

City of Riverside Greenhouse Gas Emissions Inventory

EXECUTIVE SUMMARY

Overview

The objective of this study for the City of Riverside (City) is to establish the current greenhouse gas (GHG) emissions inventory, identify actions that the City can take to minimize its carbon footprint, and develop an approach for tracking and reporting future GHG emissions.

The City of Riverside is a signatory of the U.S. Mayors Climate Protection Agreement, which contains pledges to take action to reduce GHG emissions by at least 7% from 1990 levels by the year 2012, in line with the Kyoto Protocol. Participation in the Mayor's Agreement includes membership into ICLEI - Local Governments for Sustainability. Therefore, ICLEI's resources and methods of GHG reporting have been utilized in this inventory.

Current Inventory

This preliminary study evaluates the current level of GHG emissions from City operations utilizing ICLEI's Clean Air and Climate Protection (CACP) Software and emission accounting protocols by assessing emissions from the following sectors:

- Buildings and Other Facilities
- Vehicle Fleet
- Employee Commute
- Streetlights/Traffic Signals
- Water/Sewage Facilities
- Solid Waste Facilities

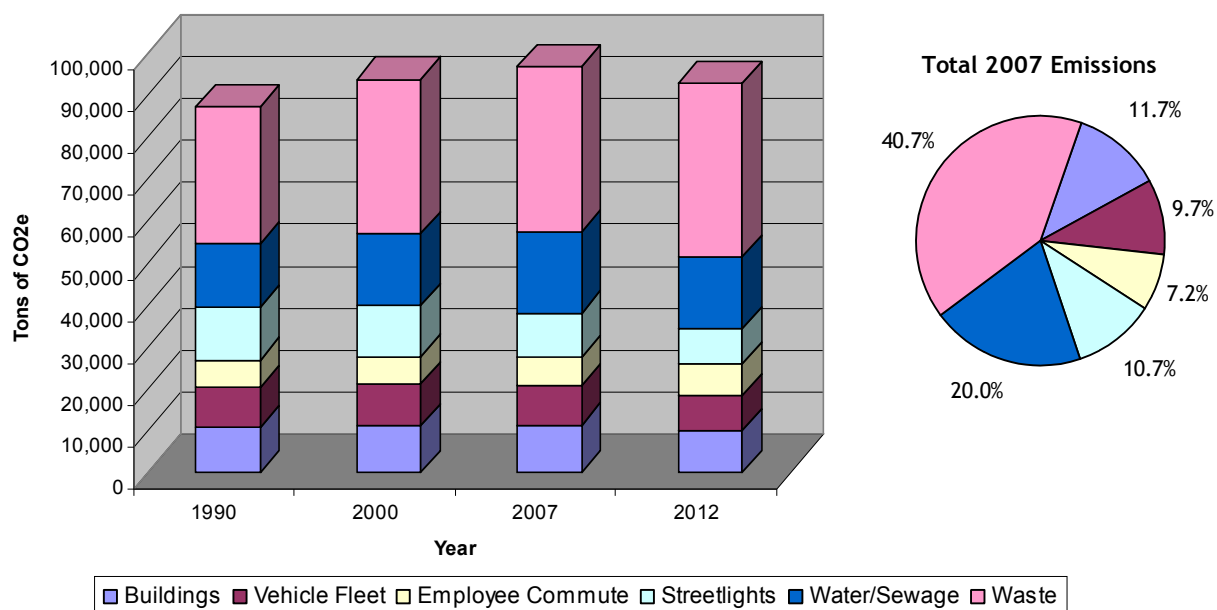
The City's estimated GHG emissions for the years 1990, 2000, 2007 and projected GHG emissions for 2012 (as represented by carbon dioxide equivalents, CO₂e) are as follows:

Summary of Municipal GHG Emissions

Sector	1990		2000		2007		Projected 2012	
	CO ₂ e (tons)	% of Total	CO ₂ e (tons)	% of Total	CO ₂ e (tons)	% of Total	CO ₂ e (tons)	% of Total
Buildings	10,660	12.2%	11,124	11.8%	11,354	11.7%	9,902	10.7%
Vehicle Fleet	9,790.1	11.2%	9,835	10.5%	9,345	9.7%	8,529	9.2%
Employee Commute	6,455	7.4%	6,764	7.2%	6,939	7.2%	7,310	7.9%
Streetlights	12,551	14.4%	12,109	12.9%	10,392	10.7%	8,661	9.3%
Water/Sewage	15,231	17.4%	17,050	18.2%	19,382	20.0%	16,919	18.2%
Waste	32,610	37.4%	37,015	39.4%	39,401.7	40.7%	41,566	44.7%
Total	87,298	100%	93,898	100%	96,815	100%	92,886	100%

City of Riverside Greenhouse Gas Emissions Inventory

Summary of Municipal GHG Emissions



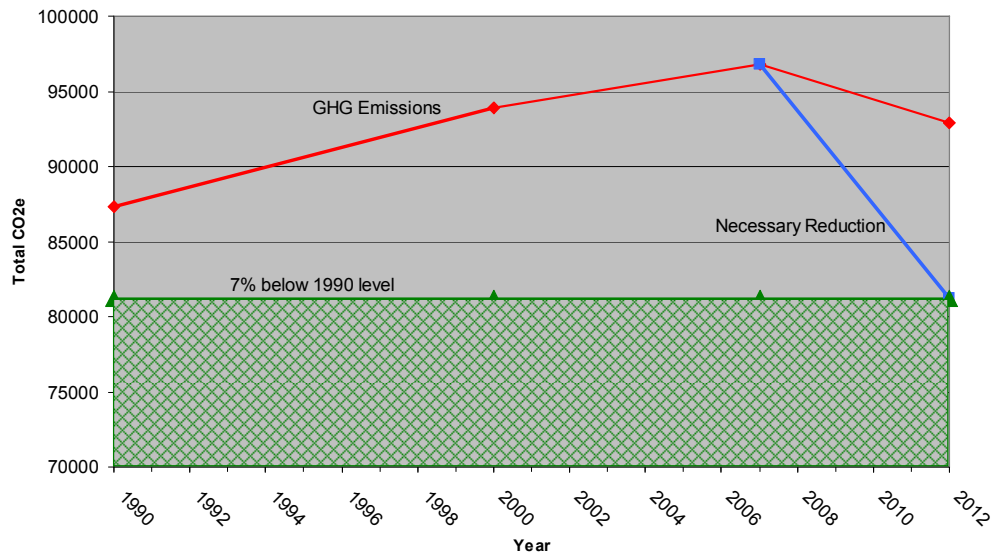
Percentage Change

Sector	1990 to 2000	2000 to 2007	Projected 2007 to 2012
Buildings	4.4%	2.1%	-12.8%
Vehicle Fleet	0.5%	-5.0%	-8.7%
Employee Commute	4.8%	2.6%	5.3%
Streetlights	-3.5%	-14.2%	-16.7%
Water/Sewage	11.9%	13.7%	-12.7%
Waste	13.5%	6.4%	5.5%
Weighted Total	7.6%	3.1%	-4.1%

Municipal operations within the City of Riverside produced a calculated 87,298 tons of CO₂e in the year 1990, 93,898 tons in 2000, 96,815 tons in 2007 and are projected to produce 92,886 tons of CO₂e in the year 2012. This is a 7.6% increase in the years between 1990 and 2000. Because of the City's proactive measures to reduce their GHG emissions, the City's percentage of increase is much lower than the national average of 14.2%. This trend can be continued in the future years, and even improved upon to reduce emissions by 7% below 1990 levels by the year 2012 -- the goal set forth in the U.S. Mayor's Climate Protection Agreement. In order to achieve this goal, the City's current output of 96,815 metric tons of CO₂e would have to be reduced by at least 11,699 metric tons by 2012.

City of Riverside Greenhouse Gas Emissions Inventory

Current Trend versus Emissions Target



GHG Emission Reduction Actions

The City of Riverside is committed to becoming a clean, green and sustainable community; this has been demonstrated by their proactive GHG reduction actions as laid out in the Clean and Green Sustainable Riverside Action Plan (Green Action Plan). Measures within this plan that will have direct impacts on municipal operations include:

- Implementation of green building rating systems for all new municipal buildings over 5,000 square feet;
- Implementation of green operations and maintenance for municipal operations and buildings;
- Reduction of per capita portable water usage by 15%;
- Increased numbers of clean vehicles in non-emergency City fleet by at least 60%;
- Implementation of alternative transportation programs for City employees;
- Increased diversion of waste from landfills by 2%;
- Promotion of green purchasing and reduction of upstream waste generation by 10%;
- Increased usage of renewable energy in order to meet 33% of the City's electric load by 2020.

Implementation of the above items in the Green Action Plan will move the City's municipal operations towards reaching at least the 7% reduction in CO₂e as laid out in AB32.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	II
LIST OF ACRONYMS	VI
1.0 INTRODUCTION	1
1.1 OBJECTIVE	1
1.2 OVERVIEW OF CLIMATE CHANGE.....	1
1.3 KEY CLIMATE CHANGE LEGISLATION AND INITIATIVES.....	2
1.3.1 Mayor’s Agreement	2
1.3.2 AB32.....	2
1.4 APPROACH	3
2.0 LOCAL GOVERNMENT PROFILE INFORMATION	5
3.0 GREENHOUSE GAS INVENTORY DETAILS	8
3.1 RIVERSIDE’S SOURCES OF GHGs	8
3.1.1 Buildings and Other Facilities	9
3.1.2 Vehicle Fleet	10
3.1.3 Employee Commute	11
3.1.4 Streetlights and Traffic Signals.....	12
3.1.5 Water/Sewage Facilities.....	14
3.1.6 Waste	15
3.1.7 Other (Riverside Public Utilities)	16
4.0 ACTIVITY DATA DETAILS	17
4.1 SOURCES OF ALL ACTIVITY DATA REPORTED	17
4.1.1 Employees and Resident Population.....	17
4.1.2 Buildings and Other Facilities	17
4.1.3 Vehicle Fleet	17
4.1.4 Employee Commute	18
4.1.5 Streetlights and Traffic Signals.....	18
4.1.6 Water and Sewage Facilities.....	19
4.1.7 Waste	20
4.2 METHODOLOGY/EMISSION FACTOR DETAILS	21
4.2.1 Fuel Emission Factors	21
4.2.2 Purchased Electricity Emission Factors	21
5.0 CONCLUSIONS AND RECOMMENDATIONS	22
5.1 RIVERSIDE’S CURRENT GHG EMISSION REDUCTION ACTIONS	22
5.2 RECOMMENDED GHG EMISSION REDUCTION ACTIONS.....	22
5.2.1 Buildings.....	22
5.2.2 Streetlights/Traffic Signals	23
5.2.3 Water/Wastewater	23
5.2.4 Vehicle Fleet	23
5.2.5 Employee Commute	23
5.2.6 Waste	24
5.2.7 Electricity Generation	24
5.3 CONCLUSION	25
REFERENCES	26
APPENDICES	27

LIST OF ACRONYMS

AB32	California Global Warming Solutions Act of 2006
CACP	Clean Air Climate Protection
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CO ₂	carbon dioxide
CH ₄	methane
CNG	compressed natural gas
E85	ethanol - 85%
GHG	greenhouse gas
HFC	hydrofluorocarbon
ICLEI	Local Governments for Sustainability
kWh	kilowatt hour
LED	light emitting diode
LGO	Local Government Operations
LPG	liquefied petroleum gas
MWh	megawatt hour
N ₂ O	nitrous oxide
NO _x	oxides of nitrogen
PFC	perflourocarbon
PUP	Power Utility Protocol
SCAQMD	South Coast Air Quality Management District
SF ₆	sulfur hexafluoride
SO _x	oxides of sulfur
SUV	sport utility vehicle
ULSD	ultra low sulfur diesel
VMT	vehicle miles traveled
W	watts

1.0 INTRODUCTION

1.1 OBJECTIVE

The City of Riverside is committed to becoming a clean, green and sustainable community. The City has commissioned this Greenhouse Gas Emissions Inventory Report as part of their ongoing effort to diminish the impact that their community has on the environment, beginning with their municipal operations. This inventory is intended to take account of the emissions generated by current municipal operations, develop an approach for tracking and reporting future emissions, and to recommend best practices for reducing greenhouse gas (GHG) emissions. These green goals are accomplished, in addition to addressing and ultimately complying with GHG reduction goals outlined in the U.S. Mayors Climate Protection Agreement (Mayor's Agreement) and Assembly Bill (AB) 32.

1.2 OVERVIEW OF CLIMATE CHANGE

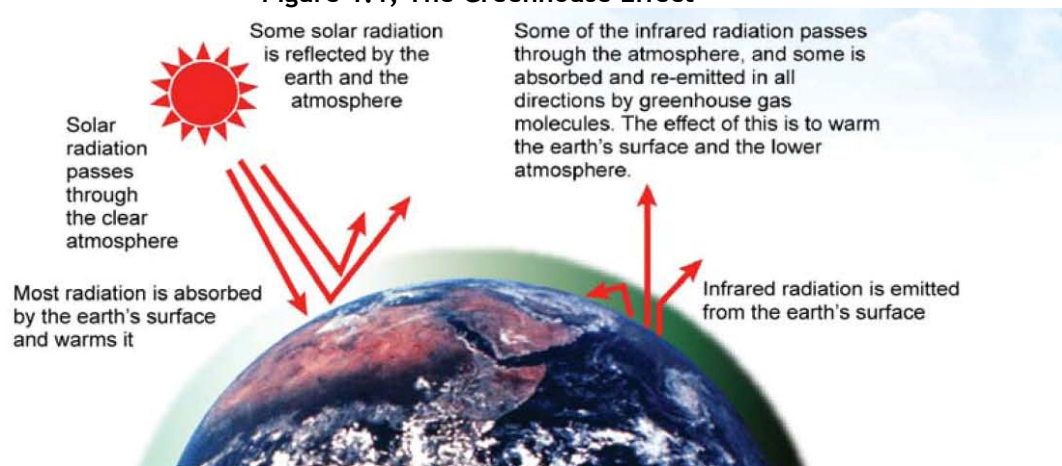
Gases in the earth's atmosphere insulate the planet from radiation originating beyond our atmosphere. The gases in the atmosphere that trap heat inside it are termed greenhouse gases because they cause a natural "greenhouse effect" (Figure 1.1). The sun radiates heat to the earth's surface, where some is absorbed by the earth, and some is reflected out to space. The GHGs in the earth's atmosphere both absorb some of this heat and reflect some of it back to the earth, causing a warming effect.

Some GHGs, such as carbon dioxide (CO_2) and methane (CH_4), occur naturally through processes such as transpiration from plants and vegetation decomposition. CO_2 can also form from anthropogenic or man-made sources such as the combustion of fossil fuels. Other GHGs, such as fluorinated gases are emitted solely from human activities. The significant GHGs emitted due to human activity and the specific focus of international attention via the Kyoto Protocol are CO_2 , CH_4 , nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

While a natural balance of GHGs contributes to the maintenance of our atmosphere and climate, an excess of anthropogenic GHGs is considered likely to be one of the main factors contributing to the enhanced greenhouse effect known as global climate change.

There are a variety of scenarios for potential impacts from climate change. Potential impacts could include more extreme temperatures, drought, sea level rise, and habitat disturbance.

Figure 1.1, The Greenhouse Effect



Source: U.S. Environmental Protection Agency Climate Change website

City of Riverside Greenhouse Gas Emissions Inventory

1.3 KEY CLIMATE CHANGE LEGISLATION AND INITIATIVES

1.3.1 Mayor's Agreement

On February 16, 2005, the Kyoto Protocol, an international agreement to address climate disruption, became law for the 141 countries that have ratified it to date. On that day, Seattle Mayor Greg Nickels launched the U.S. Mayors Climate Protection Agreement to advance the goals of the Kyoto Protocol through leadership and action. Two years later, the U.S. Conference of Mayors launched the Mayors Climate Protection Center to administer and track the agreement, among its other activities. By November 1, 2007, there were more than 710 signatories to the Agreement. Among these signatories was the City of Riverside's Mayor Ronald Loveridge.

Under the Agreement, participating cities commit to take the following three actions:

- Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns;
- Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol - 7% reduction from 1990 levels by 2012; and
- Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system.

This GHG emissions baseline inventory marks one of the first steps towards the goal of reaching at least a 7% reduction of emissions from 1990 levels by 2012.

1.3.2 AB32

The California Global Warming Solutions Act of 2006 (AB32) adopts a statewide goal to reduce GHG emissions to 1990 levels by 2020. Under this Act, the California Air Resources Board (CARB) is given the authority and a timeline to undertake a number of steps in order to meet this goal.

Key programs to be developed by CARB in order to meet the state's GHG emissions reduction goal under AB32 include:

- The creation of market mechanisms including an enforceable statewide cap on GHG emissions that will be phased in starting in 2012;
- Regulations for the mandatory reporting of GHG emissions by elected emission sources and source categories have already been developed by CARB; and
- Regulations to achieve emission reductions for selected emission sources and source categories in the subsequent years.

City of Riverside Greenhouse Gas Emissions Inventory

Table 1.1, AB32 CARB Action Timeline

By July 1, 2007	CARB forms Environmental Justice and Economic & Technology Advancement advisory committees.
By July 1, 2007	CARB adopts list of discrete early action measures that can be adopted and implemented before January 1, 2010.
By July 1, 2008	CARB adopts regulations for mandatory GHG emissions reporting. CARB defines 1990 emissions baseline for California (including emissions from imported power) and adopts that as the 2020 statewide cap.
 By July 1, 2009	CARB adopts plan indicating how emission reductions will be achieved from significant sources of GHGs via regulations, market mechanisms, and other actions.
By July 1, 2009	CARB staff drafts rule language to implement its plan and holds a series of public workshops on each measure (including market mechanisms).
By July 1, 2010	Early Action Measures take effect.
By July 1, 2010	CARB conducts a series of rulemakings, after workshops and public hearings, to adopt GHG regulations, including rules governing market mechanisms.
By July 1, 2011	CARB completes major rulemakings for reducing GHGs, including market mechanisms. CARB may revise the rules and adopt new ones after January 1, 2011 in furtherance of the 2020 cap.
By July 1, 2012	GHG rules and market mechanisms adopted by CARB take effect and are legally enforceable.
By July 1, 2020	Deadline for achieving 2020 GHG emissions cap.

1.4 APPROACH

Accounting for GHG emissions is a relatively new field, yet it has been developing rapidly in conjunction with growing public awareness and concern relating to global climate change.

The City of Riverside became an ICLEI - Local Governments for Sustainability member when it became a signatory to the U.S. Mayor's Agreement, as ICLEI was the current leader in the development of accounting methodology. ICLEI's protocol was utilized to develop this inventory. The "Local Government Operations Protocol for the quantification and reporting of greenhouse gas emissions", was not yet finalized when this inventory started to be developed. As such, further work may be required in the future to update this inventory to meet protocol requirements.

ICLEI and CACP

ICLEI was founded in 1990 as 'The International Council for Local Environmental Initiatives', and is a membership association of local governments that have made a commitment to sustainable development. The organization is now officially known as ICLEI - Local Governments for Sustainability. Through its Cities for Climate Protection campaign, ICLEI is a leader in the development of accounting methodology for local communities' GHG emission inventories. ICLEI coordinates its work with the California Climate Action Registry (CCAR), the U.S. Department of Energy, the U.S. Environmental Protection Agency, and State and Territorial Air Pollution Program Administrators - Association of Local Air Pollution Control Officials (STAPPA/ALAPCO). ICLEI, in collaboration with STAPPA/ALAPCO has

City of Riverside Greenhouse Gas Emissions Inventory

developed and released the CACP Software. CACP is a valuable tool that has enabled various local governments to inventory their GHG emissions, quantify the benefits of reduction measures, and formulate local climate action plans. The CACP software has been used precisely for these purposes within this inventory.

It is anticipated that this software tool will be revised by ICLEI in 2009 with the release of the Next Generation Emissions Analysis Tool, which will be consistent with the Local Government Operations Protocol.

Data Collection

This inventory encompasses all aspects of the City's municipal operations, and is separated into the following sectors:

- Buildings and Other Facilities
- Vehicle Fleet
- Employee Commute
- Streetlights/Traffic Signals
- Water/Sewage Facilities
- Solid Waste Facilities

Data from 2007 is the most recent full calendar year with the most complete data available from the aforementioned City sectors. Therefore, 2007 was utilized as the initial reporting (baseline) year for this inventory as it was based on the most reliable data. While 1990 as a base year is stipulated by the Kyoto Protocol, data records from this year were, for the most part, unavailable. As such, estimates for 1990 and 2000 were based on actual data or backcasted data which was correlated to changes in employee, city population or other data which was considered appropriate to generate the most accurate results. Forecasted 2012 emissions, as presented throughout the report, take into account growth within the City, as well as reduction measures already in place. Any assumptions, as well as data sources, are presented in Section 4, Activity Data Details.

2.0 LOCAL GOVERNMENT PROFILE INFORMATION

The City of Riverside was founded in 1870, and the first orange trees were planted in 1871. The following years led to the establishment and success of the citrus industry and the blooming of the City of Riverside. Even today, the Inland Empire is still experiencing rapid growth, now with increases in the residential and business sectors.

Being in one the fastest growing areas in the state and with the City Council’s dedication to creating a clean and sustainable future, the City has taken key steps toward ensuring sustainable growth to preserving the health of the local environment. The Green Action Plan addresses seven broad categories encompassing all aspects of living in Riverside including: energy, greenhouse gas emissions, waste reduction, urban design, urban nature, transportation, and water.

Location and Size

The City of Riverside is located in the northwest portion of Riverside County. Riverside is situated just southwest of the 91 and 60 Freeways at the juncture of Interstate 215 with established transportation corridors accessible by freeway, air, train or bus.

According to the United States Census Bureau, the city has a total area of 78.4 square miles (203.0 km²), of which, 78.1 square miles (202.3 km²) of it is land and 0.3 square miles (0.7 km²) of it is water. The total area is 0.36% water. Riverside is the 61st-largest city in the United States, and the largest city in California's Inland Empire region, the 14th-largest metropolitan area in the nation.

Population

In 2007, growth in the Riverside metropolitan area was the 5th largest in the nation. According to the United States Census Bureau, in 1990, the City had a population of 226,546 residents and in 2000, the City had a population of 255,166 residents. According to California Department of Finance estimates, in 2007 the City’s population consisted of 296,842 people. Population in the 17 years from 1990 to 2007 has experienced a 31% growth. According to the City of Riverside General Plan and Supporting Documents Environmental Impact Report, the projected population in 2025 will be 346,867. Assuming a linear growth rate, a population estimate of 310,738 in 2012 was derived. Much of this projected growth will result from infill and redevelopment within the City. The growth of the City’s resident population is shown in Figure 2.1, City Population.

As with any city, an increase in population correlates with the need to expand city services. With increased growth and expansion comes the potential for an increase in greenhouse gas emissions unless significant steps are taken to reduce emissions within both municipal and community operations.

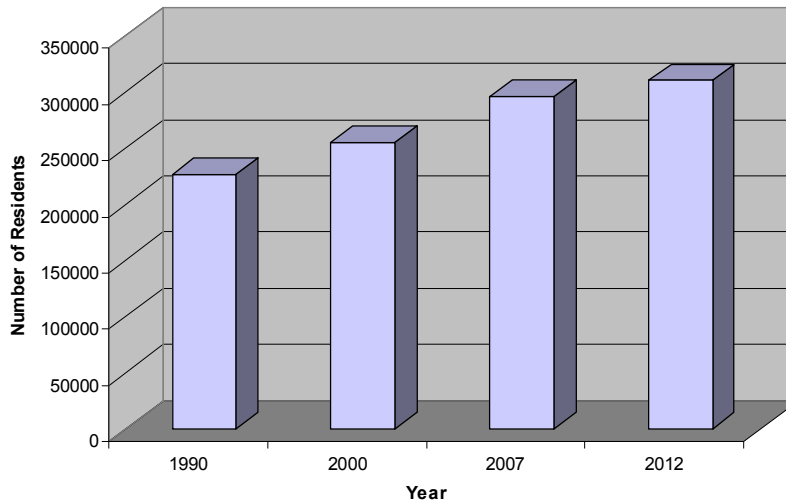
Top ten metropolitan population increases

	Metropolitan statistical area	Number increase 2000-'06
1.	Atlanta	890,211
2.	Dallas-Fort Worth	842,449
3.	Houston	824,547
4.	Phoenix	787,306
5.	Riverside	771,314
6.	Los Angeles	584,510
7.	New York	495,154
8.	Washington	494,220
9.	Miami	455,869
10.	Chicago	407,133

Source: U.S. Census Bureau

City of Riverside Greenhouse Gas Emissions Inventory

Figure 2.1, City Population

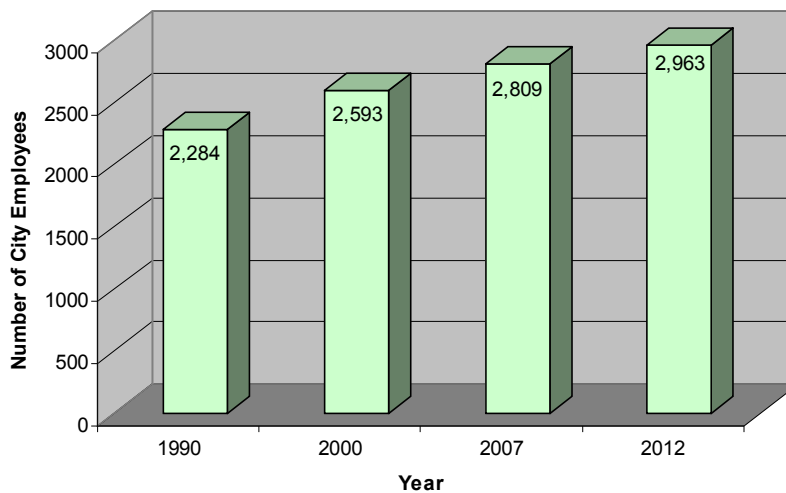


Employees

The City has a multifaceted workforce that encompasses a wide range of essential services and managerial offices. City employees facilitate much of the necessary daily operations and support the departments that provide basic City services.

According to information provided by the City of Riverside Human Resources Department, the City employed 2,809 staff members at the start of 2008 (this number was assumed to represent 2007 employee numbers) and 2,593 staff members in the year 2000. Based on these numbers, it was estimated that 2,284 staff members were employed in 1990 and 2,963 staff members are projected to be employed in 2012. The growth of the City's work force is shown in Figure 2.2.

Figure 2.2, City Employees



City of Riverside Greenhouse Gas Emissions Inventory

Services

The City provides a wide range of services including administrative services, community planning/development, emergency services, parks, libraries, utilities and museums.

The City is organized into sixteen departments which include:

1. Airport
2. City Clerk
3. City Manager - Administration
4. City Manager - Finance
5. Community Development
6. Development
7. General Services
8. Fire
9. Human Resources
10. Library
11. Mayor's Office
12. Museum
13. Park, Recreation, and
Community Service
14. Police
15. Public Works
16. Public Utilities

3.0 GREENHOUSE GAS INVENTORY DETAILS

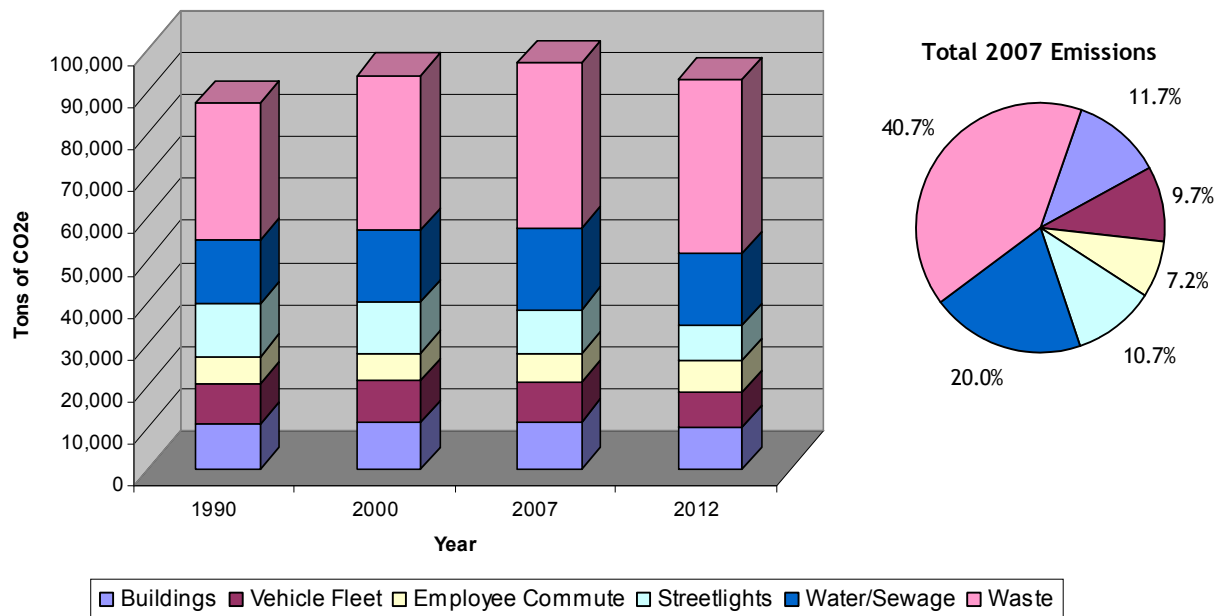
3.1 RIVERSIDE'S SOURCES OF GHGS

From 1990 to 2000, overall GHG emissions produced by municipal activities within the City of Riverside increased by 7.5%. A critical factor in this rise is the continued growth and development within the City. For comparison, GHG emissions nationwide increased by 14.2% between 1990 and 2000, according to the U.S. Environmental Protection Agency. The following table and chart summarize the GHG emissions from City operations in 1990, 2000, 2007, and projected emissions in 2012.

Table 3.1, Summary of Municipal GHG Emissions

Sector	1990		2000		2007		Projected 2012	
	CO ₂ e (tons)	% of Total	CO ₂ e (tons)	% of Total	CO ₂ e (tons)	% of Total	CO ₂ e (tons)	% of Total
Buildings	10,660	12.2%	11,124	11.8%	11,354	11.7%	9,902	10.7%
Vehicle Fleet	9,790.1	11.2%	9,835	10.5%	9,345	9.7%	8,529	9.2%
Employee Commute	6,455	7.4%	6,764	7.2%	6,939	7.2%	7,310	7.9%
Streetlights	12,551	14.4%	12,109	12.9%	10,392	10.7%	8,661	9.3%
Water/Sewage	15,231	17.4%	17,050	18.2%	19,382	20.0%	16,919	18.2%
Waste	32,610	37.4%	37,015	39.4%	39,401.7	40.7%	41,566	44.7%
Total	87,298	100%	93,898	100%	96,815	100%	92,886	100%

Figure 3.1, Summary of Municipal GHG Emissions



City of Riverside Greenhouse Gas Emissions Inventory

3.1.1 Buildings and Other Facilities

Description

The City currently owns and operates over 200 buildings. Included among these buildings are administrative uses, libraries (including a cybrary), museums, fire stations, police stations, Riverside Airport and Aerial Labs, and approximately 52 parks and recreation areas (including community centers). For calculation purposes, also included within the “building” category are buildings that are temporarily owned by the City’s Redevelopment Agency, and power meters/poles.

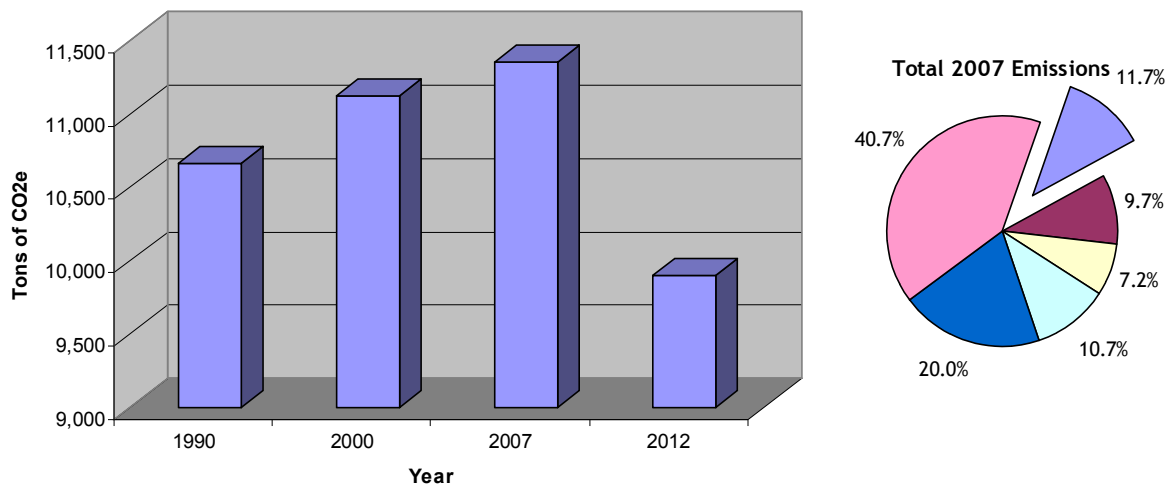
Results

The primary GHG emissions from building use are associated with the electricity and natural gas usage. In 2007, the City’s buildings utilized an estimated 14,532,963 kilowatt hours (kWh) of electricity, 191,577 therms of natural gas and 28,518 gallons of diesel fuel. This energy usage resulted in a total of 11,354 tons of CO₂e emissions in 2007. The CO₂e attributed to the City’s buildings and other facilities are as follows:

Table 3.2, GHG Emissions from City Buildings

	1990	2000	2007	2012
Metric Tons CO ₂ e	10,660	11,124	11,354	9,902

Figure 3.2, GHG Emissions from City Buildings



Energy usage from City buildings is expected to increase annually; however, overall emissions will decrease by 2012 with the City’s program to increase its usage of renewable energy by 20% by 2010.

City of Riverside Greenhouse Gas Emissions Inventory

3.1.2 Vehicle Fleet

Description

The City maintains a fleet of approximately 1,400 vehicles. These vehicles vary greatly in their uses, but include sedans, pickup trucks, sport utility vehicles (SUVs), vans, street sweepers, refuse packers, fire trucks, and a variety of other heavy duty trucks and equipment. In addition to the City fleet, the Riverside Police Department utilizes approximately 400 vehicles comprised mainly of sedans and motorcycles, but also including pickup trucks, vans, and SUVs.

Currently, over 400 of the City's fleet utilize various forms of alternative fuels. An impressive 98% of all sedans have been converted to more eco-friendly compressed natural gas (CNG), hybrid or hydrogen vehicles. Other advanced forms of alternatively fueled vehicles include liquefied petroleum gas (LPG), ethanol, full electric and hybrid electric.

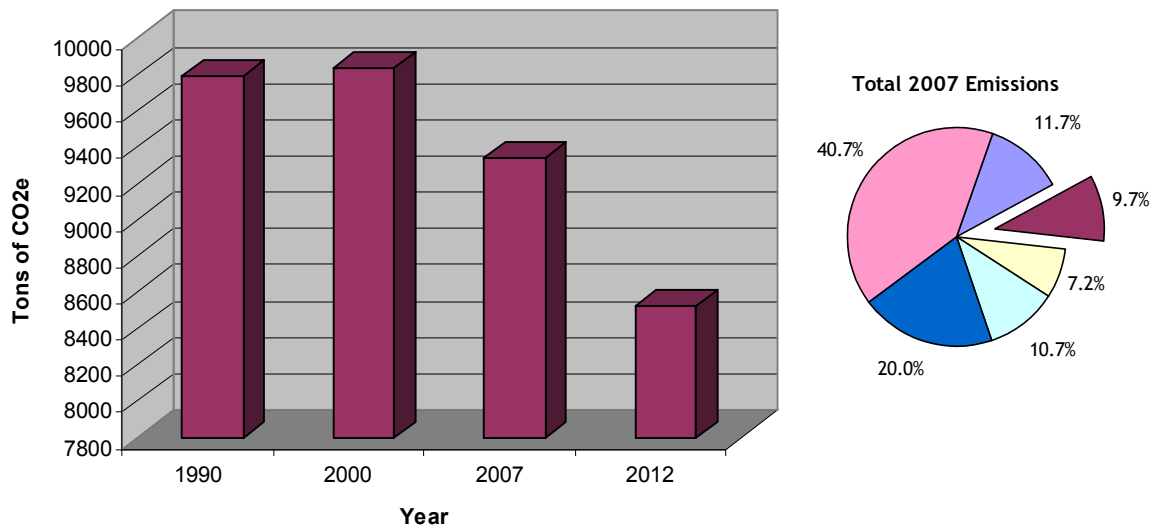
Results

In the year 2007, over 10 million miles were traveled by City vehicles and City police vehicles. Vehicle types and their respective miles driven were used to translate these miles into 9,345 tons of CO₂e in 2007. This is a decrease in emissions from previous years, as shown below:

Table 3.3, GHG Emissions from City Fleet Vehicles

	1990	2000	2007	2012
Metric Tons CO ₂ e	9,790	9,835	9,345	8,529

Figure 3.3, GHG Emissions from City Fleet Vehicles



Even though the number of miles driven has increased since 1990, greenhouse gas emissions have experienced a significant decrease due to technological advancements and air quality regulations leading to cleaner burning vehicles. The City has been proactive in making a great effort to reduce their emissions by their more recent utilization of alternative fuels. This is reflected in the decrease in emissions between 2000 and 2007 as shown above. Additionally, emissions are anticipated to continue to decrease to 2012, as the City increases their alternative fuel usage.

City of Riverside Greenhouse Gas Emissions Inventory

3.1.3 Employee Commute

Description

In 2007, 2,809 employees were employed by the City of Riverside. A breakdown of employee's County of residence and distance from the City of Riverside is presented below:

County	Average Distance (miles)	Number of Employees
Kern	170.7	1
Los Angeles	40.2	46
Maricopa	343.6	1
Orange	35.5	61
Riverside	8.6	2206
Sacramento	430.9	1
San Bernardino	21.4	467
San Diego	74.7	24
Ventura	115.6	2

An estimated 2,593 employees were employed in 2000.

Employee commute patterns were not known; however, it was assumed that this matched U.S. Census Year 2000 mode share percentages for various counties as listed in the U.S. Census Bureau's 2000 *Census Transportation Planning Package* (2004):

County	Drive Alone	Carpool	Bus/ Trolley/ Streetcar	Subway/ Rail	Bicycle	Walk	Taxi	Motorcycle	Work from home	Other
Kern	72.73%	27.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Los Angeles	73.55%	23.82%	0.97%	0.11%	0.27%	0.27%	0.00%	0.22%	0.00%	0.81%
Orange	79.76%	19.22%	0.26%	0.03%	0.03%	0.03%	0.00%	0.00%	0.00%	0.66%
Riverside	72.06%	16.68%	1.24%	0.04%	0.70%	2.57%	0.02%	0.23%	5.46%	1.00%
Sacramento	74.32%	5.41%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	20.27%
San Bernadino	79.55%	18.73%	0.43%	0.05%	0.03%	0.37%	0.00%	0.27%	0.00%	0.58%
San Diego	80.19%	17.69%	0.60%	0.00%	0.26%	0.51%	0.00%	0.34%	0.00%	0.43%
Ventura	83.33%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Results

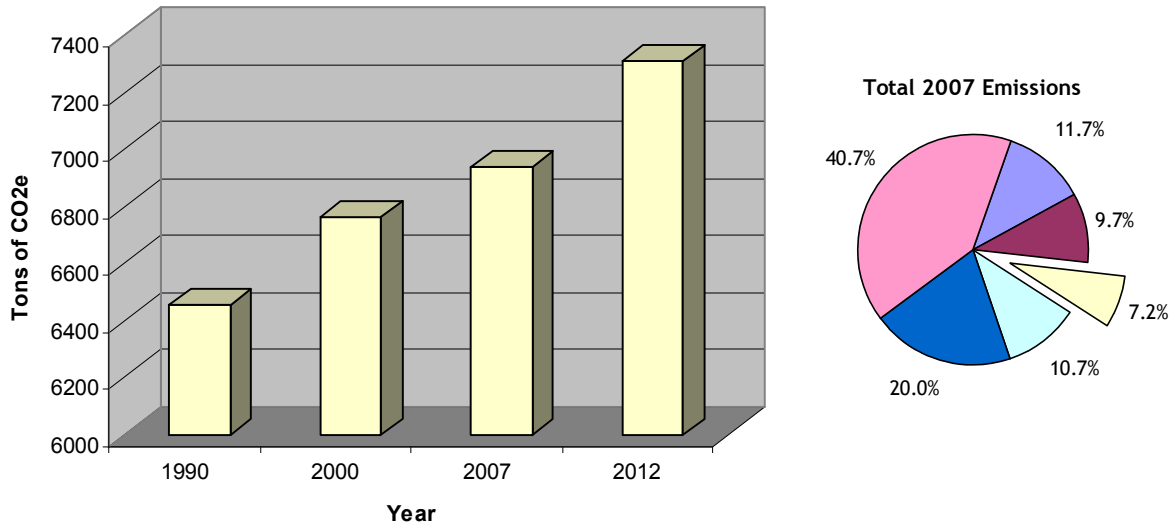
The primary GHG emissions from employee commuting are associated with gasoline and diesel combustion. In 2007, City employees that travel to and from work put an estimated 13,891,507 passenger miles on their cars, of which 11,380,801 miles were by drive-alone commuters, generating 6,939 metric tons of CO₂e from all transport modes. The CO₂e attributed to employee commuting is shown below:

City of Riverside Greenhouse Gas Emissions Inventory

Table 3.4, GHG Emissions from Employee Commuting

	1990	2000	2007	2012
Metric Tons CO ₂ e	6,455	6,764	6,939	7,310

Figure 3.4, GHG Emissions from Employee Commuting



3.1.4 Streetlights and Traffic Signals

Description

Between 1990 and 2007, the City owned and operated the following streetlights:

Lamp Type	Wattage	Number of Lamps in 1990	Number of Lamps in 2000	Number of Lamps in 2007
Incandescent	100	88	88	88
	200	135	135	135
	400	44	44	44
Mercury Vapor	100	445	445	445
	175	11,302	9,302	1,702
	400	12	12	12
High Pressure Sodium	70	2,443	2,443	2443
	100	8,487	10,487	18,087
	150	824	824	824
	200	4,361	4,361	4,361
	250	741	741	741
	400	290	290	290

The above streetlights are each operated for approximately 4,148 hours per year.

City of Riverside Greenhouse Gas Emissions Inventory

In a change-out program that occurred between 1996 and 2007, 9,600 175 watt (W) mercury vapor lights were converted to 100W high pressure sodium lamps.

The City also owns and operates approximately 9,873 traffic signals. These were previously all incandescent lamps; however, all lamps were changed to lower wattage light emitting diode (LED) lamps in 2000.

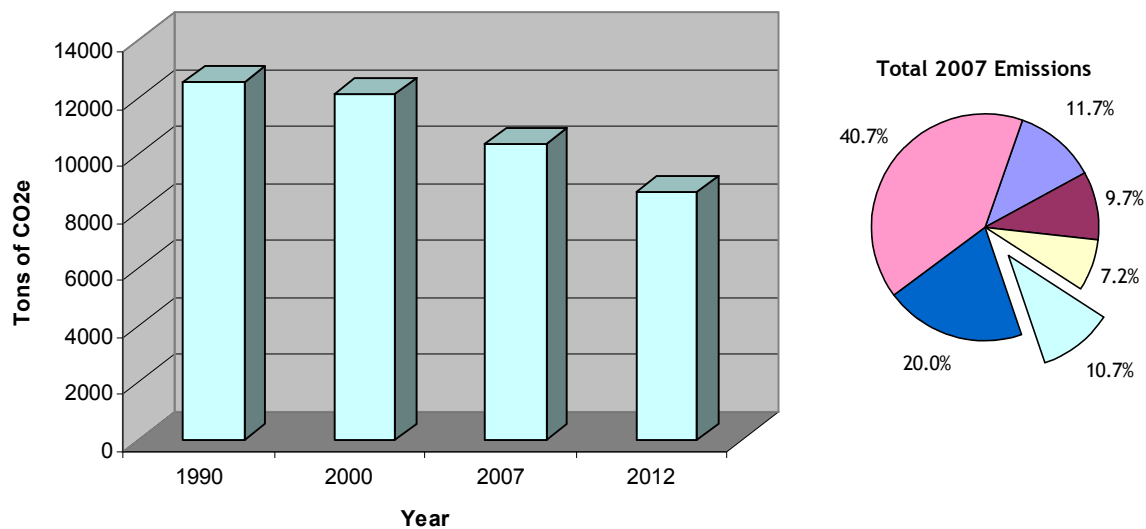
Results

The primary GHG emissions from streetlights and traffic signals are from purchased electricity. In 2007, streetlights and traffic signals consumed over 15,253,000 kWh and 50,368 kWh of electricity respectively, generating a total of 10,392 metric tons of CO₂e. The CO₂e attributed to streetlights and traffic signals in each year is shown below:

Table 3.5, GHG Emissions from Streetlights/Traffic Signals

	1990	2000	2007	2012
Metric Tons CO ₂ e	12,551	12,109	10,392	8,661

Figure 3.5, GHG Emissions from Streetlights/Traffic Signals



The emissions from streetlights/traffic signals are projected to decrease as the City continues to replace its lights with more energy-efficient models.

City of Riverside Greenhouse Gas Emissions Inventory

3.1.5 Water/Sewage Facilities

Description

The City owns and operates a number of water/wastewater related facilities including:

- The Riverside Regional Water Quality Control Plant
- Sewage Disposal Plant
- Pump Stations
- Booster Stations
- Water Meters
- Wells
- Reservoirs

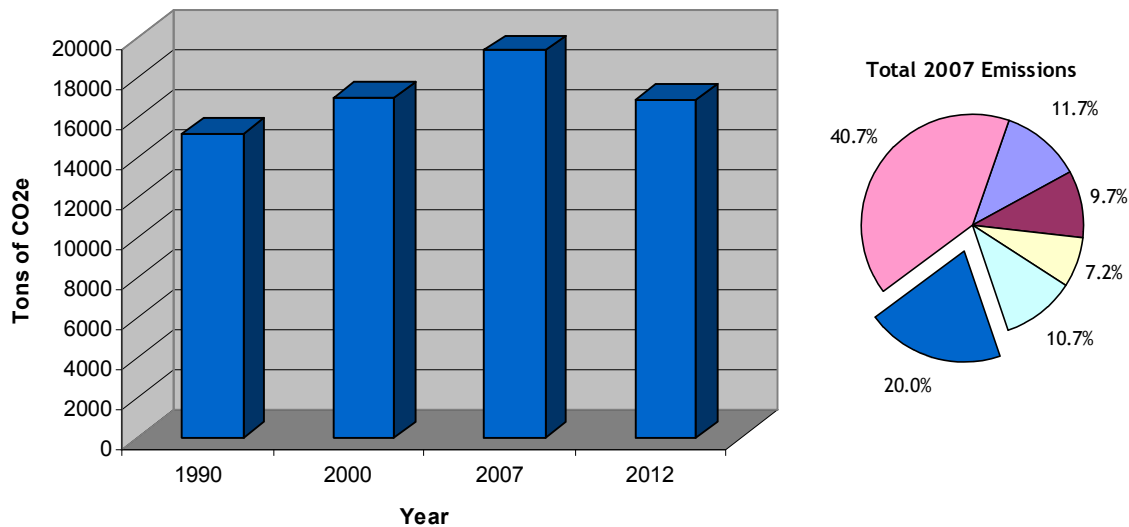
Results

The primary GHG emissions from water and sewage facilities are from natural gas combustion and purchased electricity. In 2007, GHG emissions totaled 19,018 metric tons of CO₂e. The CO₂e attributed to water and wastewater in each year is shown below:

Table 3.6, GHG Emissions from Water and Wastewater

	1990	2000	2007	2012
Metric Tons CO ₂ e	15,231	17,050	19,382	16,919

Figure 3.6, GHG Emissions from Water/Wastewater



The City of Riverside’s Water Quality Control Plant Cogeneration facility and boilers using digester gas would save over 3,762 and 1,346 metric tons of CO₂e respectively in 2012 compared to hypothetically using an equivalent amount of natural gas.

Combined, this reduction is equivalent to the amount of carbon sequestered by 133,282 tree seedlings grown for 10 years.

City of Riverside Greenhouse Gas Emissions Inventory

3.1.6 Waste

Description

Office waste, green waste and construction waste is generated by the City at various buildings and operations.

This waste is collected by three commercial waste contractors and transferred to various managed landfills. Landfill waste is sent to either Badlands landfill with a methane gas to energy plant, El Sobrante landfill with a not fully functional gas to energy plant and flare, or Lamb Canyon landfill with a methane flare. In 2007, 133,765 metric tons of waste was estimated to be disposed of to landfills.

Waste from City Hall and two other buildings have been collected for recycling since 2006. In 2007, 1,183 metric tons of waste was recycled from City Hall and other City buildings.

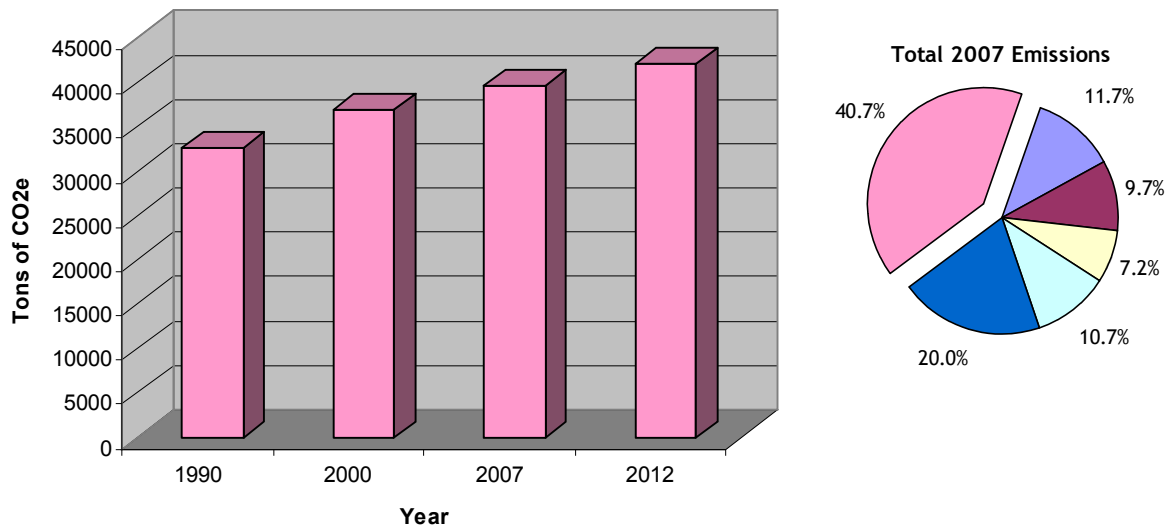
Results

The primary GHG emissions are from decomposition of organic waste. In 2007, total GHG emissions were 39,625 metric tons of CO₂e. The CO₂e attributed to waste in each year is as follows:

Table 3.7, GHG Emissions from Waste

	1990	2000	2007	2012
Metric Tons CO ₂ e	32,610	37,015	39,625	42,171

Figure 3.7, GHG Emissions from Waste



The City's Office Waste recycling program has prevented approximately 1,183 metric tons of waste from filling landfills in 2007. This is equal to over 260,800,000 sheets of office paper, or the weight of 311 elephants.

The CO₂e savings are equivalent to an estimated 632 metric tons of CO₂e emissions. Additionally, the program will continue to save emissions annually, and is anticipated to save 666 metric tons of CO₂e emissions in the year 2012.

City of Riverside Greenhouse Gas Emissions Inventory

3.1.7 Other (Riverside Public Utilities)

Description

The City generates power for sale to the public and for its own operations through Riverside Public Utilities. As some of this electricity is used in City operated buildings, water/wastewater facilities and streetlighting, it is already counted in separate sections in the City Operations inventory, and would be considered double counting to separately total the actual GHG emissions from power generation facilities operated by Riverside Public Utilities.

When a community level greenhouse gas inventory is prepared by the City of Riverside, this will account for emissions which are the result of residential/commercial and industrial consumption of purchased electricity generated by Riverside Public Utilities. As such, these emissions are not included in the City's GHG Inventory as summarized in this report.

Some of the emissions from the operation of Riverside Public Utilities cannot be attributed to either City operations or the community inventory. For example, retail and wholesale sales outside of the City's boundaries are not included in either of these inventories.

Riverside Public Utilities has developed a separate GHG inventory for its operations according to CCAR's Electricity Utilities protocol. The 2006 inventory has been verified, while the 2007 inventory is awaiting verification.

For City departments apart from Riverside Public Utilities, a small proportion of on-site power generation which occurs through cogeneration, generators and solar power at various City operated facilities is included where applicable in the buildings or water/wastewater section of the City GHG inventory.

Note: The unverified GHG emissions for Riverside Public Utilities in 2007 were 1,001,373 metric tons of CO₂e for direct emissions and 52,564 metric tons of CO₂e for indirect emissions.

Additionally, the emissions resulting from the sale of electricity outside the City's boundaries will not be reported within the City Operations or Community inventories. The emissions resulting from the sale of 297,842 MWh would equate to 180,532 metric tons of CO₂e in 2007.

4.0 ACTIVITY DATA DETAILS

4.1 SOURCES OF ALL ACTIVITY DATA REPORTED

4.1.1 Employees and Resident Population

The number of employees at the start of 2008 and 2000 was supplied by the City of Riverside Human Resources Department. This data was backcast to 1990 and forecast to 2012 using the rate of change in employee numbers over this period. The proportion of employees in each employment category was supplied by the City of Riverside Human Resources Department. The proportion of employees in each employment category was assumed to remain the same over time.

1990 and 2000 City population data was obtained from the U.S. Census Bureau, and population data for 2007 was obtained from California Department of Finance estimates. 2025 City population data was obtained from the City of Riverside General Plan and Supporting Documents Environmental Impact Report.

4.1.2 Buildings and Other Facilities

Electricity usage from City owned buildings and other facilities for the years 2000 and 2007 was obtained from the electricity bills from the Riverside Public Utilities. Data within account numbers 167075 and 260296 were utilized, as they are City-owned accounts. Since 1990 data was unavailable, the rate of change between usage in 2000 and 2007 was used to backcast 1990 data. The rate of change, as well as the City's program to increase its usage of renewable energy by 20% by 2010 was used to forecast 2012 data.

Since the electricity bills included various sectors of municipal operations, the electricity usage was allocated to either the Buildings or Water/Wastewater section of the City's GHG Inventory depending on the individual facility usage. Any unidentified facilities were grouped together and assumed to fall under the Building category. Included in the Building category were parks, libraries, museums, administrative buildings, fire and police departments, Riverside Airport and Aerial Labs, buildings associated with public utilities and fleet management, temporary City-owned buildings with the Redevelopment Agency, City parking structures, and power meters and poles.

Natural Gas Stationary Combustion

Natural gas usage for the City's accounts was supplied by the City's representative for Southern California Gas Company. This usage was allocated to either the Buildings or Water/Wastewater section of the City's GHG Inventory depending on the facility usage.

Stationary Diesel Fuel Usage

Stationary diesel fuel usage in other emergency generators was supplied by the Fleet Director for the City's General Services Department. This information was included in the Buildings and Other Facilities sector.

4.1.3 Vehicle Fleet

An inventory of vehicles owned by the City, including alternative fuel vehicles and each of the vehicle's respective miles traveled in 2007, was provided by the Fleet Director for the General Services Department.

An inventory of vehicles owned by the Police Department and each of the vehicle's respective miles traveled for 2007 was provided by the Senior Office Specialist with the Riverside Police Department.

City of Riverside Greenhouse Gas Emissions Inventory

Vehicle CNG usage for 2003 to 2008 was provided by the Fleet Director and the Operations Manager for the General Services Department.

No 2000 or 1990 vehicle data was available, so the mileage data was backcasted using the rate of change within the employee population for various vehicles classes. Data for 2012 was forecasted based on miles traveled trends and the City's targeted amounts of alternative fuel usage.

In 1990 and 2000, no alternative fuels (i.e. CNG, LPG, hybrids, hydrogen, or E85) were being utilized. Therefore, backcast alternative fuel usage from 2007 was assumed to have been diesel or gasoline usage in 1990 and 2000, depending on the vehicle class.

As of September 2006, California law required all diesel fuel to be ultra low sulfur diesel (ULSD). Therefore, it was assumed that any diesel usage prior to 2006 was regular diesel (not ULSD).

"Scooters" within vehicle fleet were placed into the motorcycle category.

4.1.4 Employee Commute

Employee commute mode was assumed to match U.S. Census Year 2000 mode share percentages for various counties as listed in the U.S. Census Bureau's 2000 *Census Transportation Planning Package* (2004).

The number of employees from various postcodes was obtained from the Human Resources Department. Trip distances from each zip code to the City of Riverside were then calculated using zip code databases and Google map trip distance calculators. The average trip distance from each County to the City was then calculated.

The estimated number of trips per year per employee type is shown in the following table:

Employee Type	Days of Work per Year	Trips per Year
Fulltime Benefited	250	500
½ Time Benefited	150	300
¾ Time Benefited	200	400
Temp/Part Time	50	100

The total trip distance for each mode type was then calculated by multiplying the number of employees in each County by the average mode share by the average trip distance by the proportion of employees in each category and number of trips per year.

4.1.5 Streetlights and Traffic Signals

Streetlighting lamp data and hours of operation were supplied by the Public Works Department for 2007 along with a description of the mercury vapor change-out program in previous years.

Traffic light electricity usage and other data for the years 1988 and 2000 were supplied by the Public Works Department. Data from 1990 was assumed to be the same as 1988 data, and 2007 data was assumed to match 2000 data when all incandescent lamps were changed to LEDs.

4.1.6 Water and Sewage Facilities

At the City's water and sewage facilities, the following emission sources were included in the emission inventory:

- Natural Gas Combustion in various small boilers/hot water systems etc. This was represented by various Southern California Gas account numbers including 1225240200, 1896235000, 848229700, 1295833155, and 1421253900.
- Natural Gas Combustion in cogeneration engines from January 2001 onwards.
- Natural gas and digester gas consumed in the fuel cell which began operation in June 2008. This fuel cell converts digester gas to hydrogen gas via a non-combustive process. This hydrogen gas is then used to generate electricity.
- Natural gas usage in the cogeneration engines and fuel cell is represented by Southern California Gas account number 1295833155.
- Landfill gas combustion in cogeneration engines from January 2001 to early 2005. This landfill gas was sent from the Tequesquite Landfill but is now flared on-site at the Landfill.
- Digester gas combustion in boilers, flares and cogeneration engines.
- Electricity purchased from Riverside Public Utilities for use at facilities such as pump stations/pump meters/booster stations/water meters/reservoirs/sewage disposal plant and the Riverside Regional Water Quality Control Plant.

Digester Gas Stationary Combustion

Digester gas production from the Regional Water Quality Control Plant (Plant) cogeneration engines from 1992 to 2008 was supplied by the Wastewater Resources Analyst from the Plant. For 1990, the rate was assumed to equal 1991 rates discussed in the *Wastewater Collection and Treatment Facilities Masterplan* (2008).

Digester gas combustion in flares, cogeneration engines and boilers for 1992 to 2008 was supplied by the Wastewater Resources Analyst from the Plant. For 1990 and 2000, the combustion in each of the flares and boilers was assumed to match the same proportion as 2001 biogas production and combustion in each of these sources. For 1990 and 2000, combustion of digester gas in cogeneration engines was assumed to be zero, as these engines were not yet operational.

Any excess digester gas not consumed in combustion was assumed to be absorbed by passive carbon absorbers and not released directly to the atmosphere.

Landfill Gas Stationary Combustion

The amount of landfill gas used in the Plant cogeneration engines was supplied by the Wastewater Resources Department. Landfill gas was only utilized by the Plant for this purpose between 2001 and 2005. No landfill gas was used for cogeneration during the inventory years 1990, 2000, and 2007 or projected for 2012.

Diesel Fuel Stationary Combustion

Stationary diesel fuel usage in diesel engines was supplied by the Wastewater Resources Analyst from the Plant. This was allocated to the Water/Wastewater section of the City's GHG Inventory.

City of Riverside Greenhouse Gas Emissions Inventory

4.1.7 Waste

Waste data was supplied by the City of Riverside’s Public Works Department.

A typical waste composition for public administration organizations was obtained from the California Integrated Waste Management Board’s *Business Waste Composition Study* (1999) as shown below:

Code	Waste Type	% Composition
1	Paper	39.40%
2	Glass	2.80%
3	Metal	4.80%
4	Plastic	10.90%
5	Other Organic	27.70%
6	Construction and Demolition	12.90%
7	Household Hazardous Waste	0.20%
8	Special Waste	1.20%
9	Mixed Residue	0.20%

In 2007, 133,765 metric tons of waste was sent to landfills from various City buildings.

In 2007, 1,183 metric tons of waste was recycled from City Hall and other City buildings. It was assumed that only paper, plastics and metals were recycled by the City. The typical composition of the landfill and recycling waste streams was then updated to reflect the diversion of these waste types to recycling. No recycling was undertaken in 2000 or 1990.

According to information provided by the Human Resources Department, the City employed 2,809 staff members at the start of 2008 (this number was assumed to represent 2007 employee numbers), 2,593 staff members in the year 2000. These numbers were extrapolated to estimate 2,284 staff members in 1990 and 2,963 staff members in 2012.

Per employee waste disposal and recycling rates for 2007 were used to derive estimates for other years. This resulted in the following calculations for waste tonnages to landfill and recycling from City operations.

Table 4.2, GHG Emissions from Waste

	1990	2000	2007	2012
Landfilled Waste Tons	109,747	124,571	133,765	141,113
Recycled Waste Tons	0	0	1,183	1,247

The landfills to which waste is sent either use landfill gas flares to control emissions or are waste-to-energy facilities.

4.2 METHODOLOGY/EMISSION FACTOR DETAILS

4.2.1 Fuel Emission Factors

Default fuel combustion emission factors were based on ICLEI's CACP software default emission factors.

4.2.2 Purchased Electricity Emission Factors

Electricity CO₂ emission factors from 1990 and 2000 were based on Riverside Public Utilities' verified 2006 Power Utility Protocol (PUP) report electricity deliveries emission factor as included in CCAR public reporting. Because the actual resource mix was not able to be obtained for 1990 and 2000, Riverside Public Utilities' PUP report CO₂ emission factor was taken to be the most accurate emission factor available. The default emission factor included in the CACP software was not considered to be representative, as the typical state power mix has a higher proportion of renewable energy than Riverside Public Utilities, for which coal fired power stations form a large proportion of the power mix. The actual power mix for 1990 and 2000 was not known; however, so it was not possible to develop an accurate emission factor for these years and instead the verified 2006 emission factor was used based on the assumption that the power resource mix has not changed significantly since this time.

Electricity CO₂ emission factors for 2007 were based on Riverside Public Utilities' not yet verified 2007 PUP report electricity deliveries emission factor as supplied by City staff. When this electricity emission factor is verified by CCAR, this can be updated in the CCAR software if any changes are required.

The 2007 PUP report data was used to derive an estimated 2012 electricity CO₂ emission factor, based on Riverside Public Utilities stated RPS goals of 20% eligible renewables by 2010 and 25% by 2015.

Electricity CH₄ and N₂O electricity emission factors for all years were based on default ICLEI CACP software emission factors for Region 13. ICLEI default emission factors were used for these gases as more accurate figures are not included in CCAR public reporting for Riverside Public Utilities.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 RIVERSIDE'S CURRENT GHG EMISSION REDUCTION ACTIONS

The City of Riverside is currently taking various proactive measures in order to reduce GHG emissions. The City's approach consists of multiple renewable fuel power generation projects, public incentive programs, and a communications and marketing campaign. Additionally, the Clean and Green Sustainable Riverside Action Plan outlines many current and proposed methods of reducing emissions.

City actions that relate specifically to municipal operations include the following:

- Cogeneration with methane (grease wastewater) is a program which is converting grease wastewater from restaurants into clean, cost-effective energy. (<http://www.switchonenergy.com/greasetogas.html>)
- Methane with sewage to power 1 megawatt (MW) fuel cell power plant is a program brought on line June 9, 2008. The program is intended to replace one third of the power needed to run the sewage treatment facility. (http://www.pe.com/localnews/environment/stories/PE_News_Local_S_fuelcell04.35d916c.html)
- There are currently nine utility funded Photovoltaic Solar installations around the City that are producing 529.4 kW.
- In the year 2000, the City's fleet was 0% alternatively fueled. Today, 40% of the City's fleet consists of either alternatively fueled vehicles or low emission gas hybrids.

5.2 RECOMMENDED GHG EMISSION REDUCTION ACTIONS

The reduction actions below pertain to municipal operations and have been taken from the City's Green Action Plan in order to quantify the associated emissions reductions.

5.2.1 Buildings

Proposed Measure 1: As per Item 16 of the Clean and Green Sustainable Riverside Action Plan, if the City mandates a green building rating system standard that applies to all new municipal buildings over 5,000 square feet, the City will have an estimated 36% reduction in future energy consumption compared to typical buildings. This would reduce 69 metric tons of CO₂e, which could account for 0.6% of the 11,699 metric ton reduction target required by 2012.

Proposed Measure 2: As per Item 18 of the Clean and Green Sustainable Riverside Action Plan, if the City encourages green operations and maintenance for municipal operations and buildings (by 2009), this is estimated to have a 20% reduction in energy consumption. This would reduce 1,942 metric tons of CO₂e, which could account for 16.6% of the 11,699 metric ton reduction target required by 2012.

Existing Measure 1: The City has already installed solar panels at a number of City properties. This is estimated to generate 156,651 kWh of green electricity each year. This would reduce 89 metric tons of CO₂e. This measure is already included in the 2012 emissions inventory projection.

If the City were to double their solar power usage, this would reduce emissions by an additional 89 metric tons of CO₂e, which could account for 0.8% of the 11,699 metric ton reduction target required by 2012.

5.2.2 Streetlights/Traffic Signals

Recommended Measure 1: Converting 741 High Pressure Sodium 250W lamps to 140W LED lamps is estimated to save over 1,356,707 kWh of electricity usage. Converting 4,361 High Pressure Sodium 200W lamps to 125W LED lamps will save over 338,103 kWh of electricity usage (IQLED, 2008). This would reduce 959 metric tons of CO₂e, which could account for 8.2% of the 11,699 metric ton reduction target required by 2012.

As bulbs require replacement, it is recommended that the City also consider replacing other high pressure sodium streetlights lamps with suitable LEDs.

Existing Measure 2: The City's Streetlighting Mercury Vapor replacement program and Traffic Signal LED replacement program has saved 3,016,439 kWh or 1,707 metric tons of CO₂e in 2012. This measure is already included in the 2012 emissions inventory projection.

5.2.3 Water/Wastewater

Proposed Measure 3: As per Item 38 of the Clean and Green Sustainable Riverside Action Plan, if the City implements a program to reduce the City's per capita potable water usage by 15% by 2025, this is estimated to have a 2,538 metric tons CO₂e reduction in 2012. This estimate is based on the assumption that the greenhouse gas emissions for the water sector are directly proportional to water usage. This reduction could account for 21.7% of the 11,699 metric ton reduction target required by 2012.

5.2.4 Vehicle Fleet

Existing Measure 3: As per Item 29 of the Clean and Green Sustainable Riverside Action Plan, if the City implements a program to increase the number of clean vehicles in the non-emergency city fleet to at least 60% by 2010, this is estimated to result in a reduction of 873 metric tons of CO₂e emissions in 2012. This measure is already included in the 2012 emissions inventory projection.

Existing Measure 4: The City has already introduced a number of clean vehicles. Vehicles already introduced by the City are estimated to result in a reduction of 620 metric tons of CO₂e emissions in 2012. This measure is already included in the 2012 emissions inventory projection.

5.2.5 Employee Commute

Proposed Measure 4: As per Item 32 of the Clean and Green Sustainable Riverside Action Plan, if the City develops and promotes alternative transportation programs to City employees this will reduce GHG emissions.

- Assuming that these alternative transportation programs result in a 15% increase in carpooling and reduction in drive alone commute trips, or 900,355 vehicle miles traveled, this would reduce 542 metric tons of CO₂e, which could account for 4.6% of the 11,699 metric ton reduction target required by 2012.
- Assuming that these alternative transportation programs increase walking and cycling by City employees living within the County of Riverside by 3%, this would potentially reduce vehicle miles traveled by 181,435 and is anticipated to result in a reduction of 111 metric tons of CO₂e emissions in 2012. This could account for 0.9% of the 11,699 metric ton reduction target required by 2012.
- If the City can increase the proportion of employees living within the County of Riverside to utilize public transportation to access work by 5%, this would reduce vehicle miles traveled by

City of Riverside Greenhouse Gas Emissions Inventory

273,864 and will result in a reduction of 62 metric tons of CO₂e emissions in 2012. This which could account for 0.5% of the 11,699 metric ton reduction target required by 2012.

- If the City can increase the proportion of City employees who work from home by 5% this would reduce vehicle mileage by 600,237 miles and will result in a reduction of 366 metric tons of CO₂e emissions in 2012. This could account for 3.1% of the 11,699 metric ton reduction target required by 2012.

5.2.6 Waste

Existing Measure 5: The City has already introduced office waste recycling at City Hall and a number of other locations. The office waste recycling program already in place is estimated to result in a reduction of 666 metric tons of CO₂e emissions in 2012. This measure is already included in the 2012 emissions inventory projection.

Proposed Measure 5: As per Item 12 of the Clean and Green Sustainable Riverside Action Plan, if the City implements a program to increase diversion of waste from landfills by 2% by 2008, this will have a reduction of 3,111 tons of waste and will result in a reduction of 757 metric tons of CO₂e emissions in 2012. This could account for 6.4% of the 11,699 metric ton reduction target required by 2012.

Proposed Measure 6: As per Item 15 of the Clean and Green Sustainable Riverside Action Plan, if the City implements a program to promote green purchasing before 2009, this will reduce upstream waste generation and GHG emissions. However, due to the method used to develop the GHG inventory, these emission reductions will not be counted towards the City of Riverside's emission reduction target, and should be further analyzed in the City's Community Inventory.

Recommended Measure 2: If the City undertakes a Green Waste program which captures 75% of the green waste generated by the City from its properties, this is assumed to represent 19,066 tons of green waste or 3,269 metric tons of CO₂e emission reductions in 2012. This could account for 27.9% of the 11,699 metric ton reduction target required by 2012.

Recommended Measure 3: If the City expands its office waste recycling program to include office paper recycling from at least 15% of all properties, this is assumed to include 8,862 tons of additional office paper recycling. This would reduce 4,298 metric tons of CO₂e, which could account for 36.7% of the 11,699 metric ton reduction target required by 2012.

5.2.7 Electricity Generation

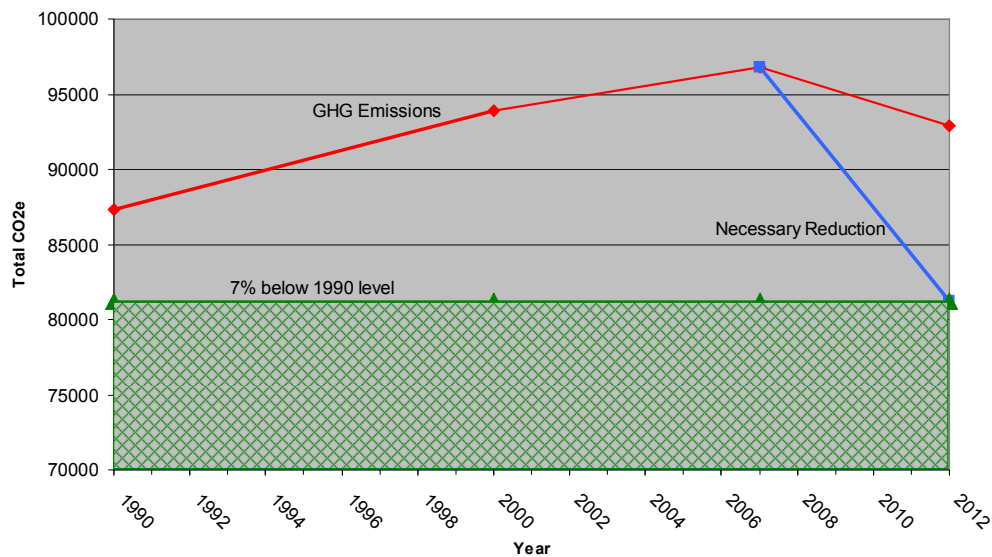
Existing Measure 6: Item 1 of the Clean and Green Sustainable Riverside Action Plan states that the City is to adopt and implement a policy to increase the use of renewable energy to meet 33% of the City's electric load by 2020. This item has already been adopted by the Public Utilities Board, (with interim targets of 20% by 2010 and 25% by 2015). This measure is estimated to reduce the electricity deliveries emission factor to 1111 lbs CO₂/MWh by 2012 and 881 lbs CO₂/MWh by 2020 compared to the 1,336 lbs CO₂/MWh in 2007. This would result in a reduction of 5,687 metric tons of CO₂e emissions from City operated buildings, streetlights and water sectors in 2012 (compared to what would have resulted from the renewable power content which existed in 2007). This measure is already included in the 2012 emissions inventory projection.

City of Riverside Greenhouse Gas Emissions Inventory

5.3 CONCLUSION

Municipal operations within the City of Riverside produced a calculated 87,298 tons of CO₂e in the year 1990, 93,898 tons in 2000, 96,815 tons in 2007 and are projected to produce 92,886 tons of CO₂e in the year 2012. This is a 7.6% increase in the years between 1990 and 2000. Because of the City's proactive measures to reduce their GHG emissions, the City's percentage of increase is much lower than the national average of 14.2%. This trend can be continued in the future years, and even improved upon to reduce emissions by 7% below 1990 levels by the year 2012 -- the goal set forth in the Mayor's Agreement. In order to meet this goal, the City's current output of 96,815 metric tons of CO₂e would have to be reduced by at least 11,699 metric tons by 2012. This goal can be accomplished with the furthered commitment to the reduction strategies set forth in the Green Action Plan.

Current Trend versus Emissions Target



City of Riverside Greenhouse Gas Emissions Inventory

REFERENCES

- BBE LED, *LED Streetlights*, (2008). Webpage: http://bbeled.com/LED_Streetlight.htm
- California Integrated Waste Management Board (CIWMB) *Business Waste Composition Study for Public Administration*. (1999). Webpage: <http://www.ciwmb.ca.gov/WASTECHAR/BizGrpCp.asp>
- California Integrated Waste Management Board (CIWMB) *Statewide Waste Composition Study: Results and Final Report*. (1999). Webpage: <http://www.ciwmb.ca.gov/Publications/default.asp?pubid=824>, [Source: http://www.ciwmb.ca.gov/WASTECHAR/DispRate.htm](http://www.ciwmb.ca.gov/WASTECHAR/DispRate.htm)
- Carollo Engineers, *City of Riverside Wastewater Collection and Treatment Facilities Integrated Master Plan, Volume 4: Wastewater Treatment System* (February 2008). Webpage: <http://www.riversideca.gov/PDF2/masterplan/Vol%204%20-%20Ch%2002%20-%20Summary%20of%20Planning%20Studies.pdf>
- City of Riverside Public Utilities, *Green Riverside* (2008). Webpage: <http://www.riversideca.gov/utilities/comm-gp.asp>,
- ICLEI, *About ICLEI* (2008). Webpage: <http://www.iclei.org/index.php?id=global-about-iclei>
<http://www.iqled.com/>
- Metropolitan Transportation Commission, *Census Transportation Planning Package Part 3-Journey to Work Data (CTPP2000)*. (2004) Webpage: http://www.mtc.ca.gov/maps_and_data/datamart/census/ctpp2000/
- IQLED, *LED Streetlight LED Bulb LED Traffic Light Manufacturer and Exporter IQLED.com*. Webpage: <http://www.iqled.com/>
- Kats, Greg. *The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force*, (October 2003).
- Phillips, *White Paper: Streetlighting*
<http://www.philipslumileds.com/pdfs/WP14.pdf>
Webpage: <http://www.philipslumileds.com/pdfs/WP14.pdf>
- Santa Barbara County, *Environmental Thresholds and Guidelines Manual (which cites Matrix Management Group, et al. Best Management Practices Analysis for Solid Waste (1988), (1990)*. Webpage: <http://www.ciwmb.ca.gov/WASTECHAR/WasteGenRates/Institution.htm>
- State of California, Department of Finance, *E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change – January 1, 2007 and 2008*. Webpage: http://www.dof.ca.gov/research/demographic/reports/estimates/e-1_2006-07/
- U.S. Census Bureau, *American Fact Finder - Riverside City, 1990, 2000*. Webpage: <http://factfinder.census.gov/>
- U.S. Environmental Protection Agency, *Greenhouse Gas Equivalencies Calculator* (2008). Webpage: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>
- U.S. Environmental Protection Agency, *Greenhouse Gas Emissions*. Webpage: <http://www.epa.gov/climatechange/emissions/index.html>
- The United States Council of Mayors, *U.S. Conference of Mayors Climate Protection Agreement (2007)*. Webpage: <http://www.usmayors.org/climateprotection/agreement.htm>
- Western Riverside Council of Governments, *TUMF Spotlight: The City of Riverside* (2007). Webpage: http://www.wrcog.cog.ca.us/ewrcog/etumf0702_main1.html

APPENDICES