources to cities to identify energy efficiency projects and technical assistance to implement them. The ELP has a tiered incentive structure with threshold criteria required to trigger advancement to the next level of participation.

Actions

- ☐ Participate in the SCE ELP and pursue energy efficiency projects which help the City advance within the tiered incentive structure.

Assumptions

- ☐ This is a supporting measure without enhancing metrics or data to support GHG and energy reduction quantification.

Goal 2: Increase Energy Efficiency in Municipal Buildings

MEASURE 2.1: CONDUCT MUNICIPAL BUILDING ENERGY AUDIT

Measure Description

Knowledge of building energy use is an effective way to determine energy inefficiencies and opportunities for retrofits and upgrades. Energy audits are a comprehensive review of both energy use and key components of the building. Energy audits provide an improved understanding of energy use, reveal energy inefficiencies of the building or building energy appliances, and offer recommendations on how to improve or correct the energy inefficiencies through retrofits or upgrades.

Actions

- ☐ Conduct annual reviews of energy use for each building to see trends and determine if energy efficiency retrofits are effective.
- ☐ Conduct municipal energy audits on a routine basis of every 3 to 5 years.

Assumptions

- ☐ This is a supporting measure without enhancing metrics or data to support GHG and energy reduction quantification.

MEASURE 2.2: REQUIRE GREEN BUILDING CERTIFICATION**Measure Description**

LEED—Leadership in Energy & Environmental Design—is a rating system for buildings, homes, and communities developed by the U.S. Green Building Council (USGBC). Under this measure, the City could improve energy efficiency by requiring LEED certification, or certification through another green building rating system, for its municipal buildings.

Actions

- ☐ Identify existing buildings planned for retrofit.
- ☐ Determine the level of LEED certification to be achieved.

Assumptions

- ☐ Upgrading an existing building with energy efficiency upgrades to meet LEED Silver certification can achieve up to 40 percent in energy savings.

MEASURE 2.3: IMPLEMENT WATER LEAK DETECTION PROGRAM**Measure Description**

Losing water from unrepaired leaks and operating at unnecessarily high-pressure results in wasted water, energy, and GHGs. The City can avoid this waste by conducting annual water audits to detect and repair leaks, developing a pressure management strategy, and devising a long-term water loss control plan.

Actions

- ☐ Conduct annual water audits to fix leaks.
- ☐ Develop a pressure management strategy.
- ☐ Devise a long-term water loss control plan.

Assumptions

- ☐ The average energy intensity (kWh/acre foot (AF)) of the water supply is projected to decrease as less water is imported.
- ☐ From 2015 to 2035, the average energy intensities of water supplied by the West Basin Municipal Water District (WBMWD) are: 2,111 kWh/AF in 2015; 2,087 kWh/AF in 2020; and 2,045 kWh/AF in 2035.

MEASURE 2.4: PARTICIPATE IN DEMAND RESPONSE PROGRAMS**Measure Description**

Electricity is supplied to buildings immediately upon demand. During hours of peak demand, such as the late afternoon, the electricity grid is often put under stress to supply the increased demand. Demand

Response Programs offer incentives (e.g. discounted rates and bill credits) to electricity consumers to reduce their energy demand, or shift their demand to off-peak hours, in response to grid stress.

Actions

- ☐ Participate in Demand Response Programs.

Assumptions

- ☐ This is a supporting measure without enhancing metrics or data to support GHG and energy reduction quantification.

MEASURE 2.5: PARTICIPATE IN DIRECT INSTALL PROGRAM

Measure Description

SCE offers a Direct Install Program to reduce energy costs and save money. The program is funded by the utility ratepayers and includes a free assessment of the building by a contractor and installation of free energy-efficient replacement equipment. Examples of the energy-efficient equipment include fluorescent lighting, LED signs, window film, and programmable thermostats.

Actions

- ☐ Participate in Direct Install Program.

Assumptions

- ☐ Energy and cost savings data were provided by SBCCOG.

MEASURE 2.6: ADOPT A PROCUREMENT POLICY FOR EE EQUIPMENT

Measure Description

By adopting a procurement policy for energy efficient equipment, the City would replace equipment as it wears out with Energy Star or energy efficient equipment. Energy Star offers an appliance calculator on its website to estimate money and energy saved by purchasing its products.

Actions

- ☐ Adopt a procurement policy for energy efficient equipment.
- ☐ Replace municipal equipment with Energy Star or energy efficient equipment.

Assumptions

- ☐ Energy efficient procurement policies can reduce government facility energy costs by about 5 to 10 percent.

MEASURE 2.7: INSTALL COOL ROOFS

Measure Description

Surfaces with low albedo, or solar reflectance, amplify urban heat island effect. Many surfaces in an urban environment consist of building roofs. Roofs affect not only the temperature of the surrounding urban environment, but also the interior temperature of the attached building below. Upgrading roofs to materials with high albedo can reduce outdoor and indoor temperatures, thereby also reducing demand on energy for air conditioning.

Actions

- ☐ Install cool roofs on existing and proposed municipal buildings.

Assumptions

- ☐ Approximately 10 MT CO₂e can be reduced for every 1,000 sq. ft. of dark roof replaced with cool roof materials.

MEASURE 2.8: REQUIRE NEW OR RETROFITTED BUILDINGS TO EXCEED TITLE 24**Measure Description**

California's current energy efficiency standards for buildings, called the 2013 Title 24 Standards, became effective July 1, 2014 and include significant changes to energy efficiency requirements in new development. Title 24 Standards are scheduled for updates and improvements every three years with the ultimate goal of zero net energy commercial buildings by 2030. Because of the update schedule, rulemaking process, and applicability dates, it is possible to implement proposed or adopted energy efficiency mandates before they are legally required. The City can implement early adoption of the energy efficiency mandates by requiring all new municipal buildings to exceed Title 24 by a specific amount, such as a percentage of energy savings above the requirement.

Actions

- ☐ Require new or retrofitted buildings to exceed Title 24.
- ☐ Establish a percentage of energy savings above Title 24 requirements.

Assumptions

- ☐ Based on the percentage of energy savings above Title 24 as selected by the City.

MEASURE 2.9: INCREASE RECYCLED WATER USE**Measure Description**

The West Basin Municipal Water District (WBMWD) uses its Edward C. Little Water Recycling Facility to provide its cities with recycled water. One of its five types of "designer" or custom-made recycled water includes Tertiary Water (Title 22), used for irrigation.

Actions

- ☐ Work with the WBMWD to use its existing infrastructure to pipe recycled water through the City.
- ☐ Use recycled water to irrigate City-owned landscapes.

Assumptions

- ☐ Approximately 1,873 kWh can be saved for every acre foot (AF) of water use replaced by recycled water.

MEASURE 2.10: RETROFIT HVAC EQUIPMENT & WATER PUMPS**Measure Description**

Project which retrofit heating, ventilation, and air conditioning (HVAC) and/or water pump equipment at municipal facilities can qualify for incentives through the SCE ELP (Measure 1.1). By replacing aging

equipment with newer, more efficient equipment, the City will reduce energy consumption and associated GHG emissions.

Actions

- ☐ Replace HVAC and/or water pump equipment with more energy efficient equipment.

Assumptions

- ☐ HVAC units account for approximately 32% of a (commercial) building's energy use, and newer, higher efficiency units are approximately 47% more efficient than older models.

MEASURE 2.11: TRACK ADDITIONAL ENERGY SAVINGS

Measure Description

This measure allows for the City to take advantage of additional energy efficiency opportunities as they arise. The various additional energy efficiency opportunities need to be documented in SBCCOG's Project Tracker database in order to keep the database current and allow the City to determine the effectiveness of the energy savings.

Actions

- ☐ Continually monitor building performance and identify cost-effective actions to reduce energy use.
- ☐ Document energy savings in SBCCOG's Project Tracker database.

Assumptions

- ☐ Energy and cost savings data were provided by SBCCOG.

MEASURE 2.12: UTILIZE AN ENERGY MANAGEMENT SYSTEM

Measure Description

Detailed information about facility energy consumption, including hourly energy profiles and energy consumption of individual building systems, can be monitored on a regular basis through an energy management system. This tool allows City staff to observe "real-time" energy consumption and analyzes building energy consumption trends using utility bill information. Using this tool, the long-term impacts of efficiency projects can be monitored.

Actions

- ☐ Utilize an energy management system.

Assumptions

- ☐ This is a supporting measure without enhancing metrics or data to support GHG and energy reduction quantification.

Goal 3: Increase Energy Efficiency in City Infrastructure

MEASURE 3.1: RETROFIT TRAFFIC SIGNALS AND OUTDOOR LIGHTING

Measure Description

Since 2001, SCE has offered its municipalities rebates on LED Traffic Signal Lamps. The program is part of a statewide effort to conserve energy and promote energy efficiency. Retrofitting a standard incandescent traffic signal with LED lamps using the SCE rebate can result in a payback of less than one year. Other outdoor lights (e.g. streetlights, park lighting, etc.) can also be retrofitted.

Actions

- ☐ Retrofit traffic signals and outdoor lighting with LED technology.

Assumptions

- ☐ Energy and cost savings data were provided by SBCCOG.

MEASURE 3.2: UPGRADE OR INCORPORATE WATER-CONSERVING LANDSCAPE

Measure Description

The City can reduce water consumption and associated energy use by converting traditional landscaping to water conserving landscaping. The City can participate in SoCal WaterSmart's Public Agency Landscape (PAL) program to receive a no-cost landscape irrigation audit and incentives to replace older landscape equipment with new, water-efficient models.

Actions

- ☐ Convert traditional landscaping to water conserving landscaping.

Assumptions

- ☐ Approximately 2,282 kWh can be saved annually for every acre of landscaping converted to water conservation landscaping.

MEASURE 3.3: PLANT TREES FOR SHADE AND CARBON SEQUESTRATION

Measure Description

Trees and vegetation naturally help cool an environment by providing shade and evapotranspiration (the movement of water from the soil and plants to the air) and reduce GHG emissions by sequestering carbon dioxide (CO₂). Trees planted near pavement can reduce surface temperatures of streets and parking lots, and trees planted strategically near windows or roofs of buildings can effectively reduce interior temperatures. The City could plant trees in City-owned spaces to reduce urban heat island effect and building energy use and increase carbon sequestration.

Actions

- ☐ Plant new (as opposed to replacement) trees annually.

Assumptions

- ☐ The average mature tree can save an average of 170 kWh and absorb as much as 48 lbs. of CO₂ per year.

Goal 4: Reduce Energy Consumption in the Long Term

MEASURE 4.1: DEVELOP AN ENERGY REINVESTMENT FUND

Measure Description

An Energy Reinvestment Fund can be created with a portion of the documented savings achieved through these energy efficiency strategies. These funds are then reinvested in future energy efficiency improvements, thereby providing a means for leveraging greater and greater energy savings.

Actions

- ☐ Develop an energy reinvestment fund to reinvest cost savings from energy efficiency projects into future energy efficiency improvements.

Assumptions

- ☐ This is a supporting measure without enhancing metrics or data to support GHG and energy reduction quantification.

MEASURE 4.2: PURCHASE CARBON OFFSETS

Measure Description

In 2015, the City of Hermosa Beach set a goal of municipal carbon neutrality by 2020. In order to achieve this goal, the City of Hermosa Beach will need to purchase carbon offsets to balance the remaining energy related emissions in 2020 and 2035.

Actions

- ☐ Purchase carbon offsets to achieve municipal carbon neutrality.

Assumptions

- ☐ Amount of carbon offsets needed to be purchased is determined by the remaining energy related emissions in 2020 and 2035 after local reduction measures have been implemented.

Appendix C: Land Use and Transportation Measures and Methodology

South Bay Cities Climate Action Plans
December 2017

Appendix C. Land Use and Transportation (LUT) Measures and Methodology - November 2017

Introduction

Transportation emissions can account for 50% or more of total emissions for a city or a region.¹ Reductions in greenhouse gas (GHG) emissions will require significant changes to how people travel. The following list of land use and transportation (LUT) emission-reduction strategies has been developed and compiled through city input, review of existing climate action plans (CAPs), and through previous work by the South Bay Cities Council of Governments in developing strategies tailored to suburban communities called: Sustainable South Bay Strategies (SSBS).

The GHG reduction potential for each LUT strategy has been developed by Fehr and Peers using methodologies from a handbook published by the California Air Pollution Control Officers Association (CAPCOA)² and other sources. LUT strategies are organized into 9 broad categories each with implementable sub-strategies. At the end of each category section, a table is presented listing the actions cities can take to implement the strategies and the action's respective GHG reduction potential along with a source for the emission reduction.

Strategy Categories:

- A. Accelerate the market for electric vehicles
- B. Encourage ride-sharing (ride-hailing, ride-sharing, car-sharing, bike-sharing)
- C. Encourage transit usage
- D. Adopt active transportation initiatives
- E. Implement parking strategies
- F. Organizational strategies
- G. Land use strategies
- H. Digital technology strategies

A. Accelerate the market for Electric Vehicles EVs (PHEV, BEV, or NEV)

Gasoline-fueled vehicles have been the primary source of household mobility for decades. The most direct way to reduce carbon emissions will be for households to replace their gasoline-fueled vehicles with electric vehicles (EVs) as EVs can emit up to 80% less CO₂.³ The EV market has several segments – plug-in hybrid electric vehicles (PHEV), full-battery electric vehicles (BEV) and neighborhood electric vehicles (NEV).

Cities can incentivize EV vehicle purchases and usage by facilitating the convenience of owning an EV through offering free or reduced parking and charging stations within public facilities such as parking lots and civic centers. Cities can also encourage the private sector to provide charging infrastructure. Educating the public about EV ownership and connecting the public to resources is an instrumental role cities can assume.

The NEV is a specialized vehicle, similar in looks to a golf cart, for short range travel at speeds of 25 MPH or less and has greater limitations than a full-battery electric vehicle. They provide benefits over full-battery electric vehicles because they are cheaper to purchase and maintain and smaller (convenient to park and charge). NEVs also represent a growing class of short-range, slow-speed, less expensive personal mobility options that include electric skateboards, e-bikes, Segways and so forth. Since NEVs are limited to slower speed streets, their usability is restricted to local

¹ For example, in the South Bay transportation emissions account for 57% of total emissions in Lawndale and on the lower end, 18% in Carson

² "Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Governments to Assess Emission Reductions from Greenhouse Gas Mitigation Measures (2010)."

³ https://www.afdc.energy.gov/vehicles/electric_emissions.php

streets. Cities can aid the NEV market by providing “complete” streets amenable to all modes including short-range, slow speed vehicles and bicycles which could be 12 to 15 different zero-emissions personal mobility vehicles as well as bicycles.

A1 EV Parking Policies

EV parking policies include changing current parking policies as well as creating incentives in future parking agreements. Regulatory policy changes include granting new and existing businesses lower parking minimums in exchange for EV preferential parking, especially NEVs and other slow-speed vehicles, as smaller parking dimensions can also lead to more efficient use of space and smaller parking areas.

A2 EV Charging Policies

EV charging policies incentivize the use of such vehicles by making it easier to charge EVs. These opportunities range from on- the-ground implementation of charging stations to adopting development standards that enable EV charging. Charging stations can be level 1, 2, or DC 3. Level 1 is a household 120-volt Outlet; it is the slowest method of charging. Level 2 is a 240-volt outlet; it is approximately twice as fast to charge versus a Level 1 EV charger. A DC 3 or "Fast Charger" provides 480 volts and is designed to recharge an EV up to 80% of capacity in approximately 20 minutes.

A3 EV Administrative Readiness

Administrative readiness refers to what cities can do within city hall to incentivize EV adoption. Actions span from expediting inspection times for the installation of EV charging to streamlining panel upgrades.

A4 Public information programs

EV Public information programs aim to promote EV usage and adoption by educating the public. These programs usually take the form of an advertisement or marketing campaign through social media, or providing information directly to the public through municipal offices, community centers, businesses, events, and online platforms.

A5 Multi-modal complete streets

Strategies for multi-modal streets provide infrastructure that supports the safe integration of EVs and other alternative, zero-emission slower transportation options on city streets. Slow speed networks are designed to accommodate Neighborhood Electric Vehicles that travel at speeds of 25 miles per hour or less, either by accommodating them on high-speed streets or integrating them with other slow-speed infrastructure such as protected bike lanes.

For reference, Portland and Berkeley have developed useful guidance documents:

[City of Portland – EV Strategy](#)

[City of Berkeley EV policies](#)

For examples of multimodal NEV plans see:

Coachella Valley: [The Coachella Valley Association of Governments NEV Plan](#)

City of Lincoln: [NEV Transportation Plan](#)

EV City Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
A1 EV Parking Policies		
Offer free parking to EVs	2.75	Fehr & Peers
Offer reduced-price parking	1.38	Fehr & Peers
Lower parking minimums for developments providing EV parking	12.5	CAPCOA
A2 EV Charging Policies		
Install level 1, 2, and DC 3 charging in city-owned parking lots	3.25%	SB 375 Policy Brief
Install charging at city-owned facilities	3.25%	SB 375 Policy Brief
Provide on-street level 1 and 2 charging	6.5%	SB 375 Policy Brief
Adopt charging standards beyond CalGreen 2016 requirements	1.3%	SB 375 Policy Brief
Create policies that encourage facility owners to provide level 1 charging	No Reduction Calculated	
Cooperate with regional agencies to expand charging networks	No Reduction Calculated	
A3 EV Administrative Readiness		
Reduce costs of electric permits for service upgrades	No Reduction Calculated	
Offer on-line permitting to streamline the application process	No Reduction Calculated	
Minimize time to complete inspection	No Reduction Calculated	
Offer inspection within 24 hours of request	No Reduction Calculated	
Streamline electrical panel upgrade	No Reduction Calculated	
A4 Public Information Programs		
Publicize EV programs through a variety of media	No Reduction Calculated	
A5 Multi-modal Complete Streets		
Publicize city charging and parking policies	No Reduction Calculated	
Implement “off-ramps” to connect NEV backbone to local activity centers	6.35%	CAPCOA
Implement South Bay slow speed backbone network plan	12.7%	CAPCOA
Provide signage, maps, and information for slow speed vehicles	No Reduction Calculated	

B. Encourage Ride-Sharing (ride-hailing, ride-sharing, car-sharing, bike-sharing)

Ride-hailing refers to single-ride taxi services provided by traditional taxi companies and new businesses such as Uber and Lyft. Ride-sharing refers to carpool services provided by Uber and Lyft such as LyftLine and uberPOOL. Via is a new carpool service in New York which offers carpool rides on fixed-routes through SUVs. Car and bike-sharing refers to shared rentals such as Car2Go, Zipcar and city bike-share programs. Both ride-hailing and the various ride-sharing services have the potential to reduce the number of vehicles owned by families, make trips more efficient by carrying more people per ride and provide a safety net for a household that chooses to rely on one or more short range vehicles.

Cities can facilitate ride-hailing and ride-sharing by providing drop off and pickup sites for these vehicles, aiding vendors in securing funds and considering service interoperability and the optimum customer experience for residents. In terms of bike-sharing, cities can create programs or extend existing ones.

Private and Public Mobility Services City Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
B1 Facilitate private and public mobility services (ride-hailing, ride-sharing, car-sharing, bike-sharing)		
Facilitate private mobility services	No Reduction Calculated	
Facilitate Bike-sharing	< 1%	Fishman, Elliot, Washington, Simon, & Haworth, Narelle (2014) Bike share's impact on car use: evidence from the United States, Great Britain, and Australia. Transportation Research Part D: Transport and Environment, 31, pp, 13-20
Facilitate Car-sharing	1%	Within the table (Millard-Ball, 2005 and (Cambridge Systematics, 2009)
Facilitate Ride-hailing and Ride-sharing	No Reduction Calculated	
Remove barriers to private sector bike and car-sharing	No Reduction Calculated	
Assist private sector organizations to secure funding	No Reduction Calculated	
Conduct a ride/bike sharing study or plan	No Reduction Calculated	

C. Encourage transit usage

Increasing transit service, frequency and speed incentivizes transit usage and offers individuals with more mobility options. Transit can shrink the number of vehicles needed for commuting, resulting in lower CO2 emissions.

C1 Provide a Bus Rapid Transit System

This strategy encourages the provision of Bus Rapid Transit (BRT) systems. Typical characteristics of a BRT system include frequent high-capacity service, modal integration, and high-quality vehicles that are quiet, clean, and easy to board.

C2 Expand Transit Network

This strategy focuses on expanding the local transit network by adding or modifying existing transit service through adding and expanding routes, providing local shuttles or other connectors, as well as first/last mile connections.

C3 Increase Transit Service Frequency and Speed

This strategy will reduce transit-passenger travel time through increasing frequency of service, speed, and reliability. Increasing transit frequency has been shown to increase the appeal and use of transit.

Transit City Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
C1 Provide a Bus Rapid Transit System		
Provide a Bus Rapid Transit System	3.3%	CAPCOA
Work with Transit Agency to implement a Bus Rapid Transit System	No Reduction Calculated	
Work with Transit Agency to add additional bus rapid transit routes	No Reduction Calculated	
Collaborate with neighboring cities/SBCCOG on regional transit	No Reduction Calculated	
C2 Expand Transit Network		
Expand Transit Network	8.5%	CAPCOA
Work with Transit Agency to expand bus or rail transit network	No Reduction Calculated	
Work with Transit Agency to improve transit connectivity	No Reduction Calculated	
Collaborate with a range of agencies to expand funding for transit	No Reduction Calculated	
Work with Transit Agency to improve transit amenities	No Reduction Calculated	
Work with Transit Agency to better accommodate bicycles	No Reduction Calculated	
Prioritize funding around transit to encourage walking and biking	No Reduction Calculated	
Implement first/last mile improvements at stations/destinations	1%	CAPCOA
Introduce a fixed-route transit service in the jurisdiction	2.1%	CAPCOA
Provide/expand local shuttle services	2.1%	CAPCOA
Explore programs to offer discounted transit passes	No Reduction Calculated	
Fund transit services for the elderly and handicap	No Reduction Calculated	
C3 Increase Transit Service Frequency and Speed		
Increase transit frequency and speed	2.6%	CAPCOA
Work with Transit Agency to increase service frequency and speed	No Reduction Calculated	
Provide transit buses with signal prioritization devices	1.3%	CAPCOA

D. Adopt active transportation initiatives

Active transportation initiatives are components of slow speed multi-modalism. The land use strategies of the SSBS specifically support more walking and cycles of all sorts (mono-, bi-, tri- and quad-cycles).

D1 Provide Traffic Calming Measures

Traffic calming measures create streets that are friendly to users of alternative mobility options, such as bicyclists, pedestrians and those using public transit or ridesharing. These strategies include the design of roadways to reduce motor vehicle speeds and encouraging pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.

D2 Provide Pedestrian/Bicycle Network Improvements

These strategies include creating and enhancing pedestrian or bike networks that internally link all uses and connects pedestrians and cyclists to all streets and facilities. The city can also minimize barriers to pedestrian and/or bike access and interconnectivity and incorporate bike lanes, bike parking and other bike facilities.

D3 Improve Design of Development

These strategies require design elements to enhance walkability and connectivity within new or proposed developments.

Active Transportation Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
D1 Provide Traffic Calming Measures		
Conduct pedestrian/bicycle study	No Reduction Calculated	
Use traffic calming measures on a minimum of 25% streets	1%	CAPCOA
Implement traffic calming measures in existing and future developments	No Reduction Calculated	
Promote traffic calming methods such as landscaped medians and traffic circles	No Reduction Calculated	
D2 Provide Pedestrian/Bicycle Networks		
Provide pedestrian/bicycle networks	2%	CAPCOA
D3 Improve Design of Development		
Improve Design of Development for pedestrian/bike access	21.3%	
Amend the Bicycle or Pedestrian Master Plan	No Reduction Calculated	
Require Bicycle parking through Zoning Code or other implementation documents	Within: Improve Design of Development: 0.48%	CAPCOA
Require new developments to provide pedestrian, bicycle, and transit amenities	Within: Improve Design of Development: 0.72%	CAPCOA
Amend zoning ordinance to require shower facilities and dressing areas for new developments	Within: Improve Design of Development: 0.64%	CAPCOA
Require commercial and multi-family residential projects to provide permanent bicycle parking facilities	Within: Improve Design of Development: 0.80%	CAPCOA
Provide short and long-term bicycle parking near key areas	Within: Improve Design of Development: 0.56%	CAPCOA
Develop Class I or Class IV bike facilities on streets with greater than 7,000 average daily trips or average speeds over 30mph	Within: Improve Design of Development: 1.04%	CAPCOA
Develop appropriate bicycle infrastructure for high traffic intersections and corridors	Within: Improve Design of Development: 0.96%	CAPCOA
Develop appropriate infrastructure within pedestrian sheds (defined area for walking i.e approximately a 5-minute walk) of key areas	Within: Improve Design of Development: 0.16%	CAPCOA
Retrofit bicycle racks and parking facilities in underserved areas	Within: Improve Design of Development: 0.40%	CAPCOA
Create bicycle lanes, routes, and shared-use paths into street systems, subdivisions, and large developments	Within: Improve Design of Development: 0.88%	CAPCOA
Improve active transportation networks (identify gaps/deficiencies and implement projects to address them)	Within: Improve Design of Development: 0.24%	CAPCOA

Construct or improve pedestrian infrastructure around transit	Within: Improve Design of Development: 0.80%	CAPCOA
Develop active transportation networks for Transit-Oriented District station area plans	Within: Improve Design of Development: 0.08%	CAPCOA
Implement policies to minimize conflicts between pedestrian and motorists. Identify pedestrian collision hot spots.	Within: Improve Design of Development: 0.32%	CAPCOA

E. Parking Strategies

Parking strategies are one of the most effective ways to reduce or modify vehicle trips. Parking strategies also can affect the number of vehicles owned per household in combination with other mobility service choices.

E1 Limit Parking Supply

This strategy reduces parking supply through the creation of parking maximums, minimums, and parking benefit districts.

E2 Unbundle Parking Costs from Property Cost

Unbundling separates parking from property costs, allowing individual who wish to purchase parking spaces to do so and those that don't, to save money. Parking can be priced separately from home rents/purchase prices or office leases. This measure can help reduce the number of vehicles per household.

E3 Implement On-street Market Price Parking

Excessive GHG emissions are created when cruising for parking spaces. Pricing on-street parking to reflect a market rate reduces emissions related to excessive driving for seeking a parking space and encourages the use of alternative modes and carpooling.

E4 Require Residential Area Parking Permits

Permits reduce the impact of spillover parking in residential areas adjacent to commercial areas, transit stations, or other locations where parking may be limited and/or priced.

Parking Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
E1 Limit Parking Supply		
Create parking benefit districts which invest meter revenue in other public amenities	No Reduction Calculated	
Reduce/eliminate parking minimums for new developments	12.5%	CAPCOA
Reduce/eliminate parking minimums for mixed-use, pedestrian, and transit-oriented development	Within E1.02: 9.4%	CAPCOA
Implement parking pricing to a downtown area	Within E1.02: 6.3%	CAPCOA
Institute parking pricing at peak-times	Within E1.03: 6.3%	CAPCOA
E2 Unbundle Parking Costs from Property Costs		
Unbundle parking costs from property costs	13%	CAPCOA
Adopt a comprehensive parking policy to unbundle the true costs of providing parking	No Reduction Calculated	CAPCOA
Encourage developers of new development to unbundle parking and eliminate the assignment of specific stalls	No Reduction Calculated	
E3 Implement On-street Market Pricing		

Implement on-street parking pricing	5.5%	CAPCOA
Change policies to disincentive parking within downtown	Within E3.00: 1.4%	CAPCOA
E4 Require residential area parking permits		
Institute residential parking programs	No Reduction Calculated	
Institute residential permit parking	0.24%	CAPCOA

F. Organizational strategies

Cities and other organizations within a city can implement telecommuting and alternative work schedule policies to reduce the VMT generated by employees. They can also expand and facilitate commute programs such as vanpools and carpooling to reduce employee-generated VMT. Many jobs within cities are in the private sectors and cities can implement telecommuting policies and ordinances to reduce commuting-related VMT.

F1 Encourage Telecommuting and Alternative Work Schedules

Alternative work schedules take the form of staggered starting times, flexible schedules, or compressed work weeks. Another option to working at home (or telecommuting) is to implement alternative workplace programs. Some organizations may prefer their employees work in an office closer to the home. Cities can offer workplace programs at neighborhood centers, available space in government offices, public shared-work facilities, or commercial executive suites.

F2 Implement Commute Trip Reduction Program – Required or Voluntary

This measure establishes a Commute Trip Reduction (CTR) Ordinance.

F3 Provide Car-Sharing Programs

Car-sharing programs can be promoted through designating a certain percentage of parking spaces for car sharing vehicles, designating adequate passenger loading and unloading and waiting areas for car-sharing vehicles, and providing a web site or message board for coordination.

Organizational Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
F1 Encourage Telecommuting and Alternative Work Schedules		
Encourage municipal telecommuting and alternative work schedules (voluntary)	2.8% of work VMT	CAPCOA
Enforce municipal telecommuting and alternative work schedules (mandatory)	5.5% of work VMT	CAPCOA
Encourage local employers to implement telecommuting and alternative work schedules	No Reduction Calculated	CAPCOA
F2 Implement a Commute Trip Reduction Program		
Establish a commute trip reduction marketing campaign	4% of work VMT	CAPCOA
Work with local employers encouraging subsidized or discounted transit programs	20% of work VMT	CAPCOA
Work with local employers to increase carpooling	No Reduction Calculated	CAPCOA
Encourage employers to provide vanpools or shuttles from major stations	10.7% of work VMT	CAPCOA

Establish a program to require employer-paid transit passes for new developments	No Reduction Calculated	
Implement a (voluntary) commute trip reduction program	6.2% of work VMT	CAPCOA
Implement a (mandatory) commute trip reduction program	21% of work VMT	CAPCOA
Implement an employee education program	No Reduction Calculated	CAPCOA
F3 Provide Car-sharing Programs		
Implement a car-sharing program	No Reduction Calculated	

G. Land use strategies

Land Use strategies for changing the built environment have the potential to eliminate trips or reduce trip length. This is the principle underlying the legislation Senate Bill 375, which sets carbon emissions targets for regions that can be met only through land use changes in each region's cities and counties.

The development pattern that the state has targeted for change is the "automobile suburb." Auto suburbs grew substantially in the immediate post-war period and their resulting land use pattern is optimized for high levels of personal vehicle use. There are essentially 2 alternatives to the auto suburban development pattern: Transit Oriented Development (TOD) and Neighborhood Oriented Development (NOD).

TOD is a strategy that has been growing in popularity within the planning profession and the development community over the last 30 years or so. TOD addresses the inefficiencies of the auto suburb strategy essentially by urbanizing the suburbs with increased housing density and mixed-use around public transit (preferably fixed rail). Theoretically this will decrease auto usage by replacing some trips with walking and transit. TOD, as its name implies, requires some form of high quality public transit to be most effective.

Transit Oriented Development (TOD)

G1 Increase Density

Design projects with increased densities, where allowed by the General Plan and/or Zoning Ordinance. Density is usually measured in terms of persons, jobs, or dwellings per unit area.

G2 Increase Diversity

These strategies encourage projects to mix uses such as office, commercial, institutional, and residential within the same development. Residential units should be within ¼-mile of parks, schools, or other civic uses. Suburban projects should have at least three of the following on site and/or offsite within ¼-mile: residential development, retail development, park, open space, or office.

G3 Increase Destination Accessibility

These strategies encourage projects to be located in areas with high accessibility to destinations. Destination accessibility is measured in terms of distance to downtowns reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones.

G4 Increase Transit Accessibility

These measures focus on projects that have a transit station/stop with high-quality, high-frequency bus service and/or a rail station located within a five- to ten-minute walk (or roughly ¼ mile from stop to edge of development),.

G5 Integrate Affordable and Below Market Rate Housing

These strategies allow the city to accommodate below market rate housing for infill and transit-oriented sites within a given building footprint and height limit. Residential development projects of five or more dwelling units will provide

a deed-restricted low-income housing component on-site. This reduces the amount of vehicle travel into the city by service employees who may not otherwise be able to afford living nearby.

Neighborhood Oriented Development (NOD)

NOD is a new strategy based on research conducted by the South Bay Cities Council of Governments for the South Bay. NOD addresses the inefficiencies of the auto suburb by re-locating as many destinations as possible as close as possible to each residential neighborhood so that destinations are in walking distance of most households. The clusters would be at regular intervals so that each household can access multiple centers within a few miles.

This should increase walking, cycling, and use of mobility services and local use vehicles to cover the short distances to final destinations. Public transit plays a minor supporting role. The findings are supported by the research that the SBCCOG and others have conducted.

Center development is complemented by gradual re-development of commercial strip arterials, characteristic of auto suburbs, to residential. Housing at densities as low as the market will allow should replace the low density, mid-century commercial buildings.

G6 **Integrate NOD planning principles**

This strategy focuses on the implementation of a Neighborhood Oriented Development (NOD) plan which includes amending the zoning code or general plan to increase business densities and create maximums for business size. Plans would include designations of NOD centers.

For a more in-depth review of the NOD concept and strategies and guide on how to implement please see the South Bay Subregional Climate Action Plan.

Land Use Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
G1 Increase Density		
Increase density	30%	CAPCOA
Encourage higher density through general plan	No Reduction Calculated	
Encourage higher density through zoning code	No Reduction Calculated	
Increase housing density near transit	Within G1.00: 15%	CAPCOA
G2 Increase Diversity		
Increase Diversity	30%	CAPCOA
Update mixed-use policies in General Plan	No Reduction Calculated	
Encourage mixed-use policies through Zoning Code	No Reduction Calculated	
Encourage transitions from single-family to higher intensity mixed-uses	No Reduction Calculated	
Encourage mixed-use and infill development projects in key in-fill areas	No Reduction Calculated	
Revise development standards that act as barriers to mixed-use projects	No Reduction Calculated	

Conduct land use/market analysis to identify sites that that could support new or expanded neighborhood centers	No Reduction Calculated	
Encourage new mixed-use development near transit	No Reduction Calculated	
G3 Increase Destination Accessibility		
Increase destination accessibility	20%	CAPCOA
G Increase Transit Accessibility		
Increase transit accessibility	25.5%	CAPCOA
Encourage transit accessibility through general plan	No Reduction Calculated	
Encourage transit accessibility through zoning code	No Reduction Calculated	
Update travel demand ordinance	No Reduction Calculated	
Conduct a public transit gap study	No Reduction Calculated	
Provide a shuttle service connecting areas	Within G4: 2.1%	CAPCOA
Establish commuter shuttles linking business districts with transit	No Reduction Calculated	
G5 Integrate Affordable and Below Market Rate Housing		
Encourage policies that promote efficient land use	No Reduction Calculated	
Institute a below market rate housing ordinance	1.2%	CAPCOA
G6 Develop a NOD Plan		
Amend zoning code or general plan to encourage higher density and smaller scale Business Establishment Density	No Reduction Calculated	
Establish NOD centers in zoning code	No Reduction Calculated	
Support higher business establishment density within NOD centers	No Reduction Calculated	
Encourage business establishment mix that promote walking	No Reduction Calculated	

H. Digital technology strategies

A new concept that is unique to NOD is the development and deployment of digital technologies as a GHG emission reduction strategy. The central premise is that services provided by cities and those available at NODs will be delivered in part through digital technologies. Digital mediums lessen the need to travel to seek and deliver services. Providing infrastructure to support digital technology applications can be undertaken by cities and involves collaboration to construct a state-of-the-art broadband network infrastructure that will deliver network connectivity.

H1 Collaborate on and Implement the South Bay Cities Digital Master Plan

First two years, 2017 and 2018

- Collaborate with other South Bay cities to implement the master plan for the South Bay Net, an initiative being led by the SBWIB and the SBCCOG to create a connected broadband network throughout the South Bay.

- Implement e-government initiatives – where information and services are migrated from city hall or other physical facility to the Web. In many cases, this also enables opportunities for service co-production with constituents.
- Develop city-wide wide area networks to connect public facilities and other key buildings to each other, and to link with South Bay Net.

Two to five years, 2019 to 2021

Assuming the initiative is developed by the SBCCOG and/or the SBWIB and funding becomes available, develop the prototype “public technology suite” (detailed in the Implementation Guidelines) in at least one of the evolving neighborhood centers.

Digital Technology Strategies and GHG Emission Reductions

City Action	Maximum GHG Emission Reduction	Source
H1 Collaborate on and implement the South Bay Cities Digital Master Plan		
Implement the South Bay Digital Master Plan “South Bay Net”	No Reduction Calculated	
Develop a prototype Public Technology Suite in an evolving neighborhood center	No Reduction Calculated	
Implement e-government initiatives	No Reduction Calculated	
Develop city-wide area networks to connect public facilities and other key buildings with each other and the South Bay Net	No Reduction Calculated	

References:

- [1] Millard-Ball, Adam. “Car-Sharing: Where and How it Succeeds,” (2005) Transit Cooperative Research Program (108). P. 4-22
- [2] Cambridge Systematics (2009). Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions. Technical Appendices. Prepared for the Urban Land Institute. (p. B-52, Table D.3)

The three references at the end of the document should be in alphabetical order and referenced in the same style. The style used for Fishman is my preference.

Appendix D: Solid Waste Measures and Methodology

South Bay Cities Climate Action Plans
December 2017

Appendix D: Solid Waste (SW) Measures and Methodology

REFERENCE GUIDE - November 2017

This document is a reference guide for Solid Waste (SW) measures that municipal governments may include and implement in their climate action plans. The South Bay Cities Council of Governments (SBCCOG) worked with member cities to identify specific measures and associated calculations to reduce Green House Gas (GHG) emissions using the baseline year of 2005. Reductions were estimated for both community and municipal operations. The 2005 inventory is established as a starting point against which other inventories are compared and targets are set.

SOLID WASTE

The decomposition of solid waste in landfills releases methane into the atmosphere. Decreasing the amount of waste going to the landfills will help reduce the greenhouse gas emissions produced from this sector. Recycling, composting, and source reduction are necessary to divert solid waste from the landfills.

Recycling provides greenhouse gas reductions in three ways: 1) offsetting a portion of “upstream” greenhouse gas emitted in raw material acquisition, manufacture and transport of virgin inputs and materials; 2) increasing the amount of carbon stored in forests, when wood and paper products are recycled; and 3) reducing emissions associated with landfilling of waste. Since the scope of the member city inventories only include the emissions released from landfilled waste, only the third benefit can be included in the reductions for these strategies. (ICLEI, Recycling and Composting Protocol, 2013)

Composting provides greenhouse gas reductions by reducing emissions associated with landfilling the waste as well. Other benefits of composting include reducing water use and associated energy emissions, reducing chemical fertilizer use and associated production emissions, reducing soil erosion, and reducing herbicide use and production. (ICLEI, Recycling and Composting Protocol, 2013)

REDUCTION MEASURES

Goal SW A: Increase Diversion and Reduction of Residential Waste

Educating local communities about waste reduction is a key step for managing waste at the residential level. Better waste management practices lead to reduced energy consumption associated with waste removal and processing and associated GHG emissions.

Measure SW A 1: Education and Outreach to Residents

Providing education and outreach to residents about opportunities to divert their waste away from the landfill will greatly support the goal to increase diversion and reduction of waste. These strategies will increase awareness of solid waste programs, encourage and increase waste-reducing behaviors, and inspire participation in further environmental activities.

Actions:

- Educate residents of waste reduction and diversion – Provide information to residents about recycling, composting, and source reduction opportunities on website and in newsletters or flyers

- Offer a waste audit for residents – Train staff to conduct residential waste audits, post worksheets and guide online for do-it-yourself audits, or work with trash hauler company to create a waste audit program
- Educate to discourage single-use bag use – Create public education outreach program to encourage use of reusable bags when making purchases
- Educate schools about recycling and waste reductions – Work with schools and/or community groups to help develop and distribute educational materials related to recycling and waste reduction for use in the classroom

Measure SW A 2: Implement Residential Collection Programs to Increase Diversion of Waste

Implementing collection programs for residents will help divert waste from going to the landfill by increasing recycling, composting, and source reduction. These programs vary from changing the rates of services to collecting additional types of waste. (CAPCOA, 2010)

Actions:

- Implement a Pay-as-you-throw program – Provide economic incentive to decrease waste using the user-pay principle, such as increasing the rates for larger sized trash bins
- Implement a Food Scrap Diversion program for residents –Provide a food waste collection service for residents
- Implement collection of green waste for residents – Provide a green waste collection service for residents
- Implement a recyclables and food scrap collection at schools – Work with school districts and trash haulers to establish recyclables and food scrap collection programs at schools

Measure SW A 3: Increase Diversion of Residential Construction and Demolition Waste

Diverting construction and demolition waste from the landfill will reduce the amount of solid waste being sent to the landfills.

Actions:

- Require residential projects to exceed the CalGreen standard of C&D diversion – Adopt a C&D Waste Recycling Ordinance to require more C&D waste to be diverted from the landfill

Goal SW B: Increase Diversion and Reduction of Commercial Waste

Education and providing better waste management options and tools to the businesses can lead to reductions in GHG emissions associated with processing and disposing commercial wastes.

Measure SW B 1: Education and Outreach to Businesses

Providing education and outreach to businesses about opportunities to divert their waste away from the landfill can greatly support the goal to increase diversion and reduction of waste. These strategies help to increase awareness of solid waste programs, encourage and increase waste-reducing behaviors, and inspire participation in further environmental activities.

Actions:

- Educate businesses of waste reduction and diversion – Provide information to businesses about recycling, composting, and source reduction opportunities on the website, newsletters, or flyers
- Offer a waste audit for businesses – Train staff or volunteers to conduct commercial waste audits, post worksheets and guide online for do-it-yourself audits, or work with trash hauler company to create a waste audit program
- Offer recognition for green businesses – Implement a program that rewards or recognizes local businesses with waste reduction programs

Measure SW B 2: Implement Commercial Collection Programs to Increase Diversion of Waste

Implementing collection programs for businesses will help divert waste from going to the landfill by increasing recycling, composting, and source reduction. These programs vary from changing the rates of trash services to collecting additional types of waste. (CAPCOA, 2010)

Actions:

- Implement Pay-As-You-Throw program – Provide economic incentive to decrease waste using the user-pay principle, such as increasing the rates for larger sized trash bins
- Implement a Food Scrap Diversion program for businesses – Provide a food waste collection service for businesses. Note the State of California passed AB1826 in 2014 to require businesses to recycle their organic waste on and after April 1, 2016 depending on the amount of waste disposed.

Measure SW B 3: Increase Diversion of Commercial Construction and Demolition Waste

Diverting construction and demolition waste from the landfill can reduce the amount of solid waste being sent to the landfills. Recycling the wood from the C&D waste will result in a net reduction in GHG emissions because it is less carbon intensive to recycle the wood than sending it to the landfill to decompose. Recycling the wood also increases the amount of carbon stored in forests since recycling means less raw material needs to be acquired. (CAPCOA, 2010)

Actions:

- Require commercial projects to exceed the CalGreen standard of C&D diversion – Adopt a C&D Waste Recycling Ordinance to require more C&D waste to be diverted from the landfill

Measure SW B 4: Require Commercial Sector to Further Increase Diversion of Waste from Landfills

Setting additional requirements for the commercial waste sector can support further reductions in greenhouse gas emissions.

Actions:

- Consider distance of the designated material recovery facilities (MRFs) and recycling facilities – When awarding franchise contracts, take the distance of the facilities into consideration
- Ban plastic bags – Adopt an ordinance to eliminate plastic bags, which will decrease waste going to the landfill and may increase the use of reusable bags

- Require food waste and recycling at special events – CA law AB 2176 requires special events to develop solid waste management plans, so the municipality can require food waste collection and recycling to be included in these plans before approving permits

Goal SW C: Increase Diversion and Reduction of Overall Community Waste

To maximize the benefits of waste reduction, it is important for the community to work together. Comprehensive waste management practices at the community level will help further contribute towards the City's goals of achieving GHG reductions associated with solid waste.

Measure SW C 1: Set a Community Goal to Divert Waste from Landfills

Setting a goal to divert a specified percentage of waste can show the municipal's commitment to reducing the greenhouse gases emitted from the landfill.

Actions:

- Set a Zero Waste goal in a Zero Waste Strategic Plan or set a percentage goal of diverting waste from the landfill – Develop a comprehensive Zero Waste Plan to achieve 90% diversion of waste from landfills, including strategies to divert waste and tools to track progress; Develop a comprehensive Waste Plan to achieve X% diversion of waste from landfills, including strategies to divert waste and tools to track progress

Goal SW D: Reduce and Divert Municipal Waste

Increasing awareness through implementing education strategies are key to achieving waste reductions and diversion. Like residential and commercial sectors, the municipal sector can also benefit from implementing capacity building programs to educate employees about benefits and methods of waste reducing behaviors.

Measure SW D 1: Education and Programs for Municipal Employees/Facilities

Education to employees may increase awareness of solid waste programs, encourage waste-reducing behaviors, and inspire participation in further environmental activities. Some of these strategies are also very visible and will set an example for the community to follow. Reducing municipal waste will help the City lead by example and demonstrate to the community that the City is committed to diverting waste from landfills.

Actions:

- Implement a Recycle at Work program – Develop a program, Recycle at Work, to educate employees about the benefits of recycling and waste reduction in the work place
- Reduce paper in municipal facilities – Adopt a policy or implement as a best practice to encourage paper reduction through various activities such as: Reduce margins and logos on templates, letterheads, and memos; Upload bid documents using online resources instead of printing for contractors; Require fewer or smaller-sized copies of project plans; Use electronic devices for meetings; Require double sided printing when feasible
- Reuse materials at municipal facilities – Adopt policy or implement as a best practice to reuse, repair, or refurbish office furniture, equipment, and supplies at a cost savings compared to

purchasing new materials; If not cost saving, reuse or redistribute to community non-profit groups office items in order to divert from landfill

- Provide additional recycling in public places – Install additional recycling containers in public places such as parks and streets
- Adopt a Municipal Purchasing Policy – Create a purchasing policy or implement as a best practice for municipal facilities to reduce purchase of disposable items, and require environmentally preferable products to be purchased when possible and reasonable
- Demonstrate composting at a municipal facility – Compost at city facilities and possibly use the compost in environmentally friendly landscaping at facilities or community gardens

Measure SW D 2: Implement Municipal Collection Programs to Increase Diversion of Waste

Collecting food waste from municipal facilities will divert it from the landfills by increasing composting. The municipal food scrap collection program can be an example for the residential and commercial programs to follow.

Actions:

- Implement a Food Scrap Diversion program for municipal facilities – Provide a food waste collection service for municipal facilities

Measure SW D 3: Set a Municipal Goal to Divert Waste from Landfills

Setting a goal to divert a specified percentage of waste will show the City's commitment to reducing the greenhouse gases emitted from the landfill.

Actions:

- Set a Zero Waste goal in a Zero Waste Strategic Plan or set a percentage goal of diverting waste from the landfill for municipal operations – Develop a comprehensive Zero Waste Plan to achieve 90% diversion of municipal waste from landfills or a plan to achieve X% diversion of municipal waste from landfills, including strategies to divert waste and tools to track progress

Works Cited

CAPCOA. (2010). *Quantifying Greenhouse Gas Mitigation Measures*.

ICLEI. (2013). *Recycling and Composting Protocol*.

Appendix E: Urban Greening Measures and Methodology

South Bay Cities Climate Action Plans
December 2017

Appendix E: Urban Greening (UG) Measures and Methodology

REFERENCE GUIDE - November 2017

This document is a reference guide for Urban Greening (UG) measures that municipal governments may include and implement in their climate action plans. The South Bay Cities Council of Governments (SBCCOG) worked with member cities to identify specific measures and associated calculations to reduce Green House Gas (GHG) emissions using the baseline year of 2005. Reductions were estimated for both community and municipal operations. The 2005 inventory is established as a starting point against which other inventories are compared and targets are set.

URBAN GREENING

Urban greening includes spaces such as parks, forests, green roofs, local agriculture, street trees, and community gardens. These spaces are “carbon sinks” as they store greenhouse gas emissions that are otherwise emitted into the atmosphere. (Institute for Local Government, 2013) Other benefits include providing critical ecosystem services, promoting physical activities, and improving the psychological well-being of community residents as well as also may reduce vehicle miles traveled. (Wolch, Byrne, & Newell, 2014)

REDUCTION MEASURES

Goal UG A: Increase and Maintain Urban Greening in the Community

The expansion of green spaces in Urban areas, is a pathway for reducing the CO₂ emissions and energy use. The urban vegetation reduces the CO₂ concentration from the atmosphere via photosynthesis and by carbon sequestration through plant growth. It also, reduces the energy use and CO₂ emissions associated with water delivery by providing a medium for wastewater recycling and increased storm water retention.

Measure UG A 1: Increase Community Gardens

Encouraging the community to create new gardens can contribute to GHG reductions by establishing new vegetated open space that will sequester CO₂ from the atmosphere. Community gardens can also potentially reduce GHG emissions by providing the community with a local source of food. This strategy may reduce the number of vehicle trips and miles traveled by both food delivery service and the consumers to grocery stores as well as displace carbon-intensive food production practices.

Actions:

- Establish a community garden – Establish a new garden or maintain an existing one
- Promote gardening and composting – Provide resources and information regarding community gardens and composting to educate the general public on how to grow organic edible plants
- Organize tool lending program and bounty exchange – Work with community organizations or neighborhood groups to organize garden-tool lending program and/or garden bounty exchange program to encourage more community gardens

Measure UG A 2: Increase Rooftop Gardens

Supporting the community in creating rooftop gardens will reduce the underlying building's temperature by shading and evapotranspiration, which results in a decrease of energy used for cooling the building and reduction of GHG emissions. The gardens can also sequester CO₂ emissions from the atmosphere, reduce storm water runoff, and improve air quality by reducing temperatures and capturing air pollutants.

Actions:

- Offer incentives to encourage rooftop gardens – Offer financial incentives (rebates) and/or recognition on website, newsletters, and other outreach materials
- Promote rooftop gardens for residential and commercial buildings – Provide informational materials to contractors, homeowners and businesses about the benefits of rooftop gardens

Measure UG A 3: Support Local Farms

Local farmer's markets can reduce GHG emissions by providing the community with a more local source of food, potentially resulting in a reduction in the number of trips and vehicle miles traveled by both the food delivery service and the consumers traveling to grocery stores. If the food sold at the local farmer's market is produced organically, it can also contribute to GHG reductions by displacing carbon-intensive food production practices.

Actions:

- Establish a local farmer's market – Work with local organizations to establish farmer's markets in the community or maintain current farmer's market
- Promote farmer's market – Promote farmer's market to the community through website, newsletters, or flyers
- Provide financial incentives to encourage residents to shop at farmer's markets – Provide financial incentives for low-income residents to purchase fresh produce at farmer's markets in the community, such as coupons for discounts

Goal UG B: Increase and Maintain Urban Greening in Municipal Facilities

Implementing urban greening strategies in municipal facilities will help reduce greenhouse gas emissions while demonstrating to the community the City's commitment to improving the environment. Cities are may also be responsible for maintaining urban forest on municipal properties such as parks. Urban forests can broadly include urban parks, street trees, landscape boulevards, public gardens, river and coastal promenades, greenways, wetlands, nature preserves, natural areas, and shelter belts of trees. Maintaining the urban forest reduces GHG emissions from decomposition of plant material.

Measure UG B 1: Increase Rooftop Gardens at Municipal Facilities

Creating a demonstration rooftop garden can reduce the underlying municipal building's temperature by shading and evapotranspiration, which results in a decrease of energy used for cooling the building and reduction of greenhouse gas emissions. The gardens can also sequester CO₂ emissions from the atmosphere, reduce storm water runoff, and improve air quality by reducing temperatures and capturing air pollutants.

Actions:

- Create a demonstration rooftop garden on municipal building – Install a rooftop garden on a municipal building as an example for the community

Measure UG B 2: Restoration/ Preservation of Landscapes

Maintenance is necessary to prevent the increase of emissions. If the urban forest is not maintained in the community, the decomposition of trees is a source of emissions.

Actions:

- Landscape/Open Space and Tree Maintenance – Develop a program to conserve open spaces and trees and promote the ability of such resources to remove carbon from atmosphere

Measure UG B 3: Increase Open Space

Creating vegetated land from previously developed land will sequester CO₂ from the atmosphere that would not have been captured if there was no land change. (CAPCOA 2010)

Actions:

- Create new green space or open space – Increase the area of green and open space in the community by developing new parks with recreational open space or re-vegetating vacant lots

Works Cited

CAPCOA. (2010). *Quantifying Greenhouse Gas Mitigation Measures*.

Institute for Local Government. (2013). Sustainability Best Practices Framework. 30-32.

Wolch, J., Byrne, J., & Newell, J. (2014). Urban green space, public health, and the environmental justice: The challenge of making cities 'just green enough'. *Landscape and Urban Planning*, 234-244.

Appendix F: Energy Generation & Storage Measures and Methodology

South Bay Cities Climate Action Plans
December 2017

Appendix F: Energy Generation & Storage (EGS) Measures and Methodology

REFERENCE GUIDE - November 2017

This document is a reference guide for EGS measures that municipal governments may include and implement in their climate action plans. The South Bay Cities Council of Governments (SBCCOG) worked with member cities to identify specific measures and associated calculations to reduce Green House Gas (GHG) emissions using the baseline year of 2005. Reductions were estimated for both community and municipal operations. The 2005 inventory is established as a starting point against which other inventories are compared and targets are set.

Energy Generation and Storage (EGS)

Energy generation and storage (EGS) strategies involve supporting clean renewable energy and decreasing dependence on traditional GHG-emitting power sources. Renewable energy technologies such as wind, solar, geothermal, hydroelectric, and biomass — provide substantial benefits for the climate, human health, and economy. Some renewable energy technologies such as wind and solar have variable outputs which can cause them to generate power inconsistently. Storage technologies have the potential for smoothing out the electricity supply from these sources and ensuring that the supply of generation matches the demand. Different energy storage technologies such as thermal storage, compressed air, hydrogen, pumped hydroelectric storage, flywheels, and batteries contribute to electricity stability by working at various stages of the grid -- from generation to consumer end-use.

Because these strategies are exploratory, the GHG reductions were not quantified for this document. As the City identifies and implements strategies in the future the associated GHG reductions will be quantified.

EGS Measures

Goal 1: Establish City as a leader in the use of alternative energy

Implementation Strategy	Measures
Solar-Photovoltaics (PV) and Thermal	[Development-Existing] Incentivize solar installations on existing parking lots and rooftops
	[Development-New & Existing] Establish ordinance to streamline the solar PV and solar thermal permitting process by reducing approval time and/or fees
	[Development-New] Implement requirement to assure that all new pools be heated with ___% renewable energy, such as solar water heating
	[Development-New] Pre-wired solar homes: Adopt a requirement for pre-wired solar through the Green Building Code update, which is a CALGreen voluntary elective measure (A5.211.4) for both Tier 1 and Tier 2
	[Development-New] Pre-wired solar homes: Require all new roofs to be pre-wired for solar PV and all new buildings to be plumbed for solar water heaters
	[Development-New] Require new construction to employ design that guarantees solar access on neighboring properties. Solar access can be protected legally under existing law and practically by employing simple design principles in planning new development. Current California law does not guarantee solar access without local action.
	[Development-New] Require new parking lots to be covered with structures that support solar production facilities

	[Development-New] Review ordinances and design guidelines for opportunities to ensure roof orientation and other measures such as strategic tree planting to reflect active and passive solar energy principles. Green Building strategy complementing renewable energy - holistic whole building view.
	[Education & Outreach] Distribute information to commercial and industrial facilities on available state and federal rebates and incentive programs, solar leases, and power purchase agreements
	[Education & Outreach] Establish contractor training for installing (insert technology)
	[Education & Outreach] Promote Solar Education and Outreach. Increase public energy conservation and awareness; provide information and education to the general public, business, and organizations on the importance of energy conservation and available programs, products, and incentives regarding energy efficiency and alternatives
	[Education & Outreach] Support and promote demonstrations of solar PV and thermal technologies in public and private projects and leverage these demonstrations to promote the achievement of the goals
	[Funding Mechanisms] Pursue incentives and grant funding through utility, state and/or federal programs for municipal installations. Utility programs include the Self-Generation Incentive Program (SGIP) and California Solar Initiative
Combined Heat and Power (CHP)	[Development-New & Existing] Install CHP systems on city facilities that can benefit from the installation of these systems
	[Development-New & Existing] Require CHP systems for large commercial and industrial facilities that have on-site electricity production, both for new construction and retrofits
	[Education & Outreach] Publicize grant opportunities and financial incentives for CHP. This includes the Self-Generation Incentive Program and feed in tariffs for CHP systems
	[Education & Outreach] Support and promote demonstrations of CHP in public and private projects and leverage these demonstrations to promote the achievement of the goals
	[Funding Mechanisms] Pursue incentives and grant funding through utility, state and/or federal programs for municipal installations. These mechanisms includes the Self-Generation Incentive Program and feed in tariffs for CHP systems
Wind	[Development-New & Existing] Incentivize wind power installations
	[Development-New & Existing] Conduct feasibility studies for the deployment of wind power
	[Development-New & Existing] Establish ordinance to streamline the wind power permitting process by reducing approval time and/or fees
	[Development-New] Identify sites for wind power generation
	[Education & Outreach] Distribute information to commercial and industrial facilities on available state and federal rebates and incentive programs for wind power
	[Education & Outreach] Establish contractor training for installing (insert technology)
	[Education & Outreach] Promote wind power Education and Outreach
	[Education & Outreach] Support and promote demonstrations of wind technologies in public and private projects and leverage these demonstrations to promote the achievement of the goals
Geothermal	[Funding Mechanisms] Pursue incentives and grant funding through utility, state and/or federal programs for municipal installations. These mechanisms include the Self-Generation Incentive Program and feed in tariffs for wind power systems
	[Development-New & Existing] Develop feasibility studies for the deployment of geothermal in both direct and indirect use applications
	[Development-New & Existing] Establish ordinance to streamline the geothermal permitting process by reducing approval time and/or fees
	[Development-New & Existing] Identify sites for geothermal potential for both direct and indirect use applications
	[Education & Outreach] Distribute information to commercial and industrial facilities on available state and federal rebates and incentive programs for geothermal
	[Education & Outreach] Establish contractor training for installing (insert technology)
	[Education & Outreach] Promote geothermal Education and Outreach

	[Education & Outreach] Support and promote demonstrations of geothermal technologies in public and private projects and leverage these demonstrations to promote the achievement of the goals
	[Funding Mechanisms] Pursue incentives and grant funding through utility, state and/or federal programs for municipal installations. These mechanisms include the Self-Generation Incentive Program and feed in tariffs for geothermal
Wave/Tidal	[Development-New & Existing] Develop feasibility studies for the employment of wave/tidal power
	[Development-New & Existing] Identify sites for wave/tidal power generation
	[Education & Outreach] Support and promote demonstrations of wave/tidal technologies in public and private projects and leverage these demonstrations to promote the achievement of the goals
Biomass (Biogas)	[Development-Existing] Develop feasibility study to implement methane recovery at the landfills and wastewater treatment plant to generate energy
	[Development-Existing] Require existing hotels and restaurants to install biodigester during retrofit
	[Development-New] Require installation of biodigestors in new construction (i.e. hotels and restaurants)
	[Education & Outreach] Support and promote demonstrations of biomass technologies in public and private projects and leverage these demonstrations to promote the achievement of the goals
	[Funding Mechanisms] Pursue incentives and grant funding through utility, state and/or federal programs for municipal installations
Energy Storage	[Development-New & Existing] Establish ordinance to streamline the energy storage permitting process by reducing approval time and/or fees
	[Development-New & Existing] Incorporate energy storage in combination with solar installations in municipal facilities
	[Development-New] Promote and incentive energy storage in combination with renewable energy installations in new construction
	[Education & Outreach] Distribute information to commercial and industrial facilities on available state and federal rebates and incentive programs for energy storage
	[Education & Outreach] Establish contractor training for installing (insert technology)
	[Education & Outreach] Promote energy storage Education and Outreach
	[Education & Outreach] Support and promote demonstrations of energy storage technologies in public and private projects and leverage these demonstrations to promote the achievement of the goals
	[Funding Mechanisms] Pursue incentives and grant funding through utility, state and/or federal programs for municipal installations
Generic-Funding Mechanisms	Pursue economic incentives and creative financing for [insert technology] projects as well as support for tenants or developers seeking funding for such projects
	Promote the adoption of a feed-in tariff that further encourages the development of mid-sized renewable energy installations
	Promote the adoption of the NEM (Net Energy Metering) program to encourage clean and/or renewable energy generation facilities
	Promote the adoption of the VNM (Virtual Net Metering) program to encourage clean and/or renewable energy generation facilities for low incomes residents
	Offers incentives to encourage a switch in electricity generation from fossil fuels to renewable sources through small-scale renewable electricity generation
	Promote investor-owned utilities self-generation incentive programs
	Pursue funding to identify renewable energy resources in the sub region (or city) and advise on how the amount of renewable energy generated within the sub region (or city) may be increased over the short-, medium-, and long-term
	Research and promote innovative financing opportunities for commercial and residential alternative/renewable energy installations
Renewable Energy Credits (RECs)	Purchase renewable energy credits as one of the strategies in an alternative energy portfolio mix

Generic- Siting and Permitting	Identify and develop methods to address barriers to renewable energy development, including permitting issues and potential opposition from the local community
	Develop maps of alternative/renewable energy potential in the [City]
	Provide complimentary plan check review to identify alternative/renewable energy opportunities in new construction
	Create a permitting process to accelerate alternative and renewable clean energy projects
Generic Policies and Ordinances	Implement onsite renewable energy generation policy for [select year - 2020, 2030, 2050]
	Establish policies and programs that facilitate the siting of new alternative energy generation and/or storage
	Conduct ongoing city staff training to building officials, plan checkers, and other building department staff on alternative/renewable energy technologies
	Identify and remove or reduce barriers to alternative/renewable energy generation, including:
	<ul style="list-style-type: none"> * Review and revise building and development codes, design guidelines, and zoning ordinances to remove barriers * Work with related agencies, such as fire, water, health and others that may have policies or requirements that adversely impact the development or use of alternative/renewable energy technologies
Generic- Education and Outreach	Promote alternative/renewable energy Education and Outreach in combination with energy efficiency
	Encourage low income residents to participate in installing alternative/renewable energy in their homes
	Promote high-impact energy efficiency options, target key institutions, and develop partnerships to implement new projects
	Promote opportunities for businesses “greening” through local chambers of commerce and other partners
	Provide incentives to promote voluntary Green Building practices incorporating alternative/renewable energy and energy efficiency

Goal 2: Achieve local control of energy supply

Implementation Strategy	Actions (Measure)
Community Choice Aggregation (CCA)	Conduct feasibility study for Community Choice Aggregation to allow residents and businesses to aggregate their buying power to purchase renewable energy
	Pursue Community Choice Aggregation
Microgrid	Establish a microgrid in municipal facilities
	Conduct feasibility study for a community microgrid
	Establish a community microgrid

Goal 3: Pursue Carbon Offsets

Implementation Strategy	Actions (Measure)
Carbon Offsets	Purchase Carbon offsets for employee air travel