Appendix A

San Bernardino County Regional 2008 Community Greenhouse Gas Inventories

San Bernardino County Regional 2008 Community Greenhouse Gas Inventories and 2020 Forecasts

June 2013

ICF Reference: 00543.12

Adelanto	Needles
Big Bear Lake	Ontario
Chino	Rancho Cucamonga
Chino Hills	Redlands
Colton	Rialto
Fontana	San Bernardino
Grand Terrace	Twentynine Palms
Hesperia	Victorville
Highland	Yucaipa
Loma Linda	Yucca Valley
Montclair	

Prepared for:
San Bernardino Associated Governments and Participating San Bernardino County Cities

Submitted by:
ICF International
620 Folsom Street
Suite 200
San Francisco, CA 94107
Tel: (415) 677-7100
Fax: (415) 677-7177

San Bernardino County Regional 2008 Community Greenhouse Gas Inventories and 2020 Forecasts

Prepared for:

San Bernardino Associated Governments and Participating San Bernardino County Cities[1]
1170 W 3rd Street, 2nd Floor
San Bernardino, CA 92410-1715
Contact: Steven Smith
(909) 884-8276

Prepared by:

ICF International
620 Folsom Street, Suite 200
San Francisco, CA 94107
Contact: Rich Walter
(510) 290-1860

June 2013

[1] "San Bernardino Associated Governments and Participating San Bernardino County Cities" is a placeholder name for the informal regional partnership, consisting of SANBAG and twenty cities in San Bernardino County that have funded the regional greenhouse gas inventory and reduction plan project. This name may be updated in the future.

ICF International. 2013. *San Bernardino County Regional 2008 Community Greenhouse Gas Inventories and 2020 Forecasts*. June. (ICF 00543.12.) San Francisco, CA. Prepared for San Bernardino Associated Governments and Participating San Bernardino County Cities, San Bernardino, CA.

Governments
SANBAG
Working Together

Adelanto

Big Bear Lake

Chino

Chino Hills

Colton

Fontana

Grand Terrace

Hesperia

Highland

Loma Linda

Montclair

Needles

Ontario

Rancho Cucamonga

Redlands

Rialto

San Bernardino

Twentynine Palms

Victorville

Yucaipa

Yucca Valley

Contents

List of Tables iii
List of Figures v
List of Acronyms and Abbreviations vii

Section 1 Executive Summary 1-1
1.1 SANBAG and San Bernardino County Cities Partnership 1-1
1.2 This Report 1-2
1.3 Regional Emissions—2008 and 2020 1-3
1.3.1 Emissions by Sector 1-3
1.3.2 Emissions by City 1-1
1.3.3 San Bernardino Regional per Capita Emissions 1-4
1.4 Next Steps 1-8
1.4.1 Climate Action Plans and Reduction Targets 1-8
1.4.2 GHG Monitoring 1-8
1.4.3 Climate Action Plan, General Planning, and CEQA 1-8

Section 2 Background Information 2-1
2.1 Greenhouse Gases, the Greenhouse Effect, and Climate Change 2-1
2.2 GHG Inventories 2-2
2.3 San Bernardino County 2-3

Section 3 Inventory Results by City 3-1
3.1 Adelanto 3-2
3.2 Big Bear Lake 3-5
3.3 Chino 3-8
3.4 Chino Hills 3-11
3.5 Colton 3-14
3.6 Fontana 3-17
3.7 Grand Terrace 3-20
3.8 Hesperia 3-23
3.9 Highland 3-26
3.10 Loma Linda 3-29
3.11 Montclair 3-32
3.12 Needles 3-35
3.13 Ontario 3-38
3.14 Rancho Cucamonga 3-41

3.15 Redlands 3-44
3.16 Rialto 3-47
3.17 San Bernardino 3-50
3.18 Twentynine Palms 3-53
3.19 Victorville 3-56
3.20 Yucaipa 3-61
3.21 Yucca Valley 3-64

Section 4 Inventory Results by Sector 4-1

4.1 Building Energy Use Emissions 4-1
4.2 Stationary Source Emissions 4-3
4.3 Light/Medium-Duty Vehicle Emissions 4-6
4.4 Heavy-Duty Vehicles 4-9
4.5 Off-Road Equipment Emissions 4-12
4.6 Agricultural Emissions 4-14
4.7 Solid Waste Management Emissions 4-16
4.8 Wastewater Treatment Emissions 4-18
4.9 Water Transport, Distribution, and Treatment Emissions 4-20
4.10 Indirect Emissions of Sulfur Hexafluoride due to Electricity Consumption 4-23

Section 5 Methods 5-1

5.1 Inventory Definitions 5-1
5.2 2020 Business-as-Usual Forecast 5-2
5.3 Inventory Protocols 5-3
5.4 Emission Factors 5-4
5.5 Analysis Methods 5-5
5.6 Inventory Limitations and Recommendations 5-10
5.6.1 Emissions Sinks 5-10
5.6.2 Activity Data 5-10
5.6.3 High Global Warming Potential Gases 5-11
5.6.4 On-Road Transportation 5-11
5.6.5 2020 Business-as-Usual Forecasts 5-11

Section 6 References 6-1

Tables

Table		Page
1-1	San Bernardino Regional 2008 Community Greenhouse Gas Inventory and 2020 Forecast by Sector ($MTCO_2e$)	1-3
1-2	San Bernardino Regional 2008 Community Greenhouse Gas Inventory and 2020 Forecast by City ($MTCO_2e$)	1-2
2-1	San Bernardino County, Partnership Cities Population, Housing, and Employment Estimates and Forecasts	2-5
3-1	Adelanto 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-2
3-2	Big Bear Lake 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-5
3-3	Chino 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-8
3-4	Chino Hills 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-11
3-5	Colton 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-14
3-6	Fontana 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-17
3-7	Grand Terrace 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-20
3-8	Hesperia 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-23
3-9	Highland 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-26
3-10	Loma Linda 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-29
3-11	Montclair 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-32
3-12	Needles 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-35
3-13	Ontario 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-38
3-14	Rancho Cucamonga 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-41
3-15	Redlands 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-44
3-16	Rialto 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)	3-47

3-17 San Bernardino 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$) 3-50

3-18 Twentynine Palms 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$) 3-53

3-19 Victorville 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$) 3-56

3-20 Yucaipa 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$) 3-61

3-21 Yucca Valley 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$) 3-64

4-1 2008 and 2020 BAU Forecast Building Energy Use Emissions by City and Sector 4-2

4-2 2008 Stationary Source Emissions by City ($MTCO_2e$) 4-4

4-3 2020 BAU Stationary Source Emissions by City ($MTCO_2e$) 4-5

4-4 2008 Light/Medium-Duty Vehicle VMT and Emissions by City 4-7

4-5 2020 BAU Forecast Light/Medium-Duty Vehicle VMT and Emissions by City 4-8

4-6 2008 Truck VMT and Emissions by City 4-10

4-7 2020 BAU Forecast Truck VMT and Emissions by City 4-11

4-8 2008 and 2020 BAU Forecast Off-Road Equipment Emissions by City 4-13

4-9 2008 and 2020 BAU Forecast Agriculture Emissions by City 4-15

4-10 Generation-Based Solid Waste Management Emissions for 2008 and 2020 BAU Projections by City 4-17

4-11 2008 and 2020 BAU Forecast Fugitive Wastewater Treatment Emissions by City 4-19

4-12 2008 Water Transport, Distribution, and Treatment GHG Emissions by City 4-21

4-13 2020 BAU Forecast Water Transport, Distribution, and Treatment Greenhouse Gas Emissions by City 4-22

4-14 2008 and 2020 BAU Forecast Sulfur Hexafluoride Emissions from Electricity Consumption by City 4-24

5-1 Greenhouse Gas Emission Factors 5-4

5-2 Community Inventory Data Sources and Methods 5-6

5-3 San Bernardino Population, Housing, and Employment Estimates and Forecasts 5-9

Figures

Figure		Page
1-1	San Bernardino County Regional 2008 Community Greenhouse Gas Inventory and 2020 Forecast	1-4
1-2	San Bernardino Regional 2008 Greenhouse Gas Emissions by City	1-3
1-3	Per Capita Greenhouse Gas Emissions for Partnership Cities	1-5
1-4	2008 Per Capita Greenhouse Gas Emissions by City and Region	1-6
1-5	2008 Per Capita Building Energy Emissions by City	1-7
2-1	San Bernardino County Map	2-4
3-1a	Adelanto GHG Emissions by Sector for 2008	3-3
3-1b	Adelanto GHG Emissions by Sector for 2008 and 2020	3-4
3-2a	Big Bear Lake GHG Emissions by Sector for 2008	3-6
3-2b	Big Bear Lake GHG Emissions by Sector for 2008 and 2020	3-7
3-3a	Chino GHG Emissions by Sector for 2008	3-9
3-3b	Chino GHG Emissions by Sector for 2008 and 2020	3-10
3-4a	Chino Hills GHG Emissions by Sector for 2008	3-12
3-4b	Chino Hills GHG Emissions by Sector for 2008 and 2020	3-13
3-5a	Colton GHG Emissions by Sector for 2008	3-15
3-5b	Colton GHG Emissions by Sector for 2008 and 2020	3-16
3-6a	Fontana GHG Emissions by Sector for 2008	3-18
3-6b	Fontana GHG Emissions by Sector for 2008 and 2020	3-19
3-7a	Grand Terrace GHG Emissions by Sector for 2008	3-21
3-7b	Grand Terrace GHG Emissions by Sector for 2008 and 2020	3-22
3-8a	Hesperia GHG Emissions by Sector for 2008	3-24
3-8b	Hesperia GHG Emissions by Sector for 2008 and 2020	3-25
3-9a	Highland GHG Emissions by Sector for 2008	3-27
3-9b	Highland GHG Emissions by Sector for 2008 and 2020	3-28
3-10a	Loma Linda GHG Emissions by Sector for 2008	3-30

3-10b Loma Linda GHG Emissions by Sector for 2008 and 2020 3-31

3-11a Montclair GHG Emissions by Sector for 2008 3-33

3-11b Montclair GHG Emissions by Sector for 2008 and 2020 3-34

3-12a Needles GHG Emissions by Sector for 2008 3-36

3-12b Needles GHG Emissions by Sector for 2008 and 2020 3-37

3-13a Ontario GHG Emissions by Sector for 2008 3-39

3-13b Ontario GHG Emissions by Sector for 2008 and 2020 3-40

3-14a Rancho Cucamonga GHG Emissions by Sector for 2008 3-42

3-14b Rancho Cucamonga GHG Emissions by Sector for 2008 and 2020 3-43

3-15a Redlands GHG Emissions by Sector for 2008 3-45

3-15b Redlands GHG Emissions by Sector for 2008 and 2020 3-46

3-16a Rialto GHG Emissions by Sector for 2008 3-48

3-16b Rialto GHG Emissions by Sector for 2008 and 2020 3-49

3-17a San Bernardino GHG Emissions by Sector for 2008 3-51

3-17b San Bernardino GHG Emissions by Sector for 2008 and 2020 3-52

3-18a Twentynine Palms GHG Emissions by Sector for 2008 3-54

3-18b Twentynine Palms GHG Emissions by Sector for 2008 and 2020 3-55

3-19a Victorville GHG Emissions by Sector for 2008 with Cement Plant Emissions 3-57

3-19b Victorville GHG Emissions by Sector for 2008 and 2020 with Cement Plant Emissions 3-58

3-19c Victorville GHG Emissions by Sector for 2008 without Cement Plant Emissions 3-59

3-19d Victorville GHG Emissions by Sector for 2008 and 2020 without Cement Plant Emissions 3-60

3-20a Yucaipa GHG Emissions by Sector for 2008 3-62

3-20b Yucaipa GHG Emissions by Sector for 2008 and 2020 3-63

3-21a Yucca Valley GHG Emissions by Sector for 2008 3-65

3-21b Yucca Valley GHG Emissions by Sector for 2008 and 2020 3-66

4-1 2008 and 2020 BAU Forecast Building Energy Use Emissions by City 4-3

4-2 2008 and 2020 BAU Forecast Stationary Source Emissions by City 4-6

4-3 2008 and 2020 BAU Forecast Light/Medium-Duty Vehicle VMT and Emissions by City 4-9

4-4 2008 and 2020 BAU Forecast Heavy-Duty Vehicle Emissions by City 4-12

4-5 2008 and 2020 BAU Forecast Off-Road Equipment Emissions by City 4-14

4-6 2008 and 2020 BAU Forecast Agriculture Emissions by City 4-16

4-7 2008 and 2020 BAU Forecast Solid Waste Management Emissions by City 4-18

4-8 2008 and 2020 BAU Forecast Wastewater Treatment Emissions by City 4-20

4-9 2008 and 2020 BAU Forecast Water Transport, Distribution, and Treatment Emissions by City 4-23

4-10 2008 and 2020 BAU Forecast Sulfur Hexafluoride Emissions from Electricity Consumption by City 4-25

Acronyms and Abbreviations

AB 32	Assembly Bill 32
AEP	Association of Environmental Professionals
AR4	Fourth Assessment Report
BAU	business as usual
BVES	Bear Valley Electric Services
CAP	climate action plan
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	methane
CIWMB	California Integrated Waste Management Board
CNG	compressed natural gas
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CPU	Colton Public Utilities
CPUC	California Public Utilities Commission
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
°F	Fahrenheit
GHG	greenhouse gas
GHG:ID	Greenhouse Gas Inventory Database
GWP	global warming potential
HCFCs	halogenated fluorocarbons
HFCs	hydrofluorocarbons
ICF	ICF International
IEUA	Inland Empire Utilities Agency
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram
kWh	kilowatt-hour
KWh/MG	kilowatt hour per million gallons

LGOP	Local Governments Operations Protocol
LMOP	Landfill Methane Outreach Program
MDAQMD	Mojave Desert Air Quality Management District
$MTCO_2e$	metric tons carbon dioxide equivalent
N_2O	nitrous oxide
NAFA	National Association of Fleet Administrators
Needles PUA	Needles Public Utility Authority
ODS	ozone-depleting substances
OPR	Office of Planning and Research
PFCs	perfluorocarbons
SANBAG	San Bernardino Associated Governments
SAR	Second Assessment Report
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCG	Southern California Gas Company
SEEC	Statewide Energy Efficiency Collaborative
SF_6	sulfur hexafluoride
SWG	Southwest Gas
SWP	State Water Project
UNFCCC	United Nations Framework Convention on Climate Change
UWMP	Urban Water Management Plan
VMT	vehicle miles travelled
VMUS	Victorville Municipal Utility Services
WWTP	wastewater treatment plant

Section 1
Executive Summary

1.1 SANBAG and San Bernardino County Cities Partnership

In 2006, the California Legislature passed Assembly Bill 32 (AB) 32, the Global Warming Solutions Act of 2006. The law establishes a limit on greenhouse gas (GHG) emissions for the State of California to reduce state-wide emissions to 1990 levels by2020. The law directed the California Air Resources Board (CARB) to develop a plan (AB 32 Scoping Plan) that charts a path toward the GHG reduction goal using all technologically feasible and cost-effective means. The Scoping Plan recommends that California cities and counties seek to reduce their GHG emissions to a level that is 15% below current levels. Senate Bill (SB) 375, passed in 2008, requires regional transportation planning to promote reductions in passenger and light duty vehicle GHG emissions.

The jurisdictions in San Bernardino County (County) face a demanding challenge to meet the targets established by the State of California to address global warming, through the requirements of AB 32 and SB 375. In response to these initiatives, an informal project partnership, led by the San Bernardino Associated Governments (SANBAG) and including many of the city governments in San Bernardino County, titled (for the purposes of this report) "San Bernardino Associated Governments and Participating San Bernardino County Cities Partnership" (or "Partnership"), is seeking to reduce GHG emissions associated with regional activities. The Partnership has committed to undertake the following actions that will reduce GHG emissions associated with its regional (or 21-city region[1]) activities as a whole:

About SANBAG

The San Bernardino Associated Governments is the transportation planning agency for San Bernardino County County. It serves 1.9 million residents and is responsible for regional planning and ensuring an efficient multi-modal transportation system. SANBAG also provides a forum for integrated planning across the County. Local governments within San Bernardino County can address issues of mutual concern with a unified voice through SANBAG.

1. prepare a current year (2008) GHG emissions inventory for each of the 21 Partnership cities;
2. prepare a future year (2020) GHG emissions forecast for each of the cities;
3. provide a tool to each city for developing a municipal inventory (i.e., emissions due only to the city's municipal operations and sometimes referred to as a municipal inventory) and municipal reduction plan;
4. develop regional (21-city regional) and local (single municipality) GHG reduction measures for the following sectors: building energy, water, transportation, off-road equipment, waste, and stationary fuel combustion; and

[1] For simplicity, this report refers to the sum of the participating city inventories/emissions as the "21-city region" inventory or "regional" emissions. The regional emissions do not include emissions from all jurisdictions in San Bernardino County (e.g., not the 3 other cities that are not participating), emissions in the unincorporated County area, or emissions from sources (such as federal lands or the Ontario International Airport) not under the control of the individual jurisdictions participating in this effort.

5. develop community climate action plans (CAPs) for each jurisdiction meeting jurisdiction-identified reduction goals.

By working in a collaborative manner on these goals, the cities aim to more effectively address emissions from activities that are affected or influenced by the region as a whole.

The 21 cities participating in this study are:

Adelanto	Big Bear Lake	Chino
Chino Hills	Colton	Fontana
Grand Terrace	Hesperia	Highland
Loma Linda	Montclair	Needles
Ontario	Rancho Cucamonga	Redlands
Rialto	San Bernardino	Twentynine Palms
Victorville	Yucaipa	Yucca Valley

1.2 This Report

This document satisfies the following goals of the Partnership:

1. Prepare a current year (2008) GHG emissions inventory for each of the 21 Partnership cities.
2. Prepare a future year (2020) GHG emissions forecast for each of the cities.

This report summarizes the 2008 GHG emissions inventory and forecasted GHG emissions in 2020 for each of the 21 Partnership cities. The 2008 emissions inventory and 2020 emissions forecast include GHG emissions from the following sources: building energy use (residential, commercial, and industrial); stationary fuel combustion (including industrial activities); light/medium-duty vehicles; heavy-duty vehicles; off-road equipment; agriculture; solid waste management and wastewater treatment; water transport, distribution, and treatment; and sulfur hexafluoride (SF_6) from electricity transmission.

Emissions for all 21 cities combined is referred to as “Regional Community Greenhouse Gas Inventory” or “Regional Emissions” throughout this report.

Additionally, this report provides background and introductory information related to climate change and climate change policy, a description of the methods used to prepare the inventory, and inventory results for each city in the Partnership. Similar to the state-level GHG planning framework, the 2008 GHG inventory forms a baseline from which to forecast future year (2020) emissions. The 2020 emissions projection, or forecast, represents business as usual (BAU) emissions (i.e., emissions that would occur in the absence of action taken by local, state, and federal governments or by private parties to mitigate emissions) associated with each city in 2020. GHG reduction targets and actions selected by each city to reduce emissions by 2020 will be addressed in subsequent project documents.

1.3 Regional Emissions—2008 and 2020

1.3.1 Emissions by Sector

Table 1-1 lists 2008 GHG emissions by sector for the sum of the cities participating in the Partnership. Regional Emissions in 2008 are also shown by sector in Figure 1-1. GHG emissions for each city are described in Section 2, *Background Information*. and summarized in Table 1-2.

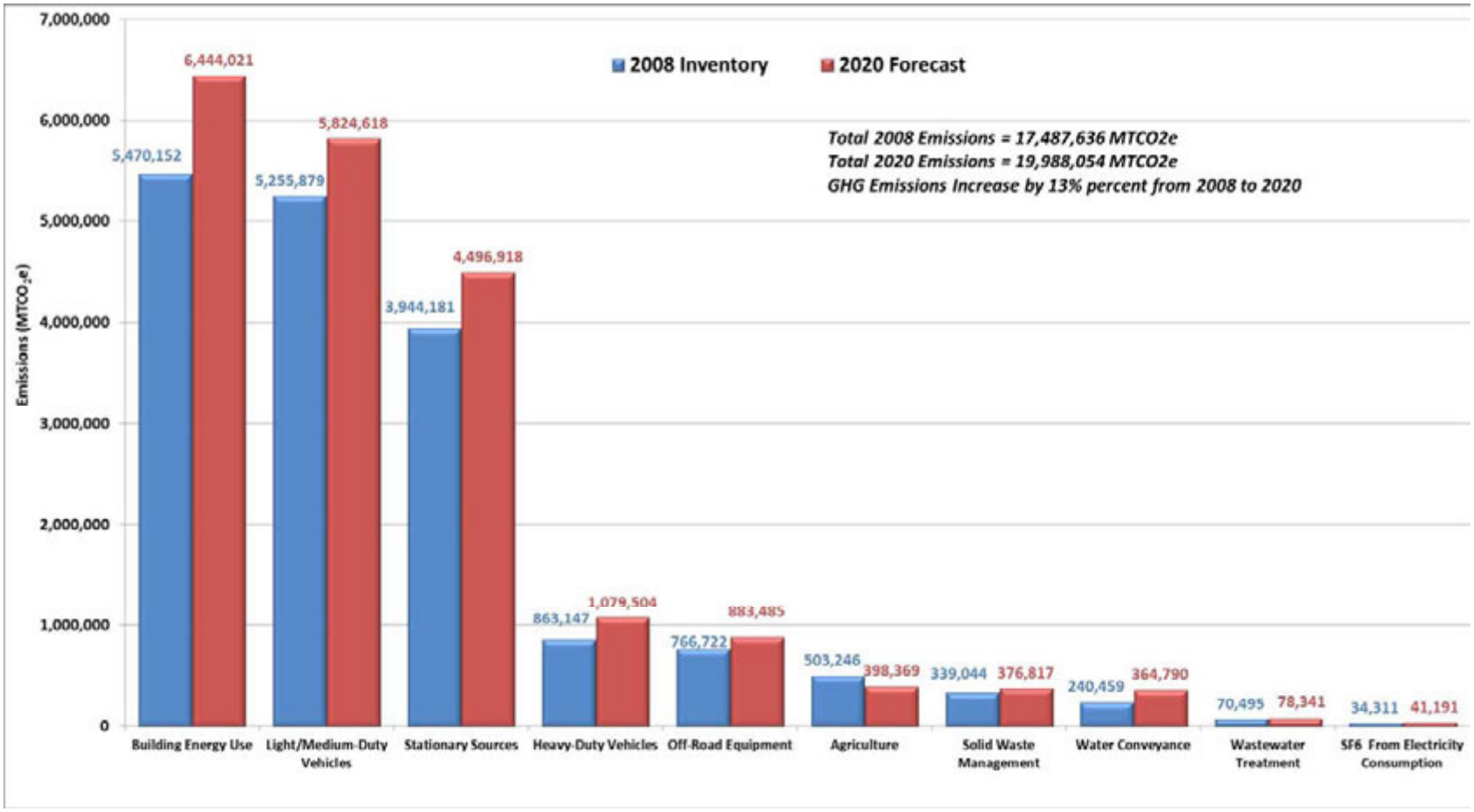
Emissions include direct emissions from a source, such as the combustion of natural gas for heating, and indirect emissions from a source, such as the GHG emissions of electricity generation that may occur outside the inventory area, but occur as a result of electricity demands within the inventory area.

Table 1-1. San Bernardino Regional 2008 Community Greenhouse Gas Inventory and 2020 Forecast by Sector ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
	Emissions	Percent	Emissions	Percent
Residential Natural Gas	1,056,849	6.0%	1,244,583	6.2%
Commercial/Industrial Natural Gas	1,214,245	6.9%	1,460,651	7.3%
Residential Electricity	1,098,037	6.3%	1,292,070	6.5%
Commercial/Industrial Electricity	2,101,021	12.0%	2,446,717	12.2%
Stationary Sources	3,944,181	22.6%	4,496,918	22.5%
Light/Medium-Duty Vehicles	5,255,879	30.1%	5,824,618	29.1%
Heavy-Duty Vehicles	863,147	4.9%	1,079,504	5.4%
Off-Road Equipment	766,722	4.4%	883,485	4.4%
Agriculture	503,246	2.9%	398,369	2.0%
Solid Waste Management	339,044	1.9%	376,817	1.9%
Wastewater Treatment	70,495	0.4%	78,341	0.4%
Water Transport, Distribution, and Treatment	240,459	1.4%	364,790	1.8%
SF_6 from Electricity Combustion	34,311	0.2%	41,191	0.2%
Total GHG Emissions	17,487,636	100%	19,988,054	100%

$MTCO_2e$ = metric tons carbon dioxide equivalent.
SF_6 = sulfur hexafluoride.

Figure 1-1. San Bernardino County Regional 2008 Community Greenhouse Gas Inventory and 2020 Forecast



Total Regional Emissions in 2008 were 17,487,636 metric tons carbon dioxide equivalent ($MTCO_2e$), approximately 3.6% of California's GHG emissions in 2008. In 2008, the top three sources of emissions in the region were:

- light/medium-duty vehicles,
- building energy use[2], and
- stationary sources[3].

Total GHG emissions from light/medium-duty vehicles in the region were 5,255,879 $MTCO_2e$ in 2008. On-road transportation is typically a considerable component of a community's total GHG emissions; ranging from 30% to 60%, depending upon other sources and local conditions. State-wide on-road transportation emissions are approximately 40% of total emissions.

Total GHG emissions in the building energy sector in 2008 were 5,470,152 $MTCO_2e$ (Figure 1-1). Building energy is often one of the largest sources of GHG emissions in community inventories and includes the residential, commercial, and industrial components. Emissions result from the energy consumed to heat, cool, and light buildings as well as natural gas used for cooking. Measures that improve the overall energy efficiency of new and existing buildings in the region have high potential to significantly reduce regional GHG emissions by 2020. Total GHG emissions from stationary sources in the region were 3,944,181 $MTCO_2e$ in 2008. For some communities, stationary source fossil fuel combustion represents a small component of the GHG footprint but in others they can be substantial, depending on the specific nature and extent of industry in each jurisdiction. These emissions are largely the result of industrial and commercial activity and signify the prominent role of industry in the region. This also indicates that industrial efficiency standards could have a significant impact on reducing regional GHG emissions by 2020.

Additional sources of GHG emissions in the region include heavy-duty vehicles; off-road equipment; agriculture; solid waste management; water transport, distribution, and treatment; wastewater treatment; and sulfur hexafluouride from electricity consumption.

Regional emissions in 2020 are projected to be 19,988,054 $MTCO_2e$, an increase of approximately 14% from 2008 levels. In the absence of mitigation measures, the regional allocation of emissions by sector in 2020 will remain largely unchanged from that in 2008. As such, the largest sources of GHG emissions in 2020 in this constant scenario are projected to be light/medium-duty vehicles, building energy use, and stationary sources.

1.3.2 Emissions by City

Table 1-2 lists 2008 GHG emissions for each individual jurisdiction, and shows the relative contribution of each city's emissions to the total (or sum of the cities' emissions). These city emissions are also shown in Figure 1-2. GHG emissions for each individual city are described in detail by sector in Section 2, "Background Information."

[2] Includes electricity and natural gas use in residential, commercial and industrial buildings

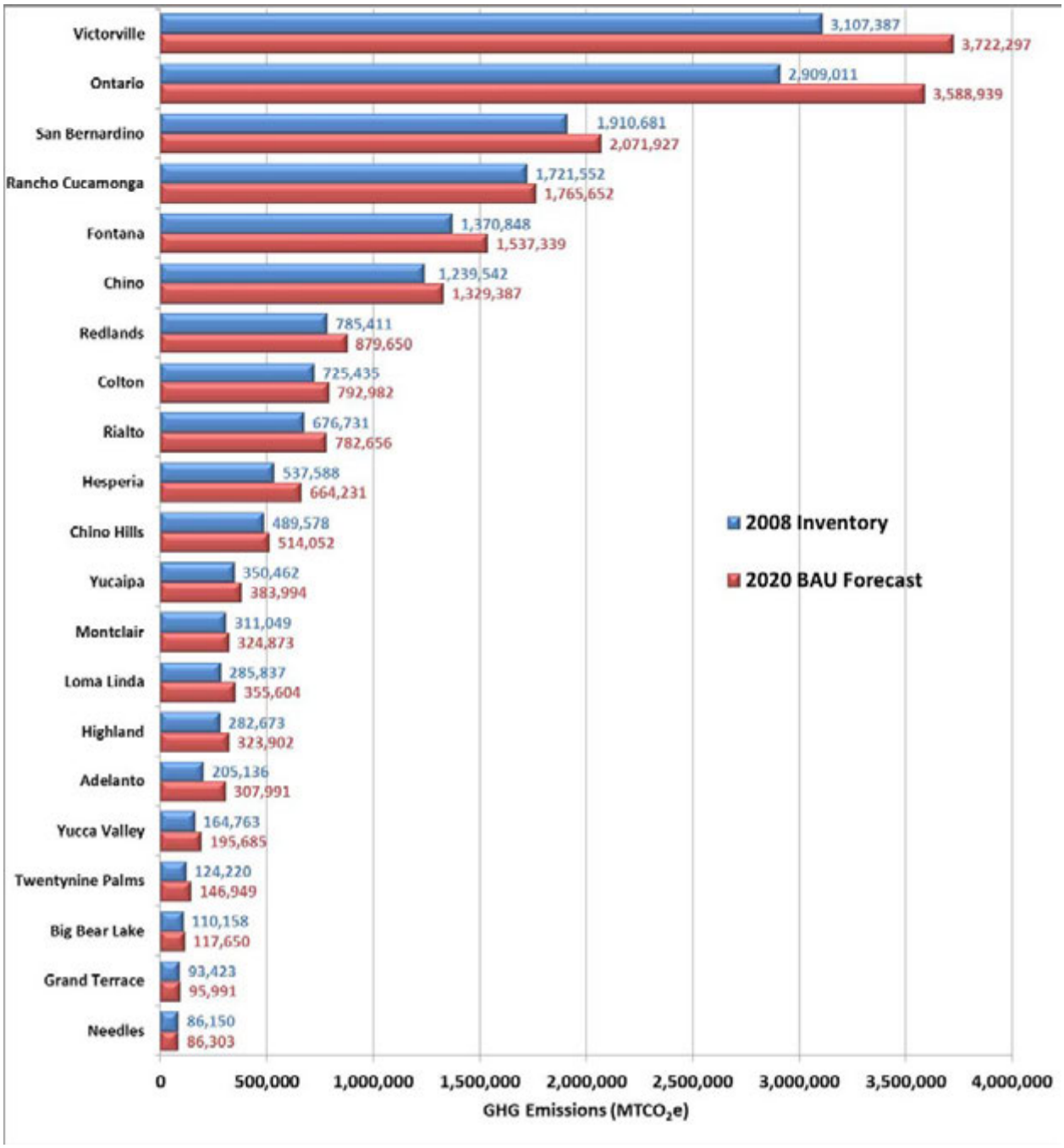
[3] Stationary sources include burning of fossil fuels on site other than natural gas. Examples include boilers and industrial equipment. These emissions are discussed in more detail in Section 4.2.1.

Table 1-2. San Bernardino Regional 2008 Community Greenhouse Gas Inventory and 2020 Forecast by City ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
City	Emissions	Percent	Emissions	Percent
Adelanto	205,136	1.2%	307,991	1.5%
Big Bear Lake	110,158	0.6%	117,650	0.6%
Chino	1,239,542	7.1%	1,329,387	6.7%
Chino Hills	489,578	2.8%	514,052	2.6%
Colton	725,435	4.1%	792,982	4.0%
Fontana	1,370,848	7.8%	1,537,339	7.7%
Grand Terrace	93,423	0.5%	95,991	0.5%
Hesperia	537,588	3.1%	664,231	3.3%
Highland	282,673	1.6%	323,902	1.6%
Loma Linda	285,837	1.6%	355,604	1.8%
Montclair	311,049	1.8%	324,873	1.6%
Needles	86,150	0.5%	86,303	0.4%
Ontario	2,909,011	16.6%	3,588,939	18.0%
Rancho Cucamonga	1,721,552	9.8%	1,765,652	8.8%
Redlands	785,411	4.5%	879,650	4.4%
Rialto	676,731	3.9%	782,656	3.9%
San Bernardino	1,910,681	10.9%	2,071,927	10.4%
Twentynine Palms	124,220	0.7%	146,949	0.7%
Victorville	3,107,387	17.8%	3,722,297	18.6%
Yucaipa	350,462	2.0%	383,994	1.9%
Yucca Valley	164,763	0.9%	195,685	1.0%
Total	17,487,636	100.0%	19,988,054	100.0%

$MTCO_2e$ = metric tons carbon dioxide equivalent.

Figure 1-2. San Bernardino Regional 2008 Greenhouse Gas Emissions by City



The jurisdictions with the highest levels of GHG emissions in 2008 were as follows, in order of emissions magnitude (from largest):

- Victorville,
- Ontario,
- San Bernardino,
- Rancho Cucamonga, and
- Fontana.

In general, total GHG emissions are proportional to a city's population, total employment, or a combination of both. These five cities have the highest populations of the Partnership jurisdictions and the highest number of jobs. However, in the case of Victorville, total emissions are heavily influenced by the presence of the CEMEX cement plant, a large stationary source within the city's jurisdictional boundaries.

These same five cities will also have the highest projected levels of emissions in 2020. These cities are expected to remain the most populous in the region with a high level of employment. The CEMEX cement plant is expected to be operational in 2020 and will continue to greatly influence emissions in Victorville.

1.3.3 San Bernardino Regional per Capita Emissions

On a state level, the AB 32 reduction target corresponds to a per capita emissions goal for 2020 of approximately 9.7 $MTCO_2e$, representing the level of emissions needed to achieve 1990 levels by 2020. The San Bernardino regional 2008 per capita emissions are 11.2 $MTCO_2e$, representing the average of all cities' per capita emissions. California average per capita emissions in 2008 are 13.0 $MTCO_2e$ and U.S. average per capita emissions are 19.7 $MTCO_2e$ (California Air Resources Board 2010a; U.S. Environmental Protection Agency 2010a).

Excluding cement manufacturing emissions (all located in Victorville at the CEMEX plant), the 21-city regional average would 9.8 $MTCO_2e$.

Per capita emissions vary depending on the methods used to estimate emissions for each individual source and the types of emissions sources included in each inventory, as well as climate zones, spatial layouts of cities, industries, and major power sources (i.e., coal, nuclear, natural gas, or hydroelectric). While the methods used for this inventory is consistent for all cities included, per capita emissions for other cities and jurisdictions not included in this study could be based on different methodologies, producing some uncertainty in comparisons made.

Figure 1-3 presents average 2008 per capita emissions grouped by the cities located in the mountain, valley, and desert areas of the County.[4]

Figure 1-4 shows total per capita emissions by city for all cities in the 21-city region. The cities are color-coded to indicate the region in which each city is located (mountain, valley, and desert regions of the County). Average per capita emissions (without cement emissions) are shown as the

[4] These general geographic areas are not formal regional planning areas but they do correspond to the unincorporated County General Plan planning areas.

horizontal red line. In general, valley cities have the lowest per capita emissions, desert cities have higher per capita emissions, and the mountain city, Big Bear Lake, has the highest per capita emissions, likely due to the influx of tourists to the resorts.

Figure 1-5 shows per capita emissions by city for building energy emissions. Per capita emissions for this sector (including residential, commercial, and industrial electricity and natural gas usage) are presented because they represent the largest sector of the inventory.

Figure 1-3. Per Capita Greenhouse Gas Emissions for Partnership Cities

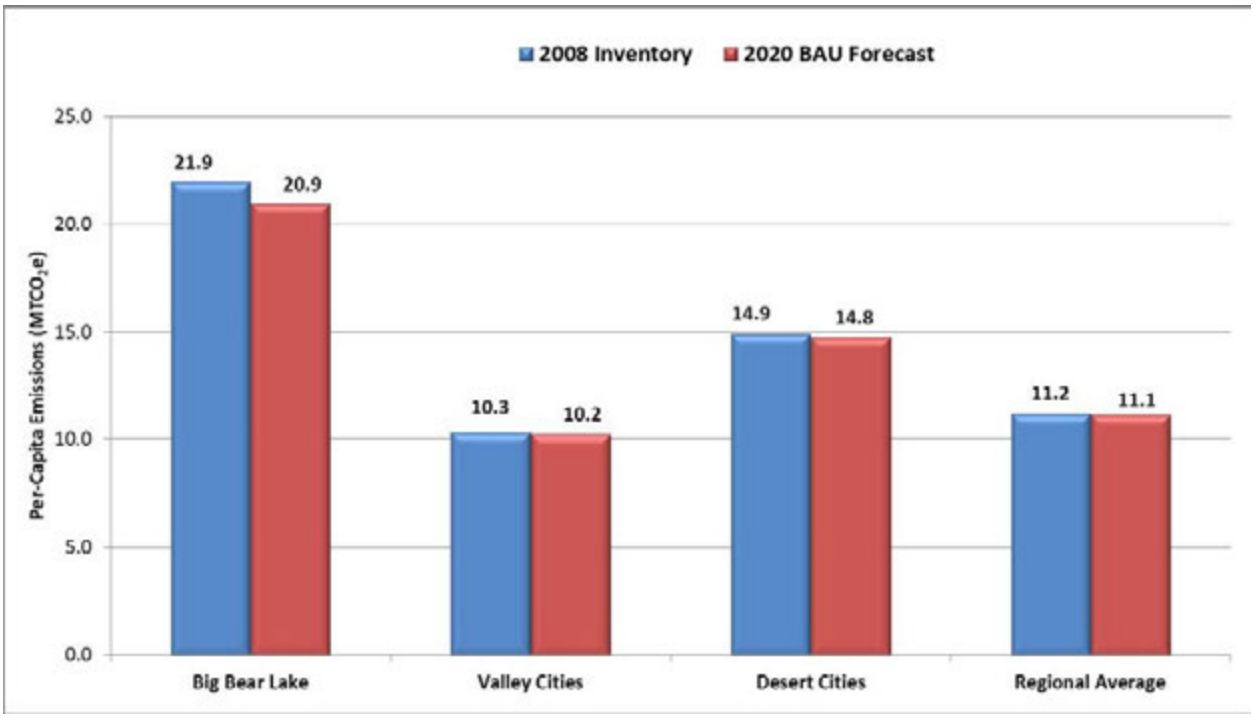


Figure 1-4. 2008 Per Capita Greenhouse Gas Emissions by City and Region

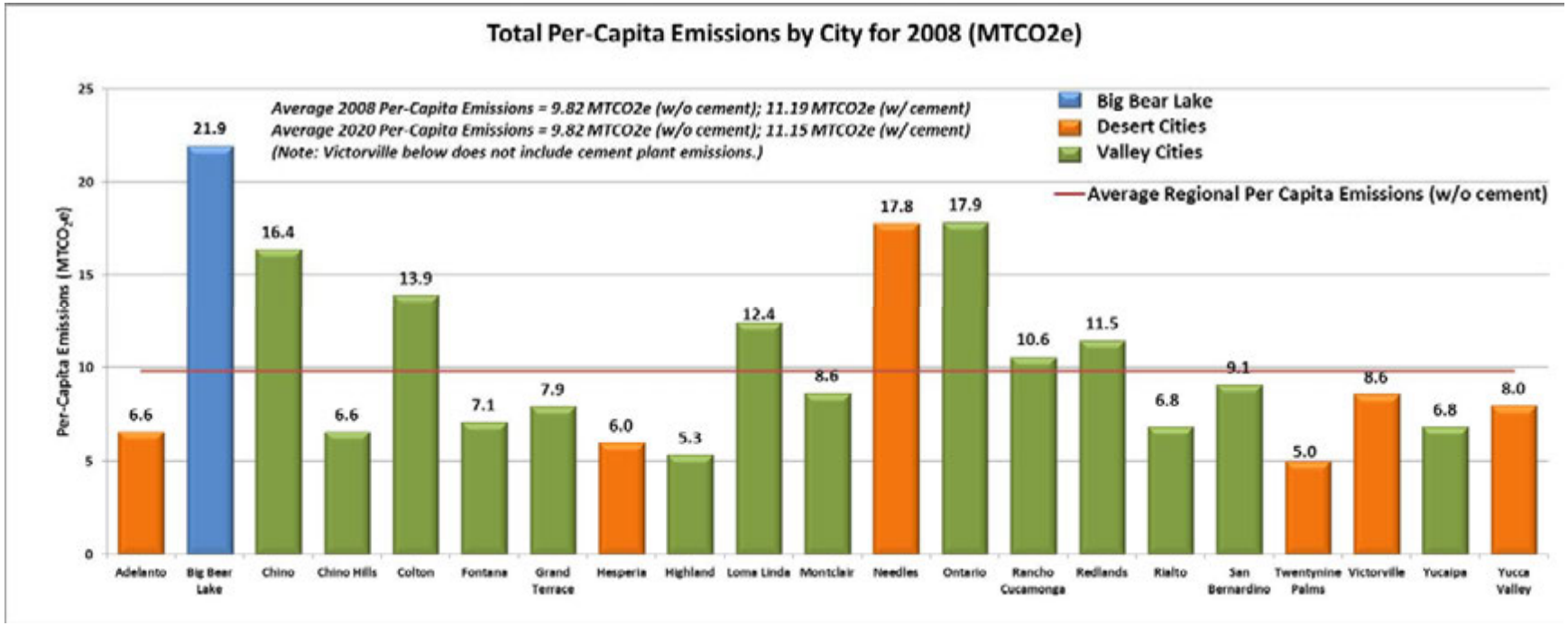
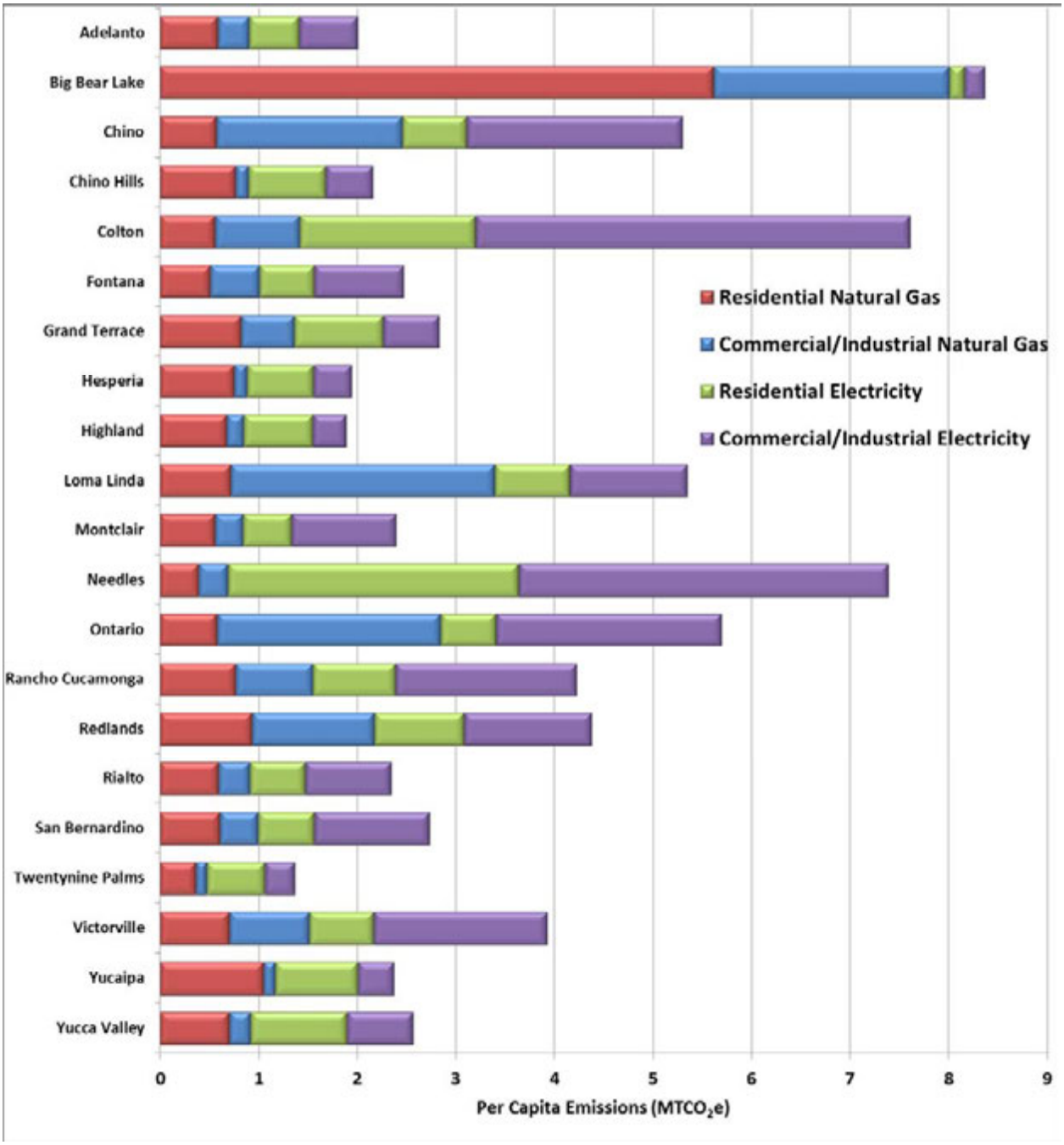


Figure 1-5. 2008 Per Capita Building Energy Emissions by City



As demonstrated by these graphs, there is a large variation in per capita emissions for this sector. Building energy varies greatly by climate and population density and varies as the mix of residential versus commercial/industrial land uses in each city varies. Higher density areas are more likely to have lower energy usage per resident, as homes are generally smaller than lower density areas and require less energy for air conditioning, lighting, appliances, etc. Some cities have more or less commercial and industrial activity than other cities and, therefore, consume different amounts of energy in those sectors. Some cities, such as Big Bear lake, have higher number of visitors than other cities. City climate also plays a role; for example, desert cities are more likely have higher air conditioning energy demands than valley cities. Also, energy providers vary by region and each provider has a different GHG energy emissions factor.

1.4 Next Steps

1.4.1 Climate Action Plans and Reduction Targets

This report serves as the foundation for the CAPs component of the project in which reduction opportunities will be evaluated with the goal of achieving a reduction in projected 2020 emissions.

1.4.2 GHG Monitoring

This report identifies the major sources of emissions for all cities in the Partnership. In addition, this report describes the data used to estimate GHG emissions in 2008 and 2020. GHG emissions monitoring is recommended as a future action for all cities so that each city can track its progress in reducing emissions, identify potential issues, target funding needs, inform future updates to both the GHG Inventory and CAP, and fully integrate GHG planning into the community's general planning process. Cities are encouraged to begin monitoring and maintaining data as soon as possible, for metrics related to GHG emissions such as public utility data, traffic data, water consumption, and waste generation. Numerous protocols and tools are available for these purposes, such as the ICLEI U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (ICLEI–Local Governments for Sustainability USA 2012), the LGOP for municipal inventories (CARB LGOP 2010), California Community-Wide Greenhouse Gas Baseline Inventory Protocol White Paper by the Association of Environmental Professionals (AEP) (2011), and the Statewide Energy Efficiency Collaborative (SEEC) Community Inventory Tool (2012).

This inventory identifies significant GHG emissions from regional activities in the 21-city region and serves as a baseline for emissions reduction measures and as a starting point for future GHG emissions inventories. Future updates to the GHG emissions inventories presented in this report should be conducted periodically to ensure that the inventory remains accurate and that data gaps are resolved in a timely manner. This also would enable efficient tracking of the effectiveness of any GHG-reduction measures put in place to address these emission sources.

1.4.3 Climate Action Plan, General Planning, and CEQA

The forthcoming individual CAPs will help to establish a legally defensible foundation of analysis of GHG emissions within the California Environmental Quality Act (CEQA) for future development projects within the Partnership cities.

Senate Bill 97 (SB 97) required that the Office of Planning and Research (OPR) prepare guidelines regarding feasible mitigation of GHG emissions or the effects of GHG emissions as required by CEQA. The adopted changes in the CEQA Guidelines (effective March 2010) require the following:

- inclusion of GHG analyses in CEQA documents;
- quantification of emissions;
- determination of significance of GHG emissions; and,
- if significant emissions would occur, adoption of mitigation to address significant emissions.

The revised CEQA Guidelines also allow for tiering of project-level analysis of GHG emissions from a programmatic document, such as a GHG reduction plan, and allow for a finding of less than significant where a project is determined to be consistent with a local reduction plan. The forthcoming CAPs, along with the environmental impact report (EIR) prepared for adoption of these CAPs, will allow for the cities to tier project-level analysis of GHG emissions.

What is CEQA?

CEQA was adopted in 1970 and is intended to:

- inform governmental decision-makers and the public about potential environmental effects of a project;
- identify ways to reduce adverse impacts;
- offer alternatives to the project; and
- disclose to the public why a project was approved.

CEQA
The California Environmental Quality Act

The revised CEQA Guidelines do not include a quantitative project or plan-level GHG emissions threshold. Although the South Coast Air Quality Management District (SCAQMD) is considering potential CEQA thresholds, to date, it has not adopted formal thresholds for land use planning or projects.[5] SCAQMD encourages local governments to adopt a qualified GHG reduction strategy consistent with AB 32 goals and the new statewide CEQA guidelines described above. SCAQMD has draft thresholds for land use projects (residential and commercial development) that would allow for tiering off a qualified GHG reduction plan and use of numeric thresholds where a qualified plan has not been adopted. The Mojave Desert Air Quality Management District (MDAQMD) has adopted a threshold of 100,000 short tons of CO_2e for new projects.

The CEQA Guidelines encourage programmatic GHG mitigation strategies including reliance on adopted regional blueprint plans, GHG reduction plans, and general plans that meet regional and local GHG emissions targets and that have also undergone CEQA review. Lead agencies within the 21-city region have the responsibility to determine the significance of a project's generation of GHG emissions and the authority to make this determination based upon a project's compliance with the CAPs.

[5] SCAQMD has adopted a project threshold for industrial stationary sources of 10,000 $MTCO_2e$.

Section 2
Background Information

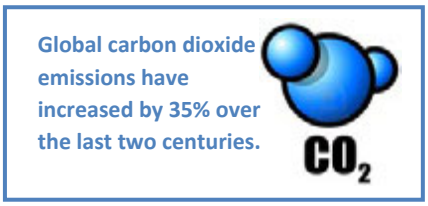
2.1 Greenhouse Gases, the Greenhouse Effect, and Climate Change

Earth's temperature is regulated by a system commonly known as the greenhouse effect. GHGs absorb heat radiated from Earth's surface. As the atmosphere warms, it in turn radiates heat back to the surface to create the greenhouse effect. According to the United States Environmental Protection Agency (EPA), a GHG is any gas that absorbs infrared radiation in the atmosphere.

AB 32 and CEQA guideline amendments define the following six GHGs:

- carbon dioxide (CO_2),
- methane (CH_4),
- nitrous oxide (N_2O),
- sulfur hexafluoride (SF_6),
- halogenated fluorocarbons (HFCs), and
- perfluorocarbons (PFCs).

GHGs are both naturally occurring and anthropogenic (i.e., human-made). Once emitted, GHGs remain in the atmosphere for decades or centuries and, therefore, can mix globally. Natural sources of GHGs include decomposition of organic matter and wildfires. Many human activities add to the levels of naturally occurring gases. CO_2 is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), wood, and wood products are burned. N_2O is emitted during agricultural and industrial activities, as well as during combustion of solid waste and fossil fuels.



CO_2 and N_2O are the two GHGs released in the greatest quantities from mobile sources burning gasoline and diesel fuel. CH_4, a highly potent GHG, results from off-gassing associated with agricultural practices and landfills, among other sources. HFCs and PFCs are families of synthetic chemicals that are used as substitutes for ozone-depleting substances (ODS) being phased out under the Montreal Protocol[1]. SF_6 is used in the electric transmission and distribution systems, as well as various industrial manufacturing processes.

As the global, national, and statewide population and economy continue to grow, anthropogenic emissions of GHGs continue to increase largely as a result of the burning of fossil fuels. The associated increase in atmospheric concentrations of GHGs will cause a variety of adverse environmental impacts related to large-scale changes in the climate system. Climate change impacts of greatest concern for California include sea-level rise, increased frequency and intensity of wildfire, decreased Sierra snowpack and associated consequences to state water supply, changes in winter precipitation patterns

[1] The Montreal Protocol is an international environmental treaty first signed by leaders in 1987. The goal of the treaty is to phase out the production and use of ODS.

and associated consequences to state water supply, increased frequency and intensity of extreme heat events, and degradation in regional air quality as a result of warmer temperatures (California Energy Commission 2009; California Natural Resources Agency 2009).

2.2 GHG Inventories

Over the last several decades, private and public entities including states, nations, cities, corporations, and universities, have sought to understand their GHG emissions and identify ways to decrease their carbon footprint. The first step in this process is the completion of a GHG inventory, essentially an audit of all sources of GHG emissions within a given boundary and an assessment of their magnitude. Standard protocols and procedures exist for conducting a GHG inventory—these are described in Section 5, *Methods* and Appendix A. Since 2006 when AB 32 was signed into law, many local governments in California have completed a community GHG inventory. Because AB 32 establishes the year 2020 as the target year by which California should reduce its emissions, many communities in California are choosing to prepare a GHG forecast for the year 2020 in addition to their base year inventory.

SANBAG and the cities, with the assistance of ICF International (ICF), developed 2008 community GHG inventories and forecasted 2020 GHG emissions for the cities. The boundaries of the inventory are defined as geographic, i.e., jurisdictional or city limits. Emissions for a particular source were included in a city's inventory if either the source of emissions occurs within the geographic boundaries of the city, or if the activity indirectly associated with a source of emissions occurs within the geographic boundaries of the city (such as electricity consumption or waste generation).

The 2008 inventory is based mostly on actual 2008 activity data (estimates were used for activity data in a few sectors) and year 2008 emission factors and includes all significant contributing sectors to GHG emissions, according to the guidelines of the ICLEI U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (ICLEI–Local Governments for Sustainability USA 2012) and the CARB Local Governments Operations Protocol (LGOP) (2010). This inventory was developed with sufficient detail to support identification of GHG-reduction measures specific to the each city's community emissions.

The 2020 emissions projection represents the BAU forecast based on anticipated growth in each city and each sector of the inventory. The BAU projections are based on current energy consumption and anticipated growth rates provided by the cities, SCAG, CARB, and other appropriate data sources, as listed in this report. The BAU projections do not assume the implementation of any federal, state, or local reduction measures, but project the future emissions based on current energy and carbon intensity in the existing economy. The specific assumptions associated with the energy growth rates are provided in Section 5.5, "Analysis Methods."

2.3 San Bernardino County

Current and projected GHG emissions are directly correlated with activity within the jurisdictional boundary. As such, emissions reflect the unique geography, climate, demographics, economy and character of a community. Further, future projections of GHG emissions reflect how a community plans to grow with respect to housing, jobs, and infrastructure. A description of the County follows below.

San Bernardino County covers more than 20,000 square miles and has various natural landscapes, including mountain ranges, valleys, forests, and waterways. The County is home to 24 incorporated cities and is the fifth most populous county in California. As of 2010, the SCAG estimated population for San Bernardino County at 2,035,210. In 2008 (the baseline year for the inventories), the County's total population was 2,015,862 (Southern California Association of Governments 2012a). The County is also home to nearly 650,000 jobs (Southern California Association of Governments 2012a). In 2008, the cities had approximately 75% of total County residents, and 87% of residents residing in incorporated cities in the County (SCAG 2012a).

The County boasts a diverse economy, with economic output and employment distributed among multiple sectors (California Employment Development Department 2013):

- In 2011, the largest labor markets in San Bernardino County are Trade, Transportation and Utilities (26% of the total employed labor force) and Government (19%), followed by Educational and Health Services (13%), Professional and Business Services (12%) and Leisure and Hospitality (9%).
- All other industries accounted for less than 10% of the total labor force.

The Riverside-San Bernardino metro area's fastest growing sectors are projected to be Leisure and Hospitality, Accommodation and Food Services, Education Services, Health Care and Social Assistance, Administrative and Support and Waste Management and Remediation Services, Professional and Business Services, Other Services and Local Government.

The majority of the County's workforce is in services, retail, government, and construction. The County is home to 10 universities and colleges, seven museums, and two mountain resorts. About 90% of the County is desert, and the remainder consists of the San Bernardino Valley and the San Bernardino Mountains. The San Bernardino Valley climate is temperate with about 15 inches of rain annually and temperatures ranging from 30 to 60 degrees Fahrenheit (°F) in January and from 50°F to 98°F in July.

Figure 2-1 shows a map of the County and includes the desert, mountain, and valley regions. Table 2-1 shows current and projected population, households, and jobs for each of the cities (Southern California Association of Governments 2012b).

Figure 2-1. San Bernardino County Map

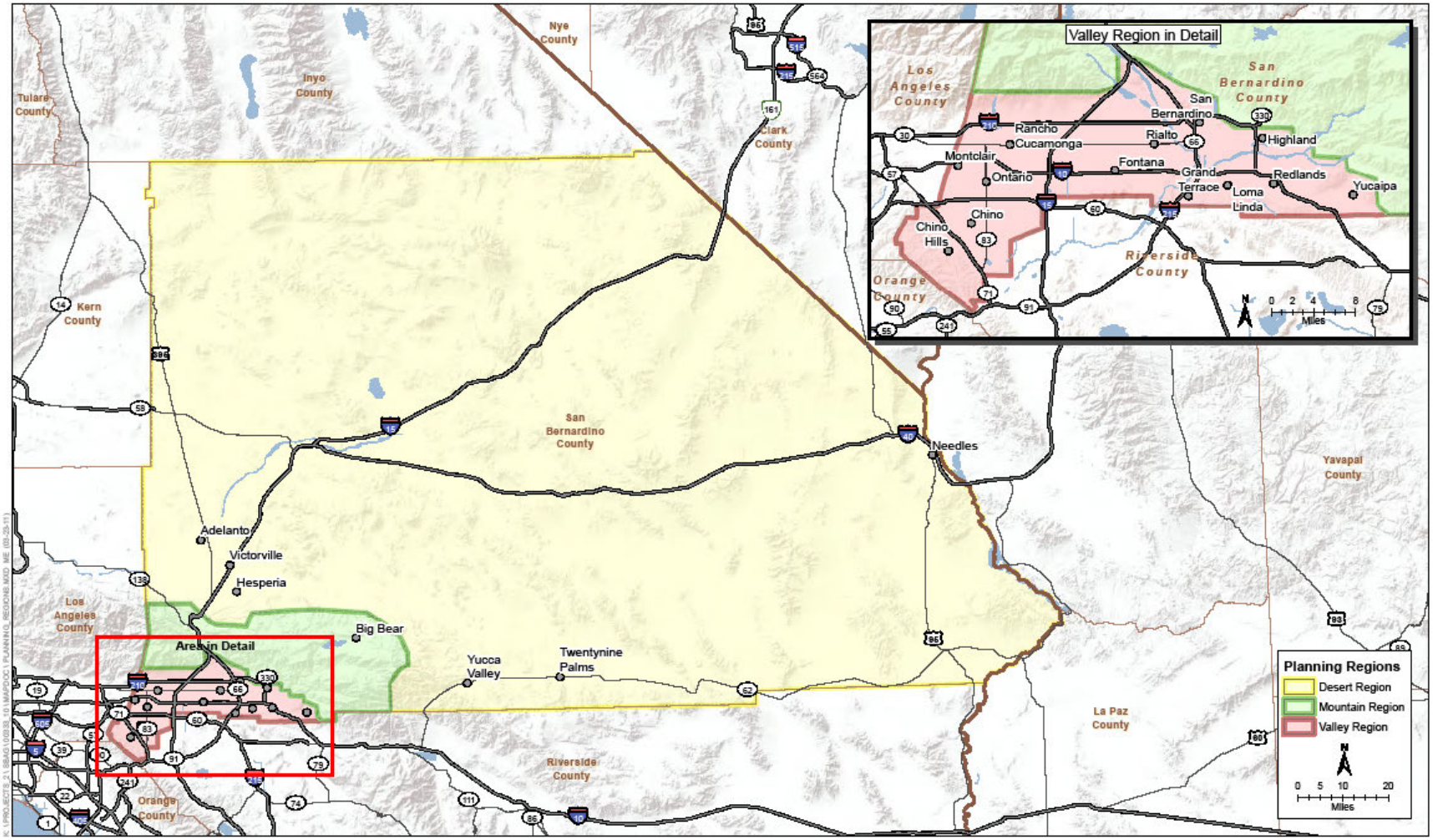


Table 2-1. San Bernardino County, Partnership Cities Population, Housing, and Employment Estimates and Forecasts

	Population			Households[a]			Employment		
City	2008	2020	Growth Factor[b]	2008	2020	Growth Factor[b]	2008	2020	Growth Factor[b]
Adelanto	31,200	46,084	1.48	7,670	11,900	1.55	5,432	7,313	1.35
Big Bear Lake	5,019	5,619	1.12	2,196	2,400	1.09	6,212	6,423	1.03
Chino	75,596	88,772	1.17	20,135	24,569	1.22	48,495	53,470	1.10
Chino Hills	74,571	76,558	1.03	22,870	23,999	1.05	9,302	10,452	1.12
Colton	52,103	60,652	1.16	14,955	17,842	1.19	24,023	25,529	1.06
Fontana	193,913	222,717	1.15	48,573	57,482	1.18	47,622	53,652	1.13
Grand Terrace	11,768	11,644	0.99	4,303	4,554	1.06	3,019	3,160	1.05
Hesperia	89,617	98,163	1.10	26,266	28,892	1.10	15,537	20,438	1.32
Highland	52,986	58,646	1.11	15,436	17,713	1.15	6,037	7,757	1.28
Loma Linda	23,027	26,746	1.16	8,675	10,459	1.21	17,597	23,281	1.32
Montclair	35,987	39,667	1.10	9,346	10,446	1.12	16,527	17,049	1.03
Needles	4,844	4,941	1.02	1,918	1,956	1.02	3,323	3,145	0.95
Ontario	162,871	215,765	1.32	44,639	61,128	1.37	114,339	151,279	1.32
Rancho Cucamonga	162,792	167,118	1.03	53,564	56,303	1.05	62,462	63,869	1.02
Redlands	68,576	75,494	1.10	24,701	28,262	1.14	41,435	46,682	1.13
Rialto	98,923	109,970	1.11	25,137	29,396	1.17	22,877	26,425	1.16
San Bernardino	209,924	231,151	1.10	59,310	66,924	1.13	101,253	113,357	1.12
Twentynine Palms	24,905	29,538	1.19	8,048	9,623	1.20	3,211	3,625	1.13
Victorville	111,872	145,345	1.30	31,423	43,687	1.39	33,705	45,930	1.36
Yucaipa	51,217	55,821	1.09	18,176	20,692	1.14	9,761	10,923	1.12
Yucca Valley	20,652	22,953	1.11	8,254	9,856	1.19	4,575	5,071	1.11
Total	1,562,363	1,793,364	N/A	455,595	538,083	N/A	596,744	698,830	N/A

[a] Includes single-family and multifamily dwelling units.

[b] Represents the total growth between the forecast year and the existing year. For example, between 2008 and 2020, population in Adelanto is anticipated to increase by a factor of 1.48.

Section 3
Inventory Results by City

The following section presents emissions summaries for each city. Each city summary includes a brief description of the major emissions sources and the projected growth in emissions from 2008 to 2020, a table showing 2008 emissions and 2020 BAU forecast emissions by scope and sector, a pie chart showing the 2008 inventory by scope and sector, and a bar chart with 2008 emissions and 2020 BAU forecast emissions by sector from highest to lowest emissions. Additional information for each inventory sector is discussed in Section 4, *Inventory Results by Sector*.

Percentages for each major sector of emissions presented for each city are based on the current city inventories. "Average" per capita emissions are defined as the total Regional Emissions in each sector per resident within the region (i.e., total emissions/total population for all 21 cities) excluding emissions from the CEMEX plant in Victorville as shown in Figure 1-4. For comparison purposes, CEMEX emissions were excluded from the per-capita numbers, but were included in the total emissions inventory for Victorville and the Region.

For greater detail regarding data collection, inventory methodology, and data gaps, please refer to Appendix A.

3.1 Adelanto

Primary sources of GHG emissions in Adelanto are on-road transportation (48%), building energy (31%), and stationary sources (8%). Emissions are projected to increase by 50% from 2008 to 2020 due to economic and population growth. In 2008, Adelanto had lower (6.6 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city's commercial and industrial sectors are smaller compared to its population relative to the average of other cities in the 21-city region.

Table 3-1. Adelanto 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	18,366	9%	28,494	9%
Commercial/Industrial Natural Gas	10,033	5%	13,410	4%
Residential Electricity	15,709	8%	24,373	8%
Commercial/Industrial Electricity	18,663	9%	25,576	8%
Stationary Sources	16,597	8%	22,015	7%
Light/Medium-Duty Vehicles	76,971	38%	134,374	44%
Heavy-Duty Vehicles	20,537	10%	27,098	9%
Off-Road Equipment	12,144	6%	17,655	6%
Agriculture	9,664	5%	4,925	2%
Solid Waste Management	1,744	1%	2,381	1%
Wastewater Treatment	1,262	1%	1,876	1%
Water Transport, Distribution, and Treatment	3,045	1%	5,222	2%
SF_6 from Electricity Combustion	402	<1%	593	<1%
Total Emissions	205,136	100%	307,991	100%

Figure 3-1a. Adelanto GHG Emissions by Sector for 2008

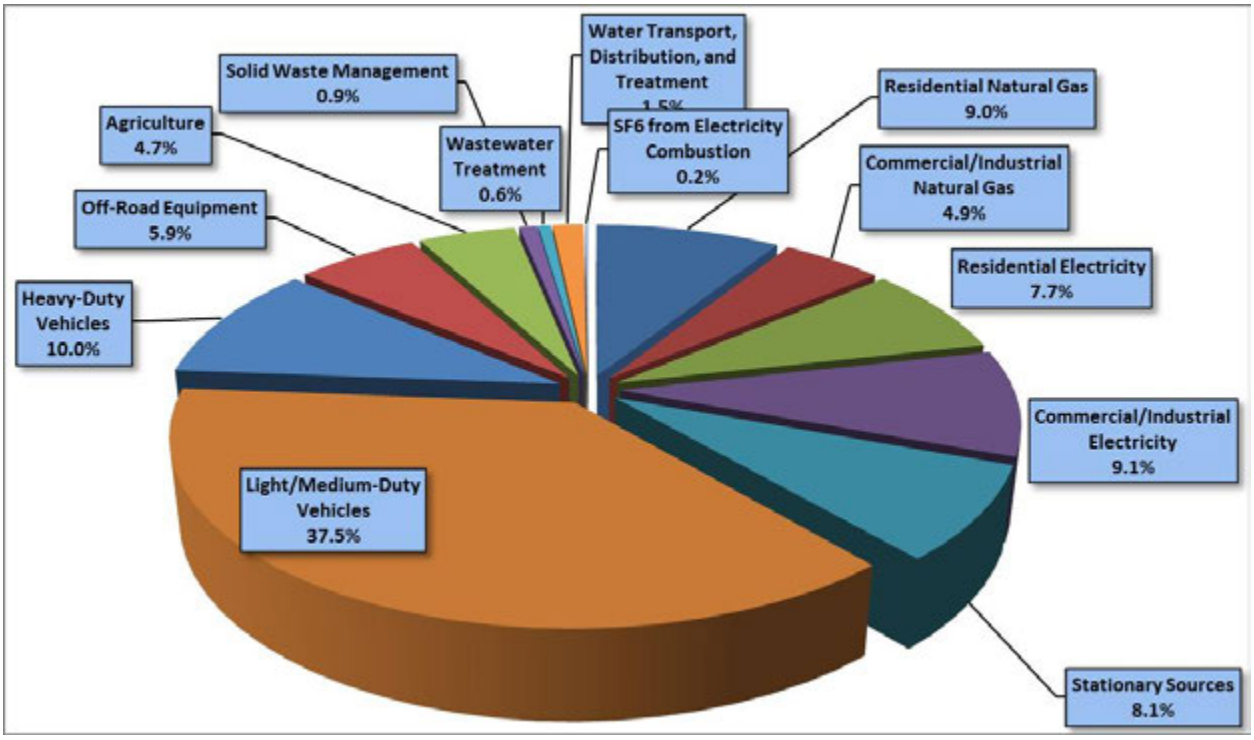
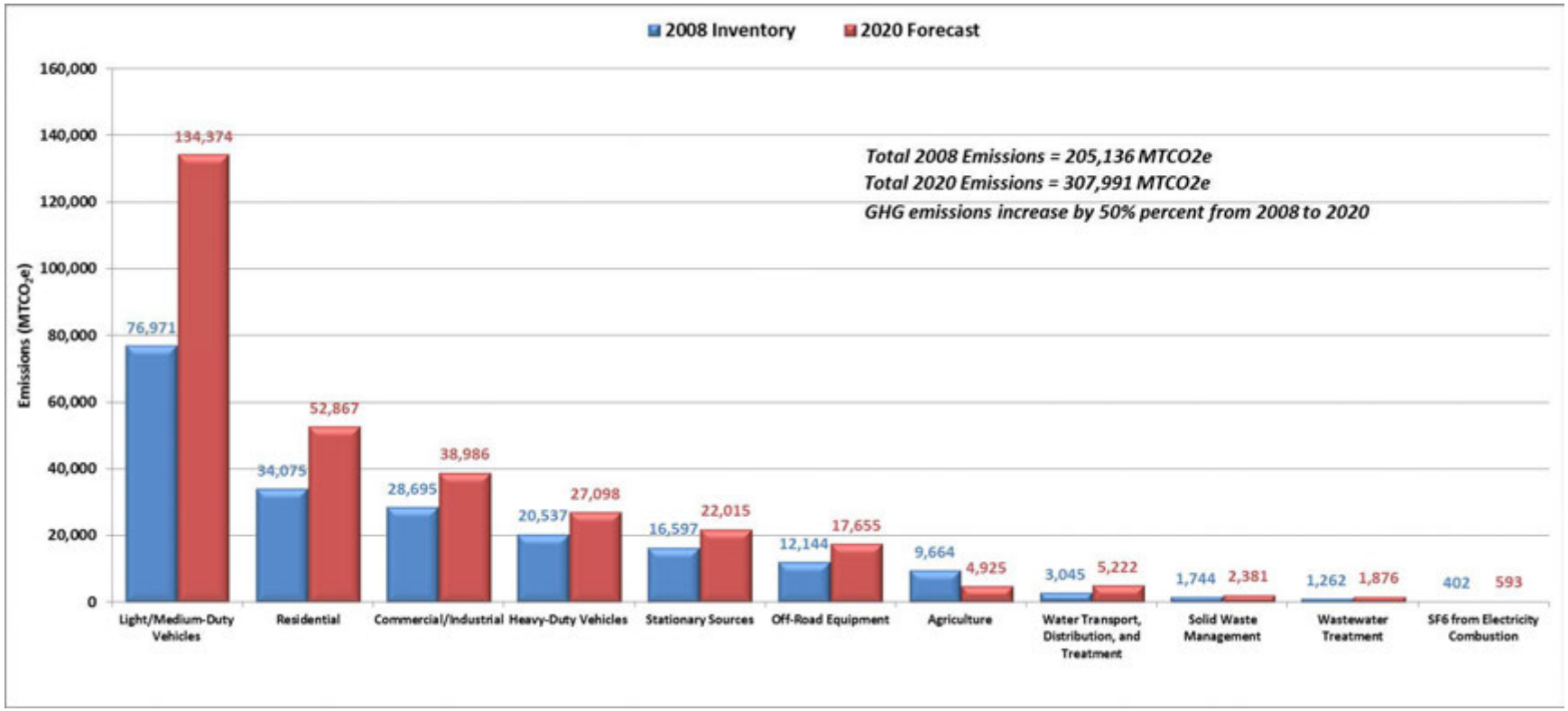


Figure 3-1b. Adelanto GHG Emissions by Sector for 2008 and 2020



3.2 Big Bear Lake

Primary sources of GHG emissions in Big Bear Lake are building energy (38%), on-road transportation (34%), and stationary sources (13%). Emissions are projected to increase by 7% from 2008 to 2020 due to economic and population growth. In 2008, Big Bear Lake had higher (21.9 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions because of higher energy demands due to altitude and because it is a resort community with significant tourism and thus has larger emissions relative to its residents compared to the average of other cities in the 21-city region.

Table 3-2. Big Bear Lake 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	28,172	26%	30,789	26%
Commercial/Industrial Natural Gas	12,031	11%	11,972	10%
Residential Electricity	751	1%	821	1%
Commercial/Industrial Electricity	1,034	1%	1,039	1%
Stationary Sources	14,019	13%	15,271	13%
Light/Medium-Duty Vehicles	28,957	26%	29,492	25%
Heavy-Duty Vehicles	8,344	8%	10,402	9%
Off-Road Equipment	4,362	4%	4,863	4%
Agriculture	0	0%	0	0%
Solid Waste Management	11,929	11%	12,250	10%
Wastewater Treatment	203	<1%	229	<1%
Water Transport, Distribution, and Treatment	334	<1%	498	<1%
SF_6 from Electricity Combustion	21	<1%	23	<1%
Total Emissions	110,158	100%	117,650	100%

Figure 3-2a. Big Bear Lake GHG Emissions by Sector for 2008

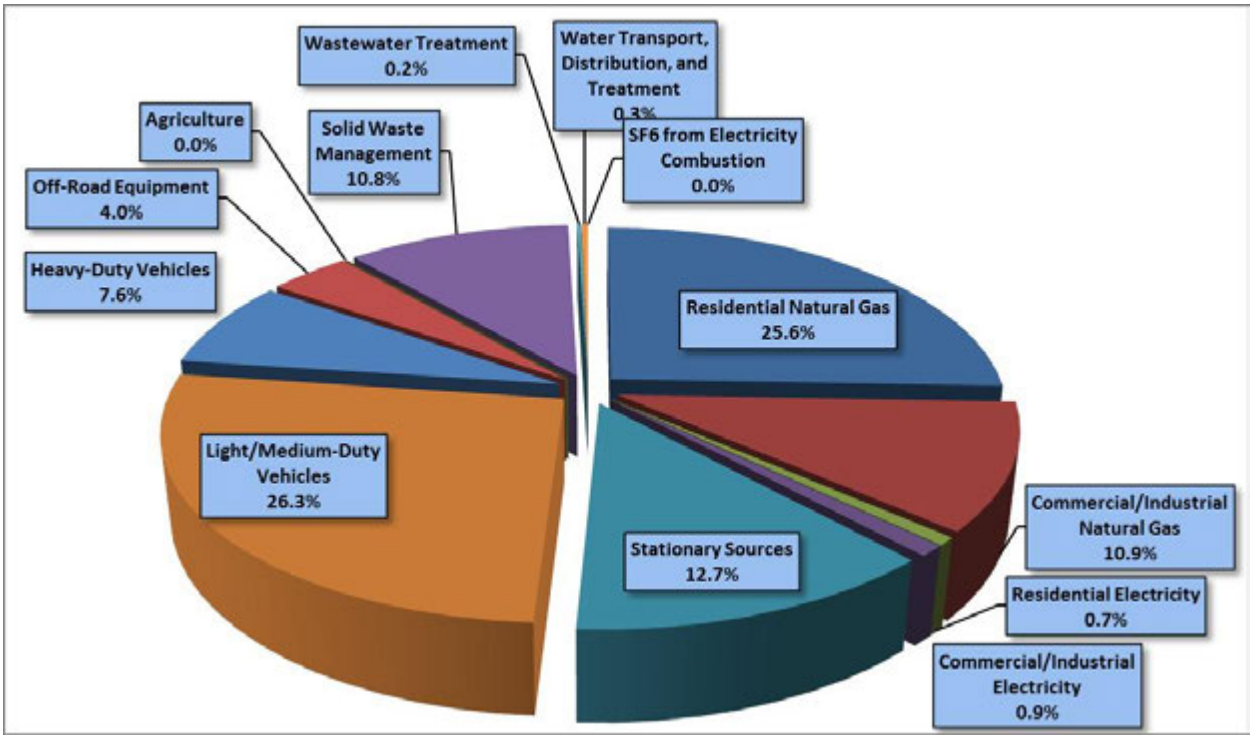
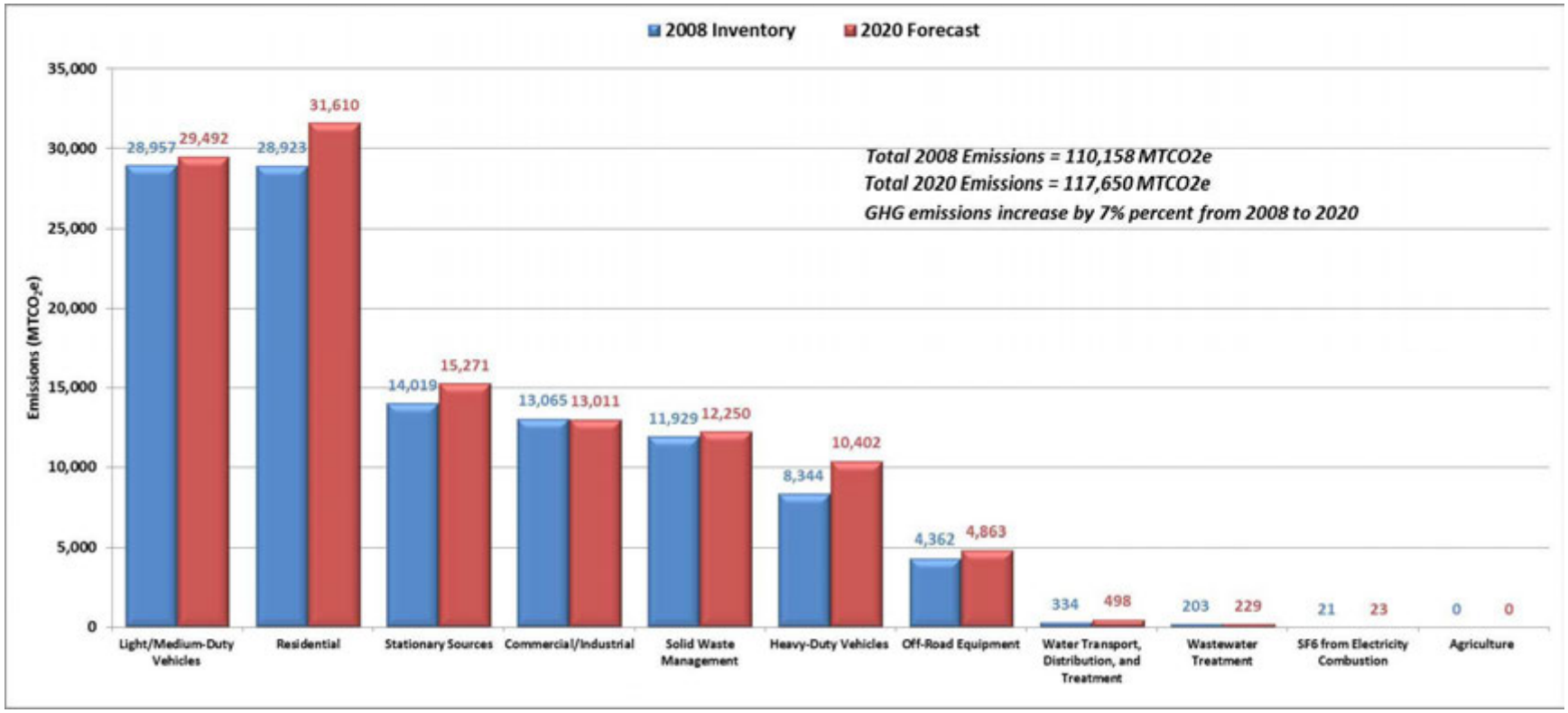


Figure 3-2b. Big Bear Lake GHG Emissions by Sector for 2008 and 2020



3.3 Chino

Primary sources of GHG emissions in Chino are on-road transportation (33%), building energy (32%), and stationary sources (17%). Emissions are projected to increase by 7% from 2008 to 2020 due to economic and population growth. In 2008, Chino had higher (16.4 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city has a relatively larger amount of commercial and industrial activity compared to its population and a larger agricultural sector than the average of other cities in the 21-city region.

Table 3-3. Chino 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	43,241	3%	52,763	4%
Commercial/Industrial Natural Gas	143,018	12%	157,690	12%
Residential Electricity	48,949	4%	59,729	4%
Commercial/Industrial Electricity	165,875	13%	183,941	14%
Stationary Sources	207,650	17%	244,412	18%
Light/Medium-Duty Vehicles	326,571	26%	344,425	26%
Heavy-Duty Vehicles	80,562	6%	98,635	7%
Off-Road Equipment	82,908	7%	90,661	7%
Agriculture	101,287	8%	51,623	4%
Solid Waste Management	16,239	1%	17,305	1%
Wastewater Treatment	3,057	<1%	3,613	<1%
Water Transport, Distribution, and Treatment	17,684	1%	21,736	2%
SF_6 from Electricity Combustion	2,501	<1%	2,855	<1%
Total Emissions	1,239,542	100%	1,329,387	100%

Figure 3-3a. Chino GHG Emissions by Sector for 2008

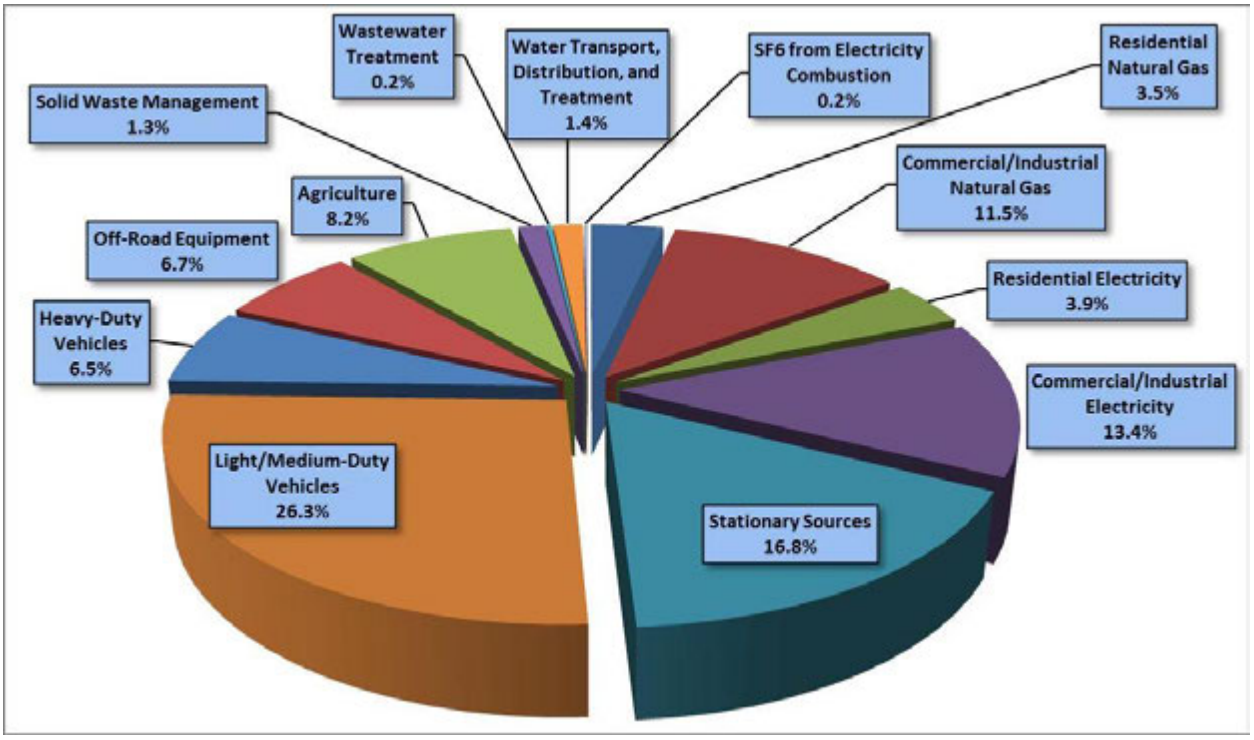
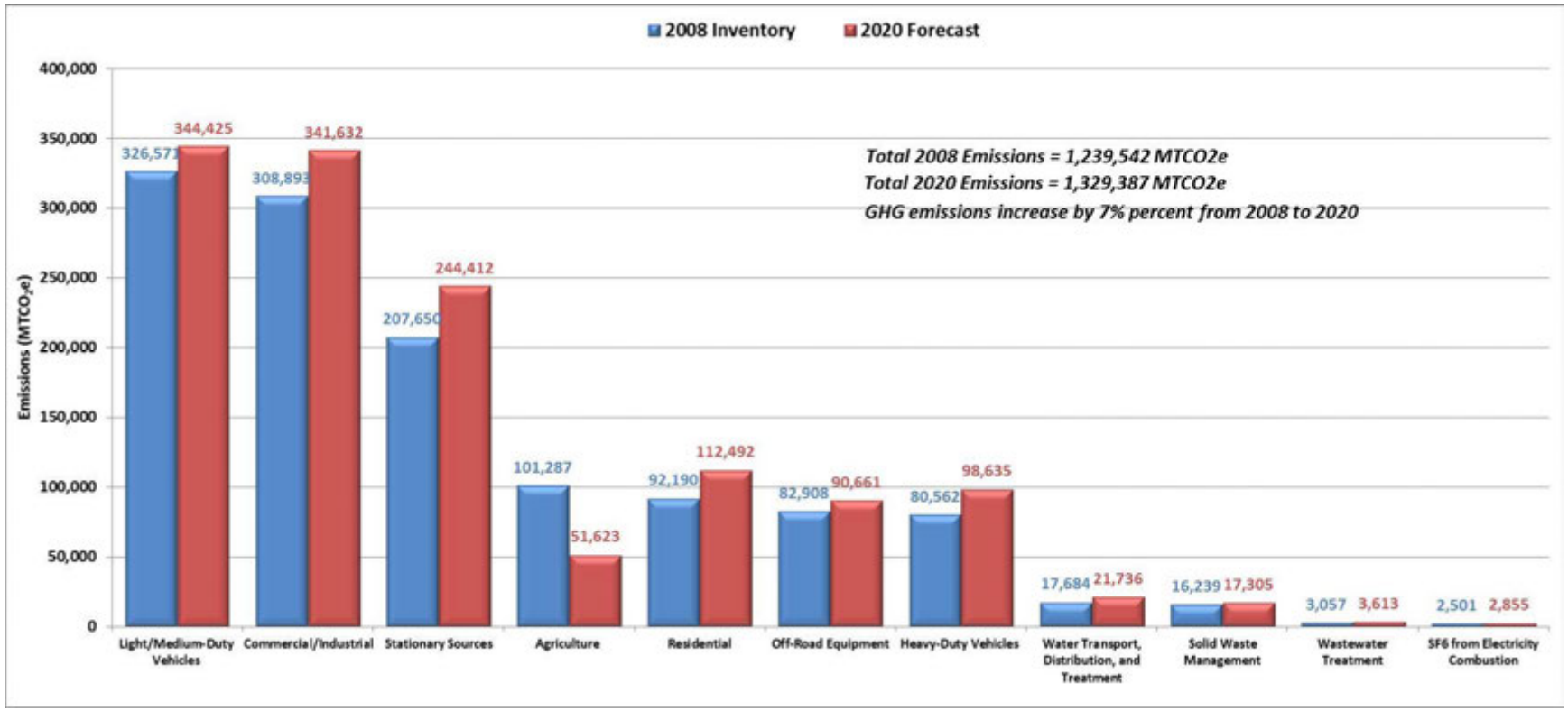


Figure 3-3b. Chino GHG Emissions by Sector for 2008 and 2020



3.4 Chino Hills

Primary sources of GHG emissions in Chino Hills are on-road transportation (54%), building energy (33%), and stationary sources (5%). Emissions are projected to increase by 5% from 2008 to 2020 due to economic and population growth. Chino Hills has relatively lower (6.6 $MTCO_2e$) per capita emissions than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city has relatively smaller commercial and industrial sectors compared to its population than the average of other cities in the 21-city region.

Table 3-4. Chino Hills 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	57,377	12%	60,210	12%
Commercial/Industrial Natural Gas	9,645	2%	10,838	2%
Residential Electricity	58,378	12%	61,260	12%
Commercial/Industrial Electricity	35,901	7%	39,878	8%
Stationary Sources	25,417	5%	33,375	6%
Light/Medium-Duty Vehicles	248,071	51%	240,418	47%
Heavy-Duty Vehicles	17,636	4%	25,291	%
Off-Road Equipment	14,628	3%	15,040	3%
Agriculture	5,691	1%	2,900	1%
Solid Waste Management	6,831	1%	11,754	2%
Wastewater Treatment	3,016	1%	3,116	1%
Water Transport, Distribution, and Treatment	5,909	1%	8,790	2%
SF_6 from Electricity Combustion	1,078	<1%	1,182	<1%
Total Emissions	489,578	100%	514,052	100%

Figure 3-4a. Chino Hills GHG Emissions by Sector for 2008

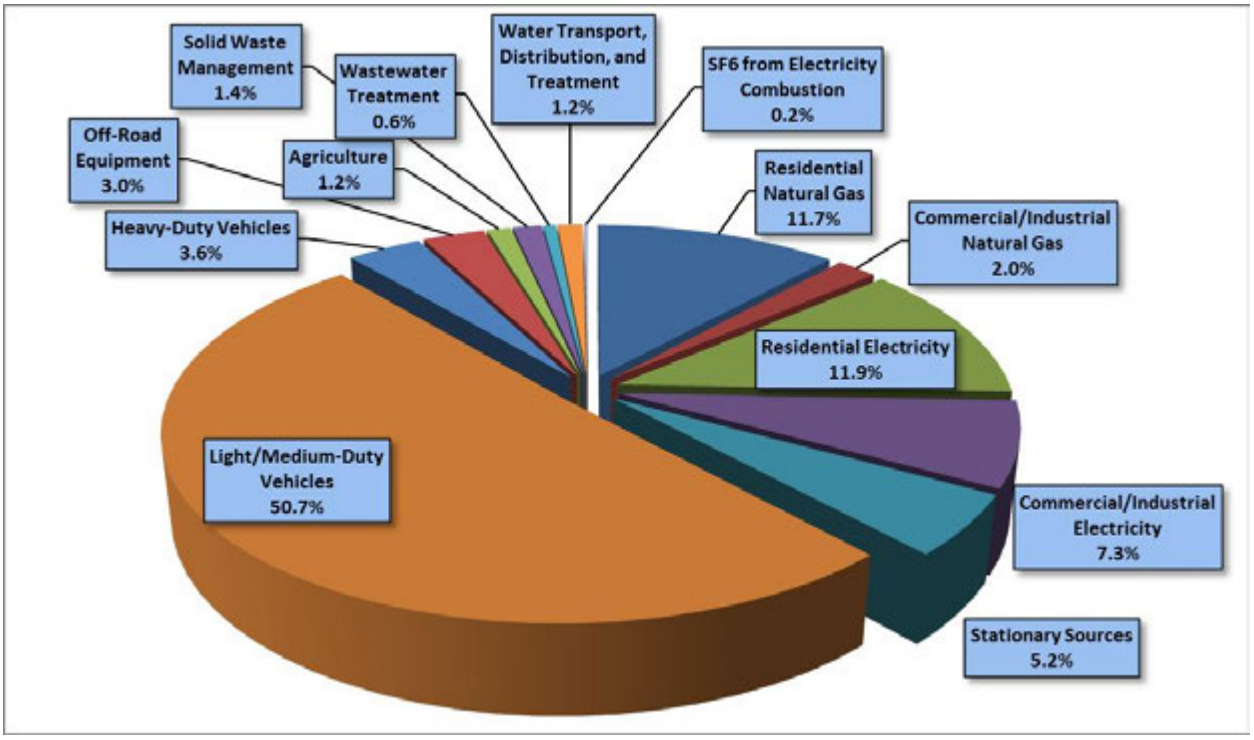
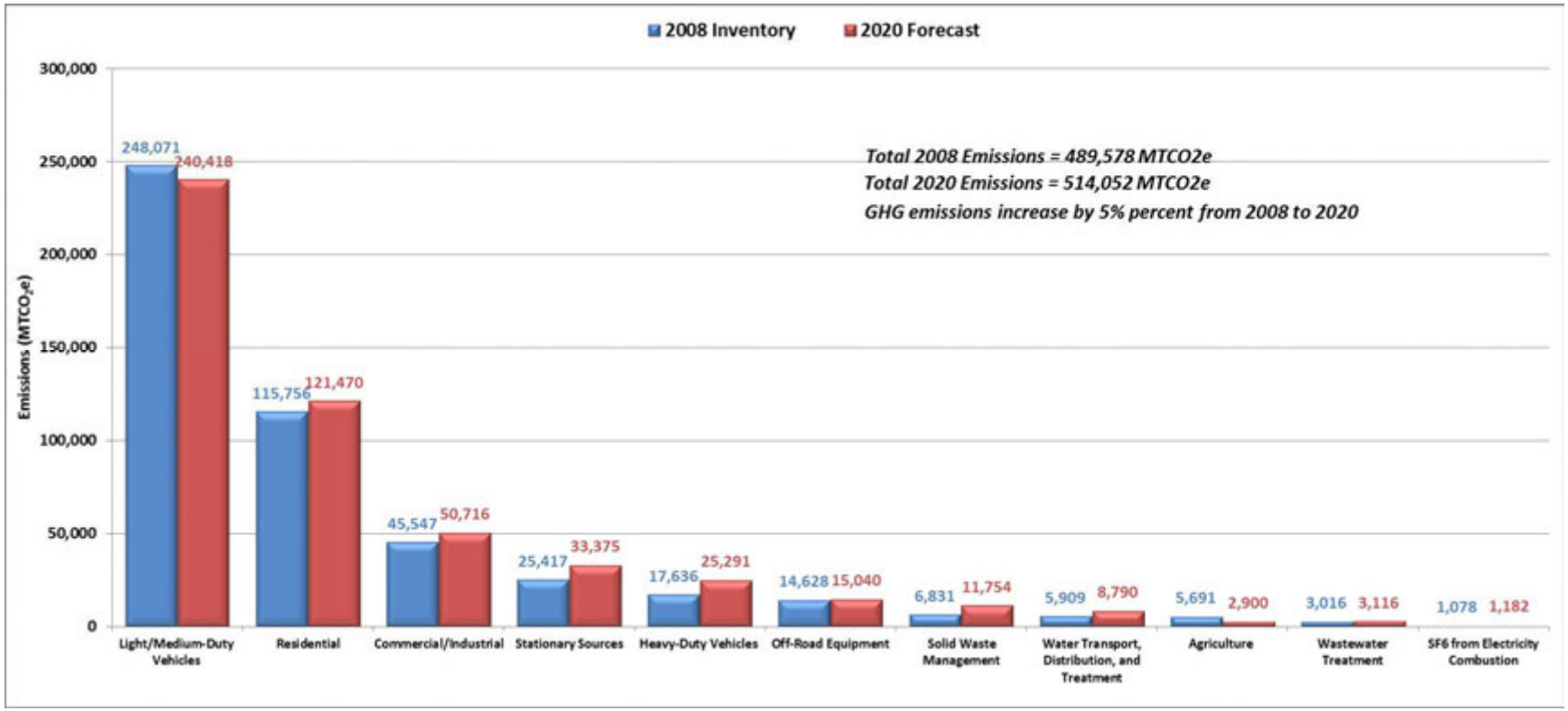


Figure 3-4b. Chino Hills GHG Emissions by Sector for 2008 and 2020



3.5 Colton

Primary sources of GHG emissions in Colton are building energy (55%), on-road transportation (30%), and stationary sources (8%). Emissions are projected to increase by 9% from 2008 to 2020 due to economic and population growth. Colton has higher (13.9 $MTCO_2e$) per capita emissions than average (9.8 $MTCO_2e$ without cement) per capita emissions because the city is served by Colton Public Utilities, which has a much higher electricity emission factor than SCE, which serves the majority of the other cities.

Table 3-5. Colton 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	29,349	4%	35,015	4%
Commercial/Industrial Natural Gas	44,650	6%	47,449	6%
Residential Electricity	92,766	13%	110,674	14%
Commercial/Industrial Electricity	229,943	32%	243,338	31%
Stationary Sources	55,509	8%	60,605	8%
Light/Medium-Duty Vehicles	191,290	26%	200,630	25%
Heavy-Duty Vehicles	24,545	3%	29,429	4%
Off-Road Equipment	22,891	3%	26,167	3%
Agriculture	731	<1%	373	<1%
Solid Waste Management	18,037	2%	18,826	2%
Wastewater Treatment	2,128	<1%	2,519	<1%
Water Transport, Distribution, and Treatment	12,492	2%	16,739	2%
SF_6 from Electricity Combustion	1,102	<1%	1,218	<1%
Total Emissions	725,435	100%	792,982	100%

Figure 3-5a. Colton GHG Emissions by Sector for 2008

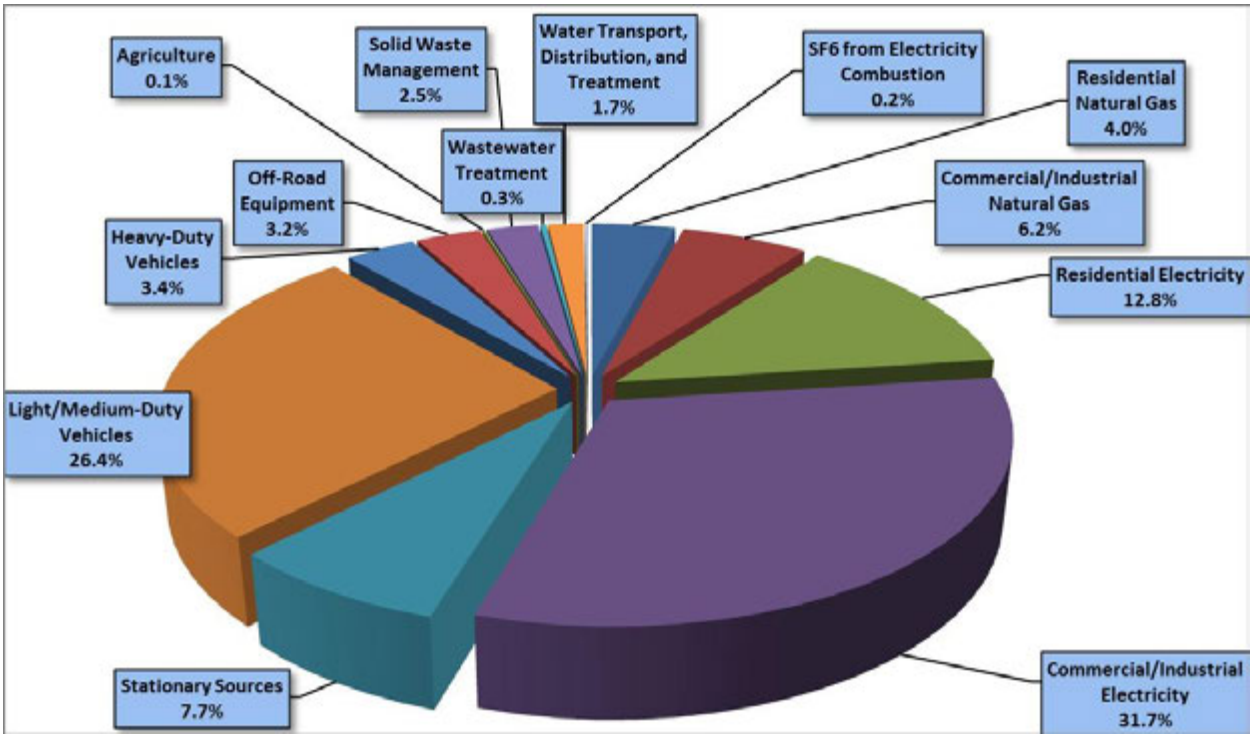
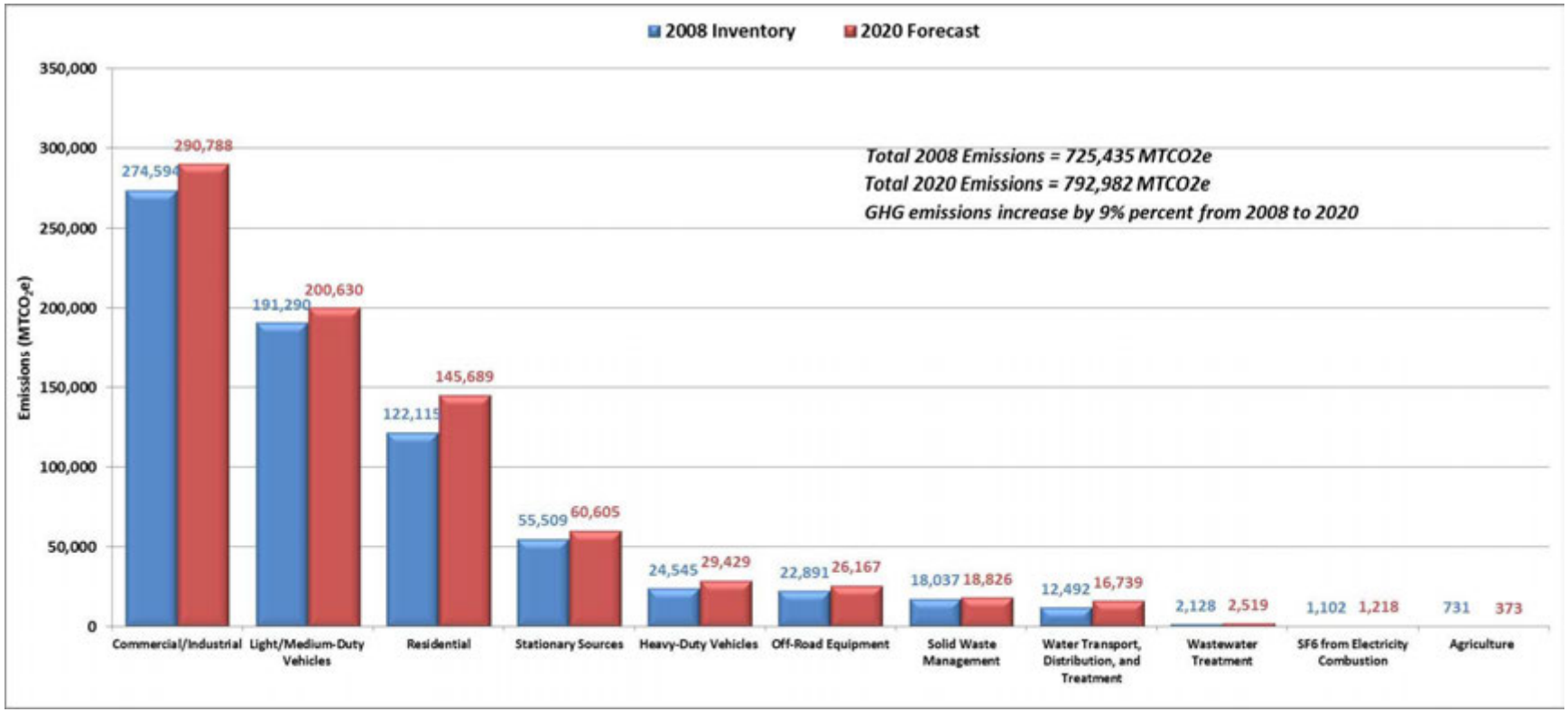


Figure 3-5b. Colton GHG Emissions by Sector for 2008 and 2020



3.6 Fontana

Primary sources of GHG emissions in Fontana are on-road transportation (46%), building energy (35%), and stationary sources (10%). Emissions are projected to increase by 12% from 2008 to 2020 due to economic and population growth. In 2008, Fontana had lower (7.1 $MTCO_2e$) per capita emissions than average (9.8 MTCO2e without cement) per capita emissions likely because its commercial and industrial sectors are relatively smaller compared to its population than the average of other cities in the 21-city region.

Table 3-6. Fontana 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	99,441	7%	117,680	8%
Commercial/Industrial Natural Gas	96,230	7%	108,415	7%
Residential Electricity	108,327	8%	128,195	8%
Commercial/Industrial Electricity	176,459	13%	198,948	13%
Stationary Sources	131,922	10%	151,072	10%
Light/Medium-Duty Vehicles	546,795	40%	584,542	38%
Heavy-Duty Vehicles	88,271	6%	105,557	7%
Off-Road Equipment	73,650	5%	83,979	5%
Agriculture	3,850	<1%	1,962	<1%
Solid Waste Management	19,570	1%	24,052	2%
Wastewater Treatment	7,842	1%	9,064	1%
Water Transport, Distribution, and Treatment	15,265	1%	20,138	1%
SF_6 from Electricity Combustion	3,227	<1%	3,735	<1%
Total Emissions	1,370,848	100%	1,537,339	100%

Figure 3-6a. Fontana GHG Emissions by Sector for 2008

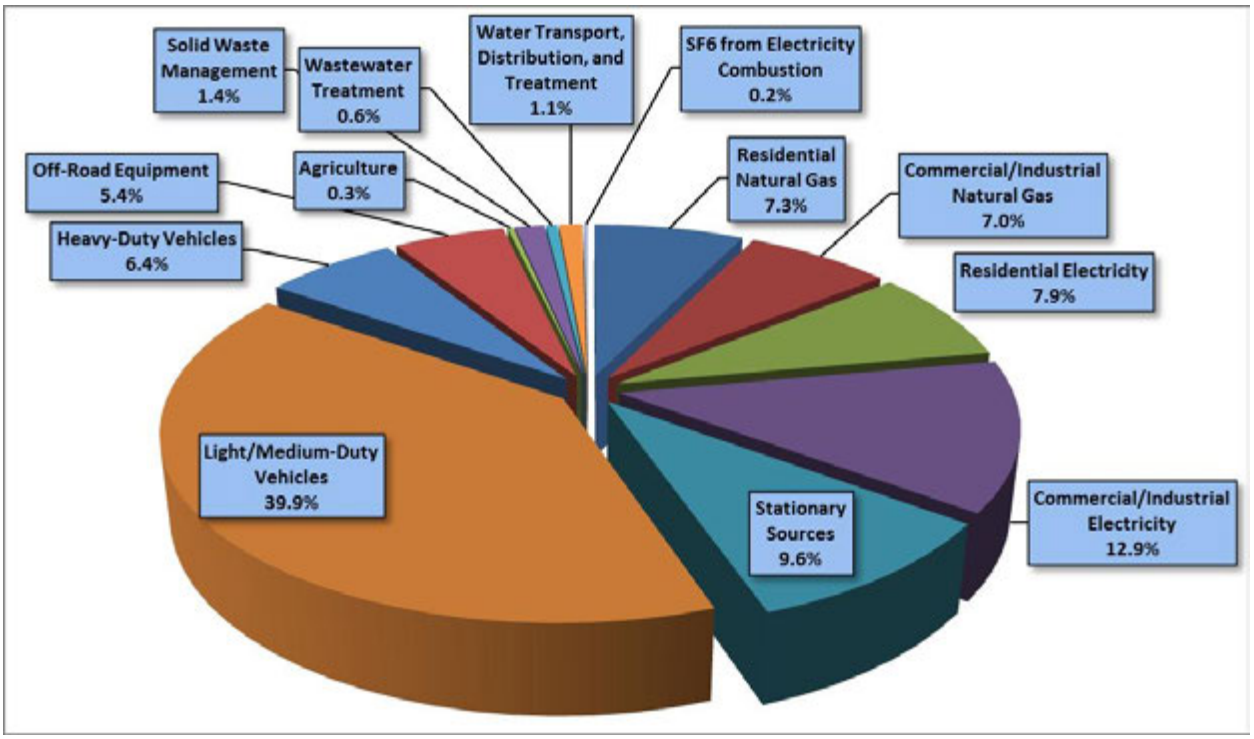
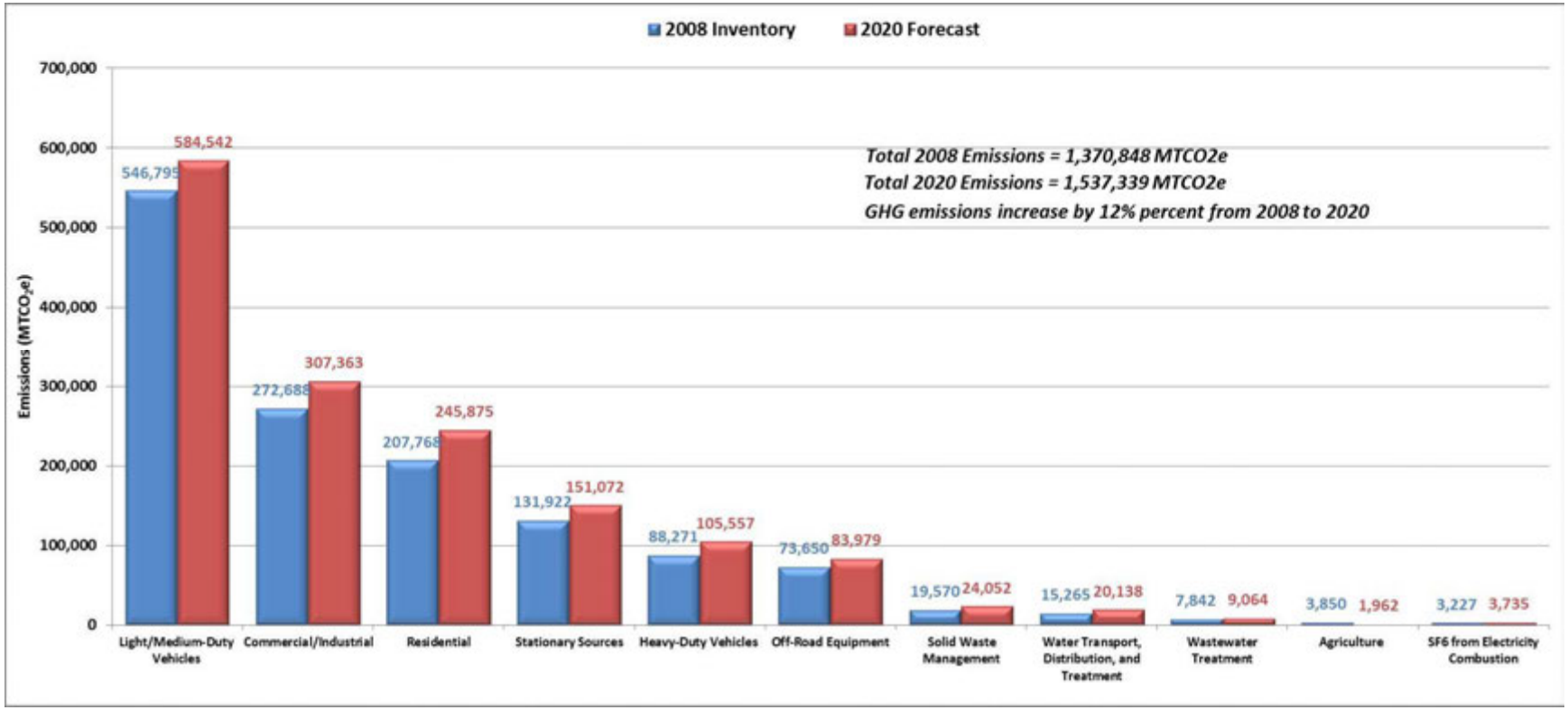


Figure 3-6b. Fontana GHG Emissions by Sector for 2008 and 2020



3.7 Grand Terrace

Primary sources of GHG emissions in Grand Terrace are on-road transportation (45%), building energy (36%), and stationary sources (8%). Emissions are projected to increase by 3% from 2008 to 2020 due to economic and population growth. In 2008, Grand Terrace had lower (7.9 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city has relatively smaller commercial and industrial activity compared to its population than the average of other cities in the 21-city region.

Table 3-7. Grand Terrace 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	9,680	10%	10,244	11%
Commercial/Industrial Natural Gas	6,381	7%	6,679	7%
Residential Electricity	10,606	11%	11,224	12%
Commercial/Industrial Electricity	6,715	7%	7,018	7%
Stationary Sources	7,348	8%	7,781	8%
Light/Medium-Duty Vehicles	37,840	41%	36,799	38%
Heavy-Duty Vehicles	3,916	4%	4,637	5%
Off-Road Equipment	3,909	4%	3,922	4%
Agriculture	116	<1%	59	<1%
Solid Waste Management	3,863	4%	3,895	4%
Wastewater Treatment	476	1%	474	<1%
Water Transport, Distribution, and Treatment	2,362	3%	3,029	3%
SF_6 from Electricity Combustion	212	<1%	229	<1%
Total Emissions	93,423	100%	95,991	100%

Figure 3-7a. Grand Terrace GHG Emissions by Sector for 2008

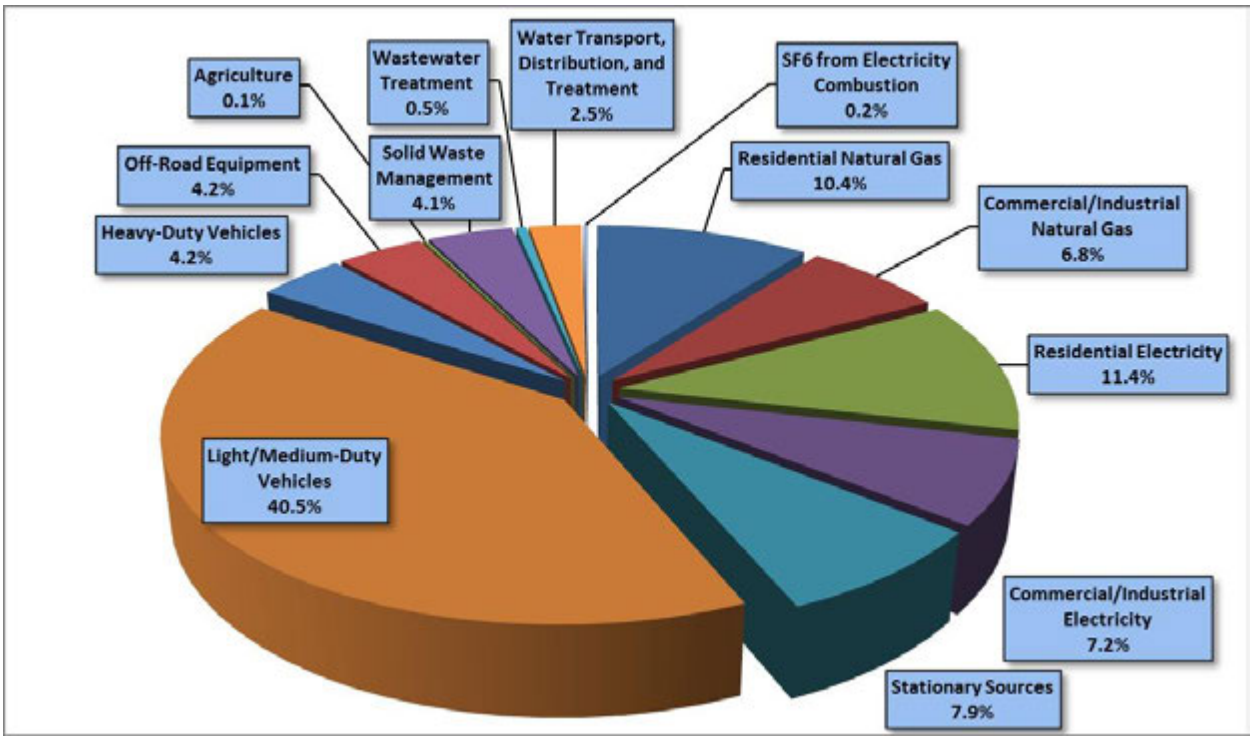
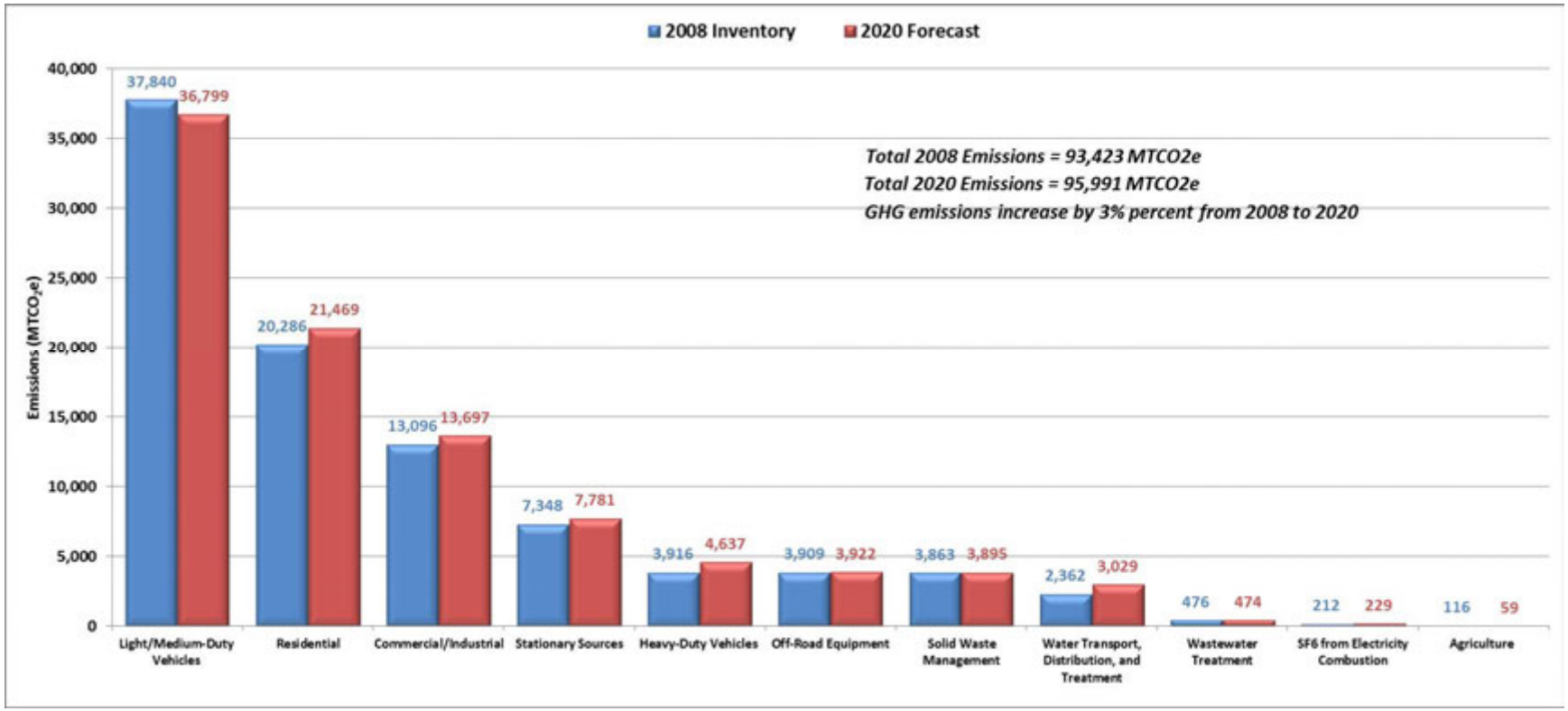


Figure 3-7b. Grand Terrace GHG Emissions by Sector for 2008 and 2020



3.8 Hesperia

Primary sources of GHG emissions in Hesperia are on-road transportation (48%), building energy (32%), and stationary sources (9%). Emissions are projected to increase by 24% from 2008 to 2020 due to economic and population growth. In 2008, Hesperia had lower (6.0 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city has relatively smaller commercial and industrial sectors compared to its population than the average of other cities in the 21-city region.

Table 3-8. Hesperia 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	67,900	13%	74,688	11%
Commercial/Industrial Natural Gas	11,575	2%	14,698	2%
Residential Electricity	60,139	11%	66,151	10%
Commercial/Industrial Electricity	34,920	6%	45,534	7%
Stationary Sources	50,216	9%	71,693	11%
Light/Medium-Duty Vehicles	220,898	41%	271,088	41%
Heavy-Duty Vehicles	34,962	7%	43,162	6%
Off-Road Equipment	27,949	5%	31,045	5%
Agriculture	5,572	1%	2,840	<1%
Solid Waste Management	7,007	1%	8,858	1%
Wastewater Treatment	3,624	1%	3,995	1%
Water Transport, Distribution, and Treatment	11,677	2%	28,968	4%
SF_6 from Electricity Combustion	1,148	<1%	1,513	<1%
Total Emissions	537,588	100%	664,231	100%

Figure 3-8a. Hesperia GHG Emissions by Sector for 2008

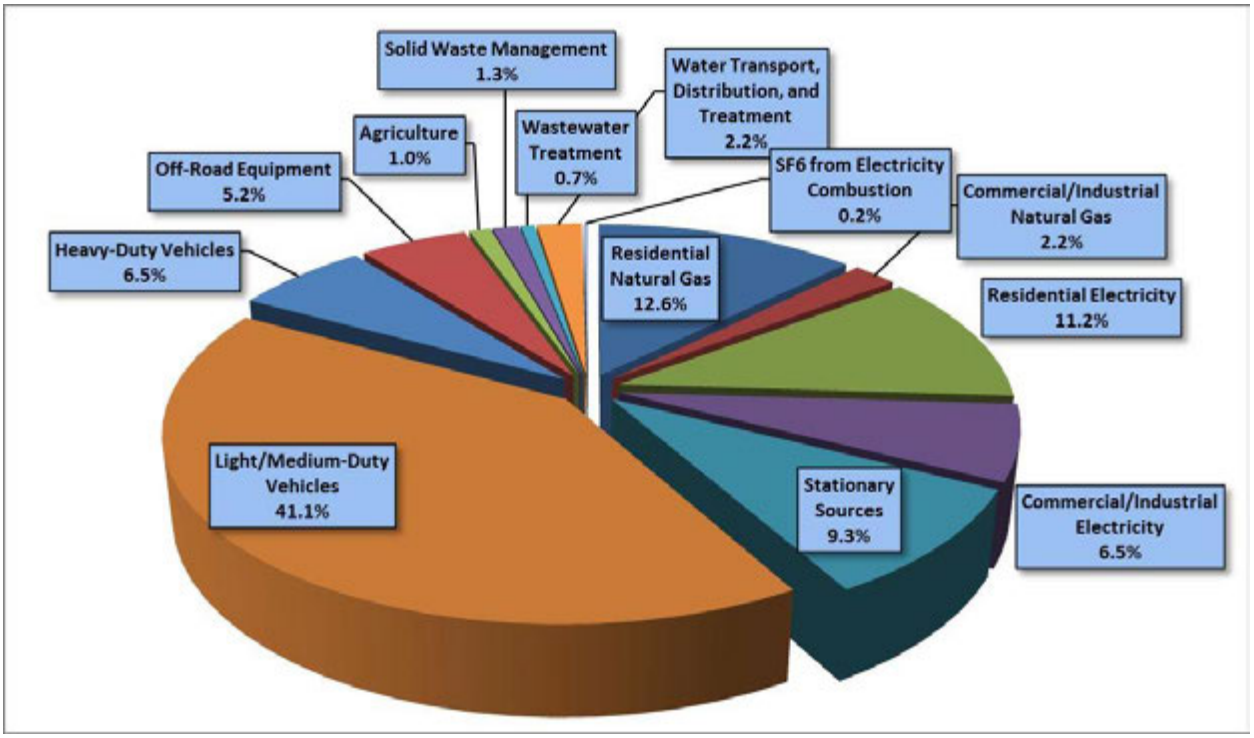
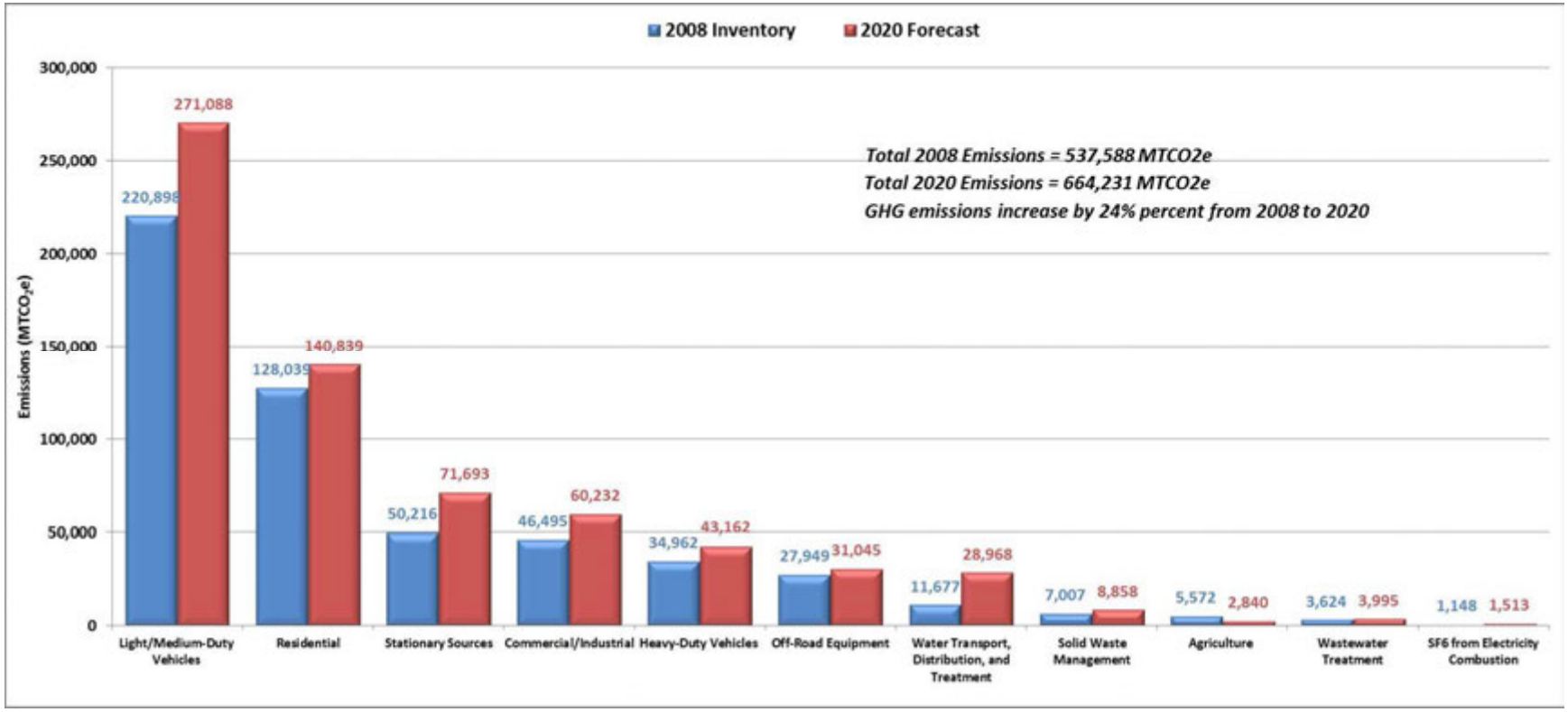


Figure 3-8b. Hesperia GHG Emissions by Sector for 2008 and 2020



3.9 Highland

Primary sources of GHG emissions in Highland are light/medium-duty vehicles (47%), building energy (35%), and stationary sources (6%). Emissions are projected to increase by 15% from 2008 to 2020 due to economic and population growth. In 2008, Highland had lower (5.3 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city has a smaller commercial and industrial sector compared to its population relative to the average of other cities in the 21-city region.

Table 3-9. Highland 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	35,947	13%	41,249	13%
Commercial/Industrial Natural Gas	9,372	3%	12,979	4%
Residential Electricity	37,141	13%	42,620	13%
Commercial/Industrial Electricity	17,800	6%	22,373	7%
Stationary Sources	15,615	6%	20,364	6%
Light/Medium-Duty Vehicles	121,794	43%	130,208	40%
Heavy-Duty Vehicles	11,216	4%	14,842	5%
Off-Road Equipment	11,736	4%	13,319	4%
Agriculture	715	<1%	364	<1%
Solid Waste Management	9,533	3%	10,957	3%
Wastewater Treatment	2,143	1%	2,387	1%
Water Transport, Distribution, and Treatment	8,974	3%	11,417	4%
SF_6 from Electricity Combustion	687	<1%	822	<1%
Total Emissions	282,673	100%	323,902	100%

Figure 3-9a. Highland GHG Emissions by Sector for 2008

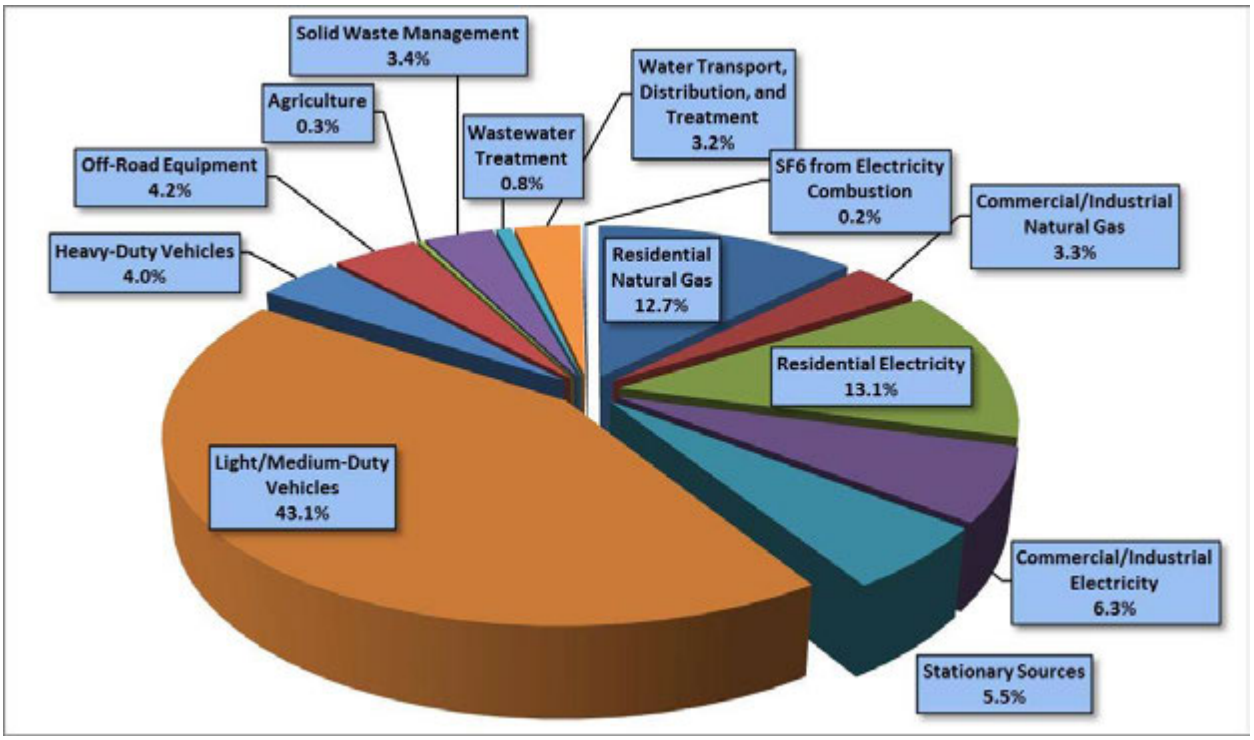
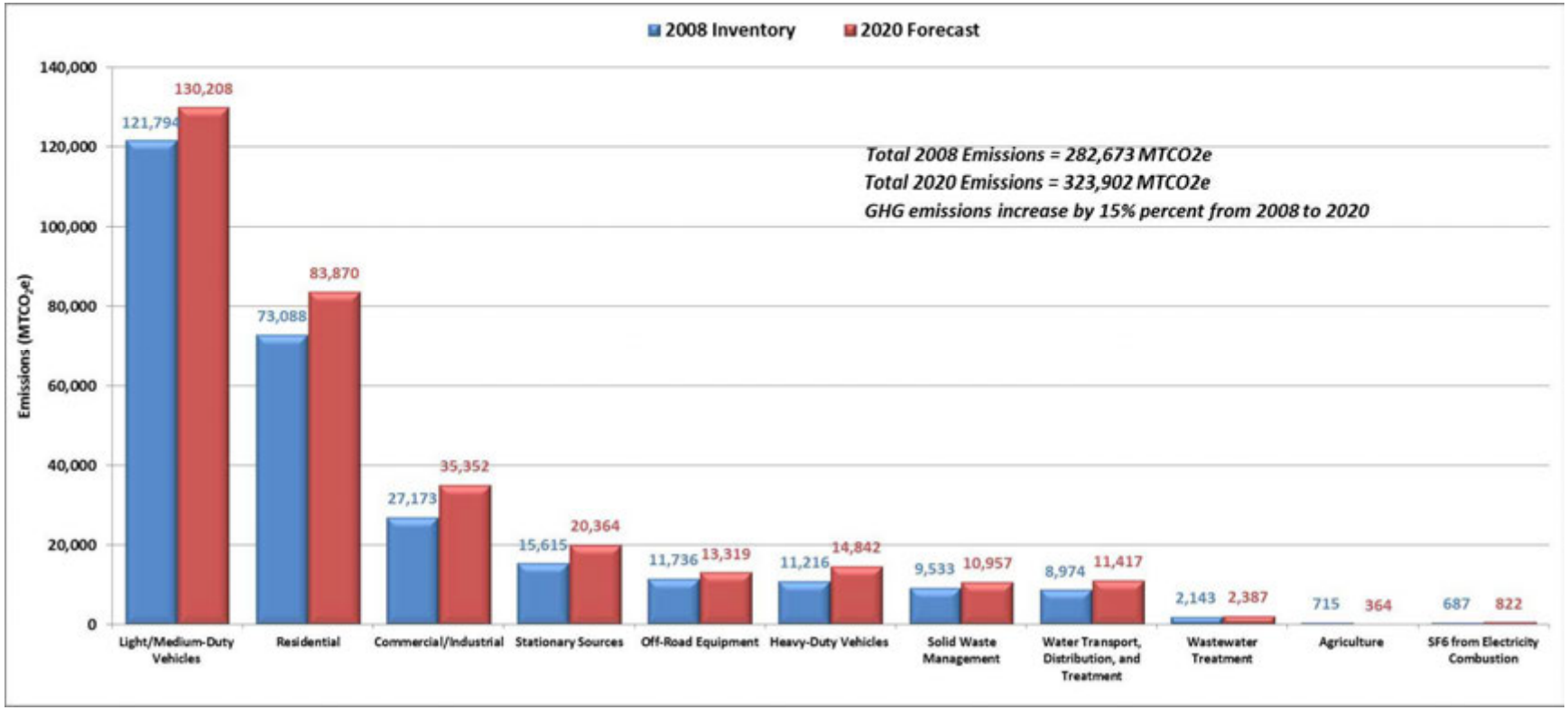


Figure 3-9b. Highland GHG Emissions by Sector for 2008 and 2020



3.10 Loma Linda

Primary sources of GHG emissions in Loma Linda are building energy (43%), on-road transportation (39%), and stationary sources (12%). Emissions are projected to increase by 24% from 2008 to 2020 due to economic and population growth. In 2008, Loma Linda had higher (12.4 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city is home to large medical centers and the Loma Linda University and thus have more commercial and institutional activity compared to averages in the 21-city region.

Table 3-10. Loma Linda 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	16,615	6%	20,032	6%
Commercial/Industrial Natural Gas	61,537	22%	79,220	22%
Residential Electricity	17,675	6%	21,310	6%
Commercial/Industrial Electricity	27,441	10%	35,919	10%
Stationary Sources	33,316	12%	45,375	13%
Light/Medium-Duty Vehicles	105,396	37%	123,796	35%
Heavy-Duty Vehicles	6,454	2%	10,170	3%
Off-Road Equipment	6,747	2%	8,451	2%
Agriculture	675	<1%	344	<1%
Solid Waste Management	6,911	2%	6,925	2%
Wastewater Treatment	931	<1%	1,088	<1%
Water Transport, Distribution, and Treatment	1,636	1%	2,332	1%
SF_6 from Electricity Combustion	503	<1%	641	<1%
Total Emissions	285,837	100%	355,604	100%

Figure 3-10a. Loma Linda GHG Emissions by Sector for 2008

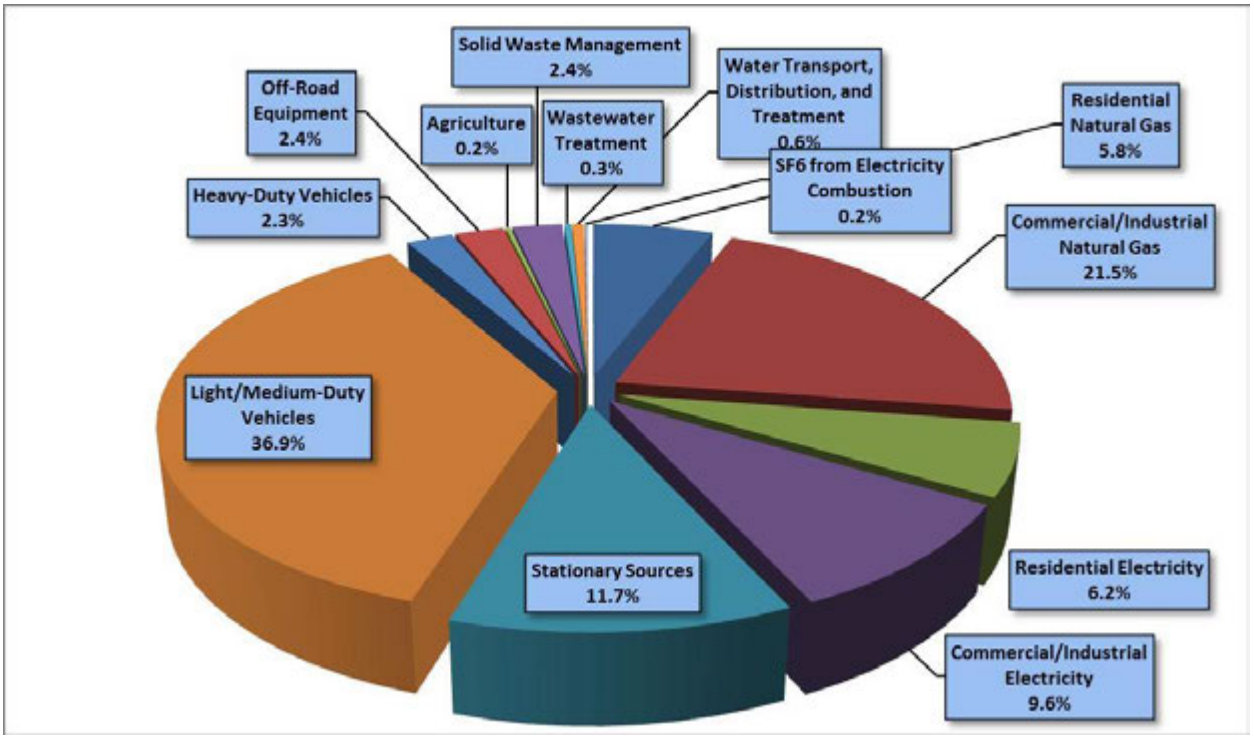
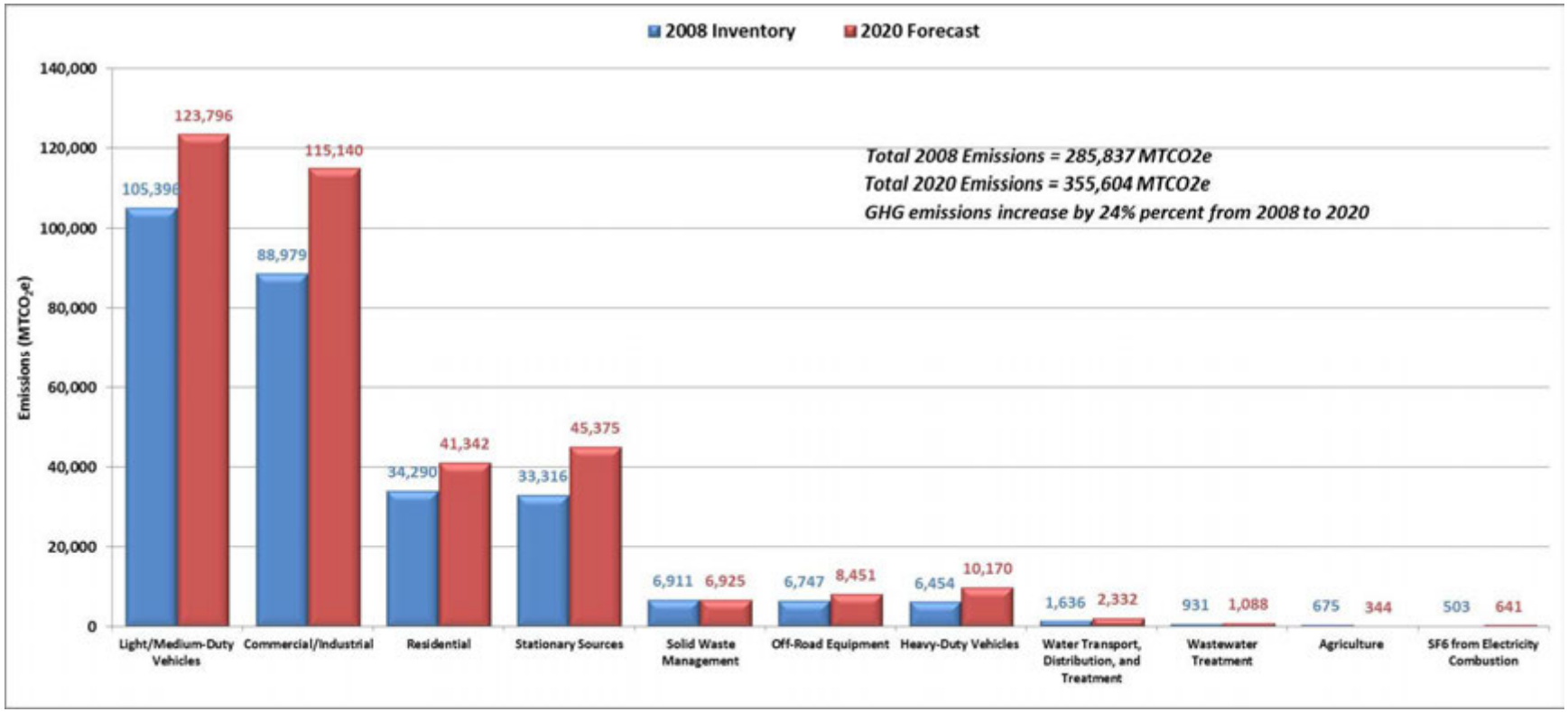


Figure 3-10b. Loma Linda GHG Emissions by Sector for 2008 and 2020



3.11 Montclair

Primary sources of GHG emissions in Montclair are on-road transportation (46%), building energy (28%), and stationary sources (14%). Emissions are projected to increase by 4% from 2008 to 2020 due to economic and population growth. In 2008, Montclair had slightly lower (8.6 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions despite having a slightly higher jobs/residents ratio compared to the 21-city regional average, indicating it may have a slightly higher than average commercial activity compared to its population than the regional average.

Table 3-11. Montclair 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	20,242	7%	22,624	7%
Commercial/Industrial Natural Gas	10,164	3%	10,520	3%
Residential Electricity	17,787	6%	19,881	6%
Commercial/Industrial Electricity	38,188	12%	39,498	12%
Stationary Sources	42,224	14%	45,753	14%
Light/Medium-Duty Vehicles	127,994	41%	127,705	39%
Heavy-Duty Vehicles	16,019	5%	17,414	5%
Off-Road Equipment	16,474	5%	17,917	6%
Agriculture	0	<1%	0	<1%
Solid Waste Management	10,108	3%	9,873	3%
Wastewater Treatment	1,455	<1%	1,614	<1%
Water Transport, Distribution, and Treatment	9,687	3%	11,313	3%
SF_6 from Electricity Combustion	706	<1%	760	<1%
Total Emissions	311,049	100%	324,873	100%

Figure 3-11a. Montclair GHG Emissions by Sector for 2008

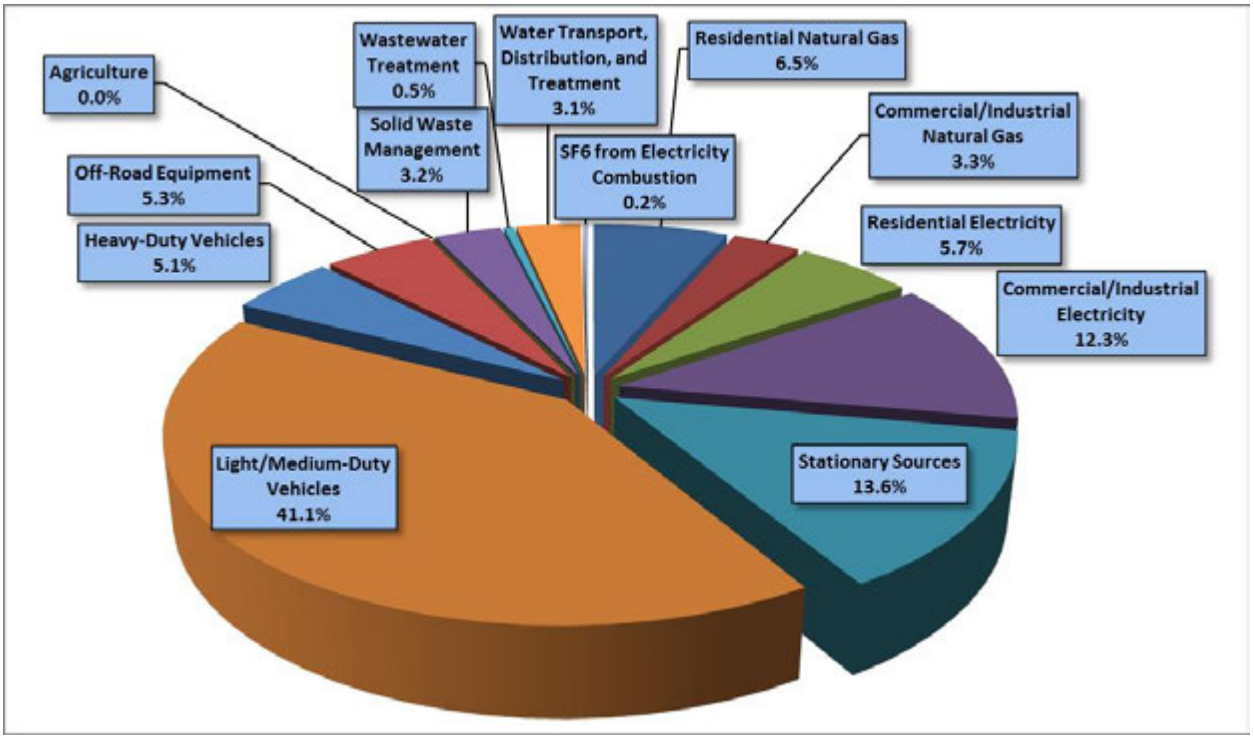
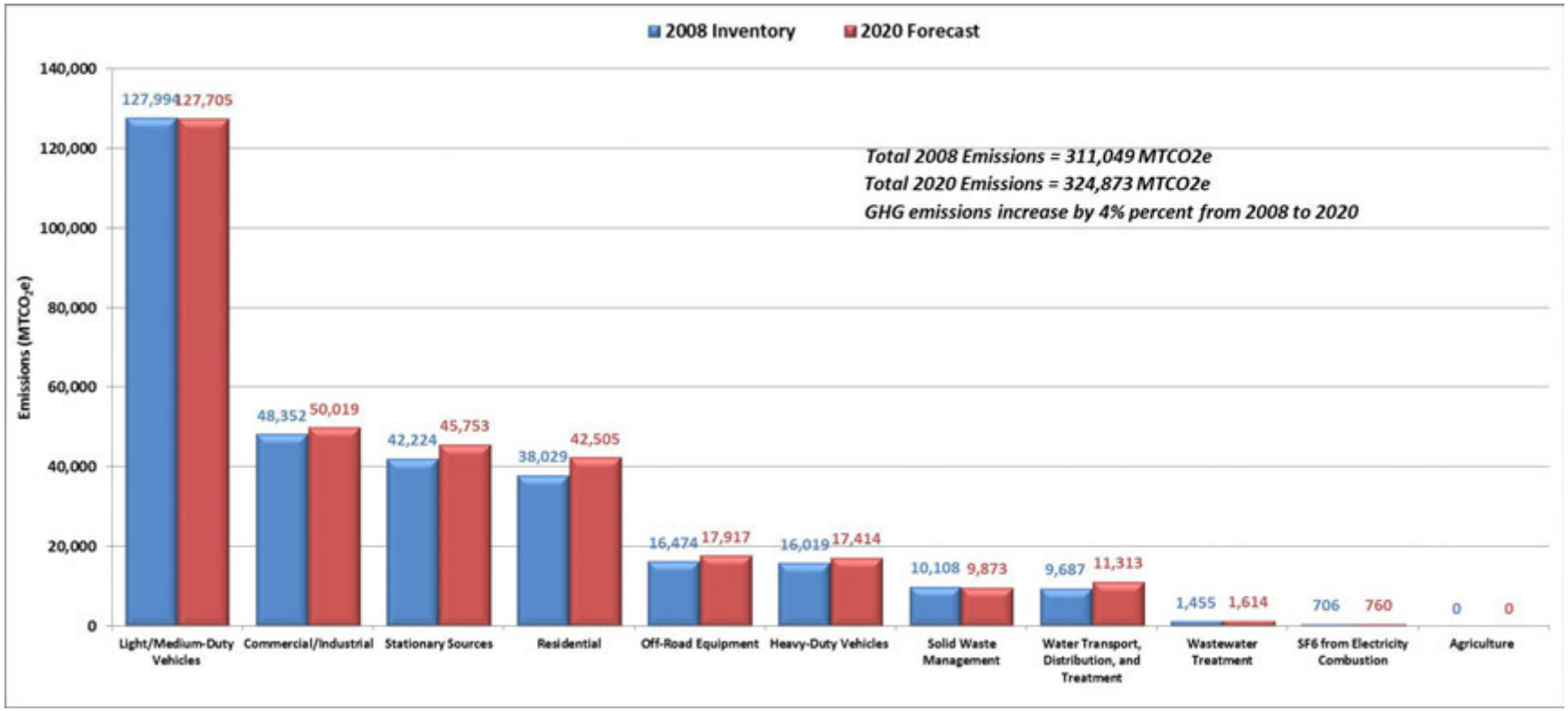


Figure 3-11b. Montclair GHG Emissions by Sector for 2008 and 2020



3.12 Needles

Primary sources of GHG emissions in Needles are on-road transportation (41%), building energy (42%), and stationary sources (9%). Emissions are projected to increase by 0.2% from 2008 to 2020 due to slight conomic and population growth. In 2008, Needles had higher (17.8 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city has relatively higher residential and commercial electricity emissions than the 21-city average and possibly due to higher cooling needs than other cities in the 21-city region. Needles also has a higher jobs/resident ratio than the 21-city regional average as well indicating a relatively higher commercial and/or industrial activity compared to population.

Table 3-12. Needles 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	1,924	2%	1,963	2%
Commercial/Industrial Natural Gas	1,444	2%	1,367	2%
Residential Electricity	14,246	17%	14,531	17%
Commercial/Industrial Electricity	18,169	21%	17,194	20%
Stationary Sources	7,391	9%	7,807	9%
Light/Medium-Duty Vehicles	23,622	27%	23,747	28%
Heavy-Duty Vehicles	11,514	13%	11,720	14%
Off-Road Equipment	2,549	3%	2,587	3%
Agriculture	0	<1%	0	<1%
Solid Waste Management	3,915	5%	3,989	5%
Wastewater Treatment	196	<1%	201	<1%
Water Transport, Distribution, and Treatment	999	1%	1,019	1%
SF_6 from Electricity Combustion	181	<1%	177	<1%
Total Emissions	86,150	100%	86,303	20%

Figure 3-12a. Needles GHG Emissions by Sector for 2008

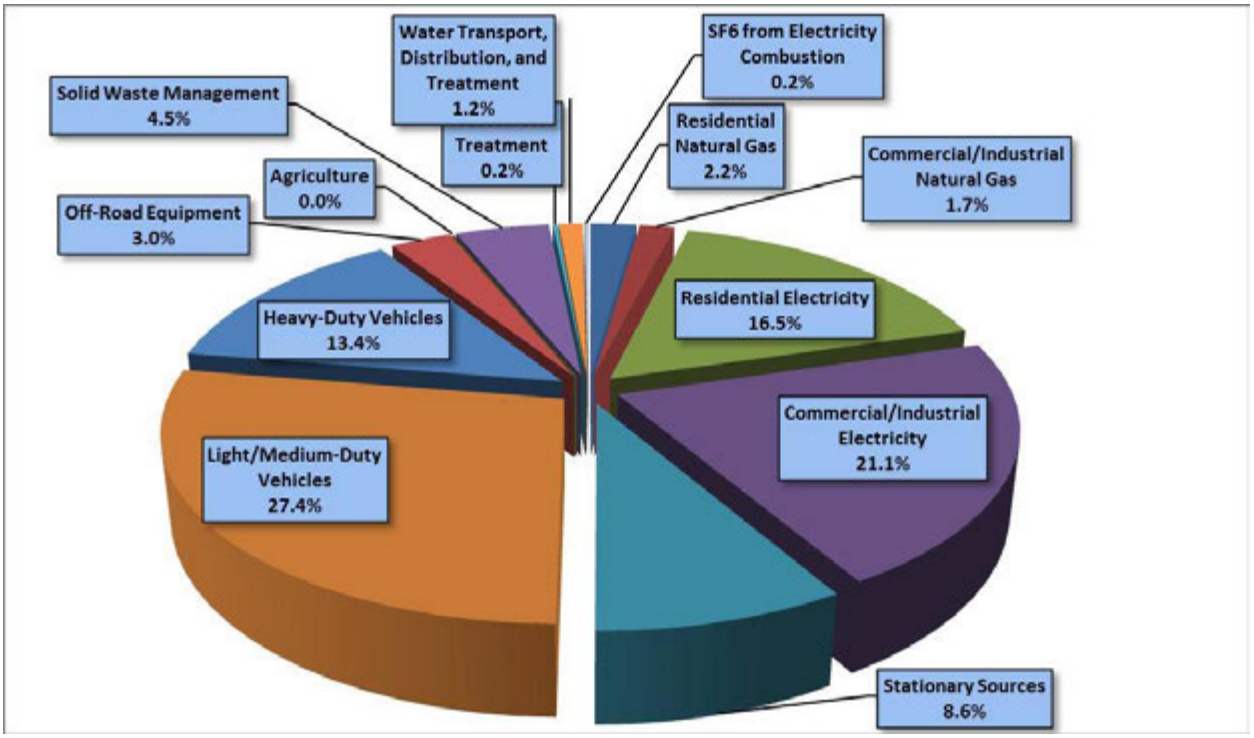
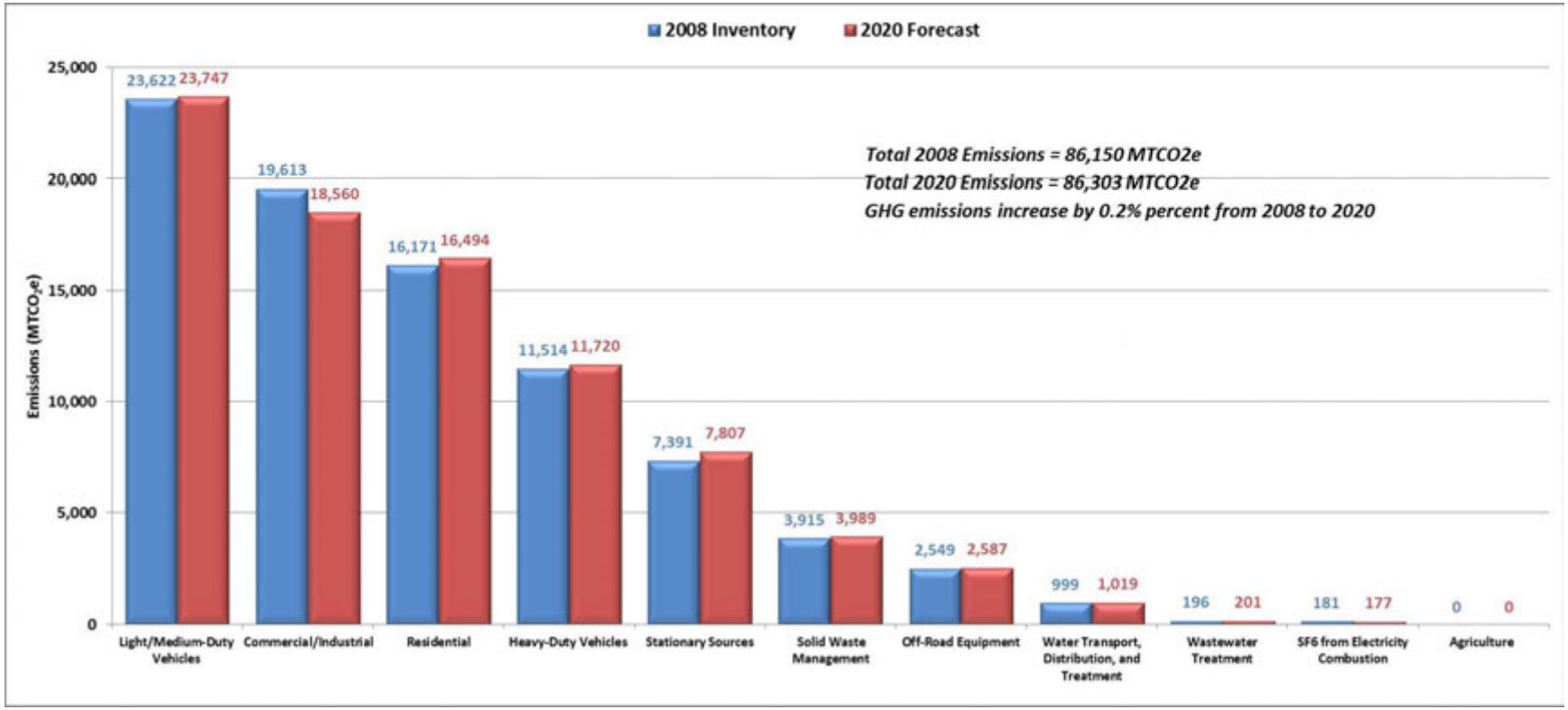


Figure 3-12b. Needles GHG Emissions by Sector for 2008 and 2020



3.13 Ontario

Primary sources of GHG emissions in Ontario are on-road transportation (32%), building energy (32%), and stationary sources (14%). Emissions are projected to increase by 23% from 2008 to 2020 due to economic and population growth. In 2008, Ontario had higher (17.9 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city is home to substantial commercial activity including the Mills Mall, the Ontario Convention center, extensive warehousing, and large dairy operations, and thus, has a larger commercial, industrial, and agricultural sector compared to its population relative to the average of other cities in the 21-city region.

Table 3-13. Ontario 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	95,327	3%	130,539	4%
Commercial/Industrial Natural Gas	368,456	13%	487,494	14%
Residential Electricity	91,231	3%	124,930	3%
Commercial/Industrial Electricity	373,395	13%	494,042	13%
Stationary Sources	405,195	14%	511,548	14%
Light/Medium-Duty Vehicles	744,248	26%	909,985	25%
Heavy-Duty Vehicles	197,772	7%	259,186	7%
Off-Road Equipment	176,314	6%	229,069	6%
Agriculture	356,131	12%	323,390	9%
Solid Waste Management	60,000	2%	64,326	2%
Wastewater Treatment	6,587	<1%	8,781	<1%
Water Transport, Distribution, and Treatment	29,044	1%	38,575	1%
SF_6 from Electricity Combustion	5,310	<1%	7,072	<1%
Total Emissions	2,909,011	100%	3,588,939	100%

Figure 3-13a. Ontario GHG Emissions by Sector for 2008

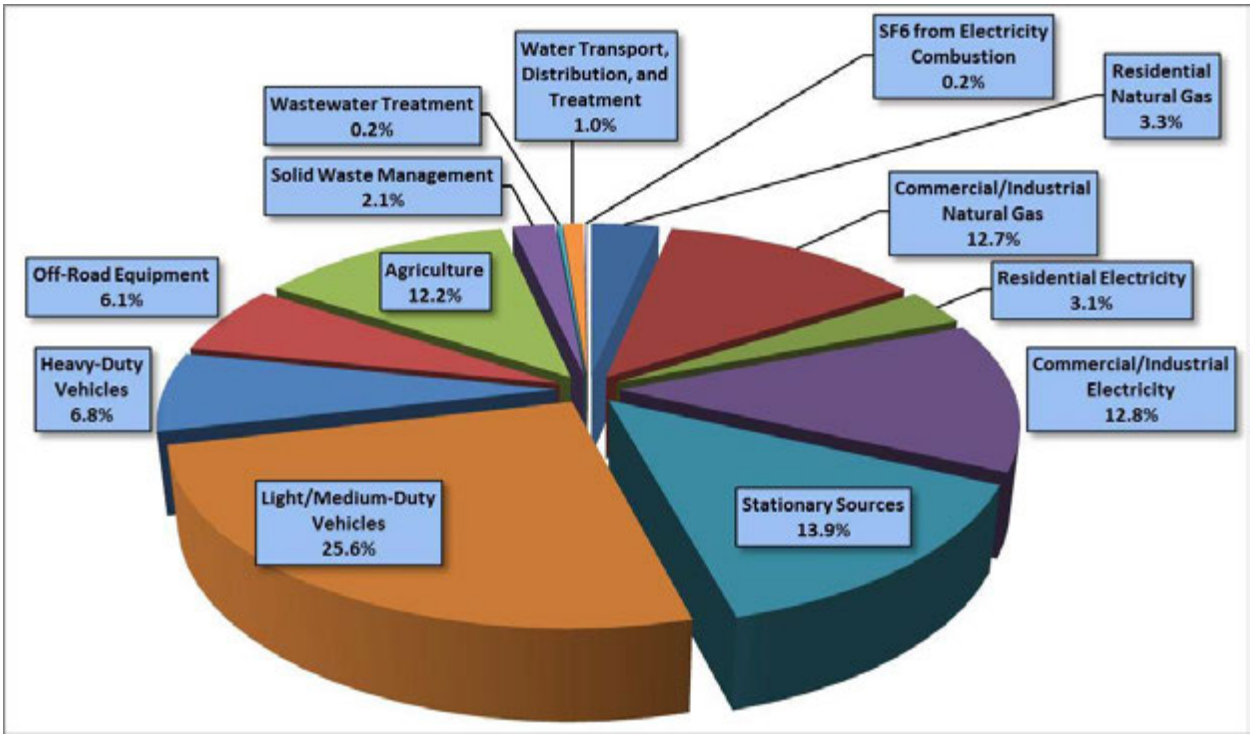
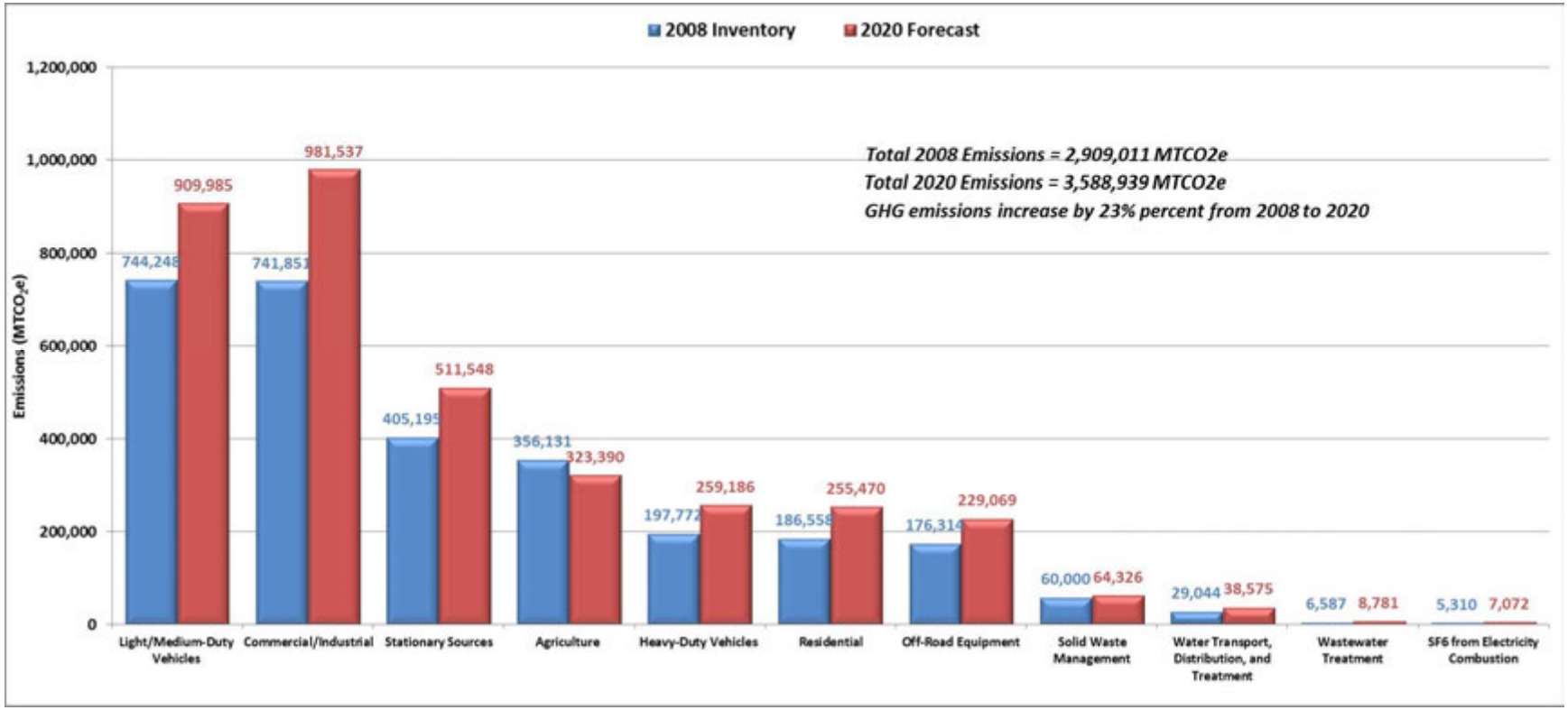


Figure 3-13b. Ontario GHG Emissions by Sector for 2008 and 2020



3.14 Rancho Cucamonga

Primary sources of GHG emissions in Rancho Cucamonga are on-road transportation (41%), building energy (40%), and stationary sources (9%). Emissions are projected to increase by 3% from 2008 to 2020 due to economic and population growth. In 2008, Rancho Cucamonga had roughly average per capita emissions (10.6 $MTCO_2e$) compared to other cities in the 21-city region (9.8 $MTCO_2e$ without cement) and has roughly the same jobs/residents ratio as the 21-city regional average.

Table 3-14. Rancho Cucamonga 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	125,368	7%	131,779	7%
Commercial/Industrial Natural Gas	127,591	7%	135,955	8%
Residential Electricity	135,894	8%	142,843	8%
Commercial/Industrial Electricity	299,391	17%	306,175	17%
Stationary Sources	162,416	9%	171,551	10%
Light/Medium-Duty Vehicles	620,627	36%	606,697	34%
Heavy-Duty Vehicles	82,277	5%	95,301	5%
Off-Road Equipment	80,830	5%	82,950	5%
Agriculture	300	<1%	153	<1%
Solid Waste Management	29,042	2%	29,475	2%
Wastewater Treatment	6,584	<1%	6,801	<1%
Water Transport, Distribution, and Treatment	46,054	3%	50,598	3%
SF_6 from Electricity Combustion	5,177	<1%	5,374	<1%
Total Emissions	1,721,552	100%	1,765,652	100%

Figure 3-14a. Rancho Cucamonga GHG Emissions by Sector for 2008

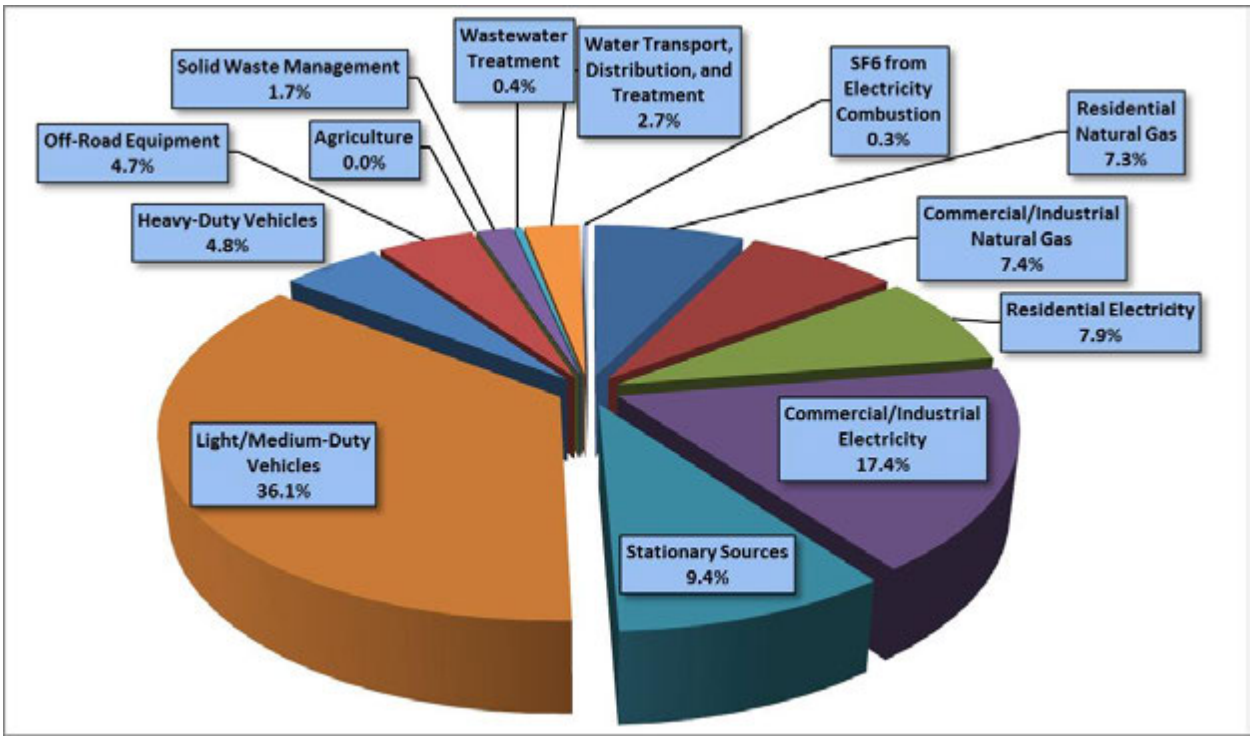
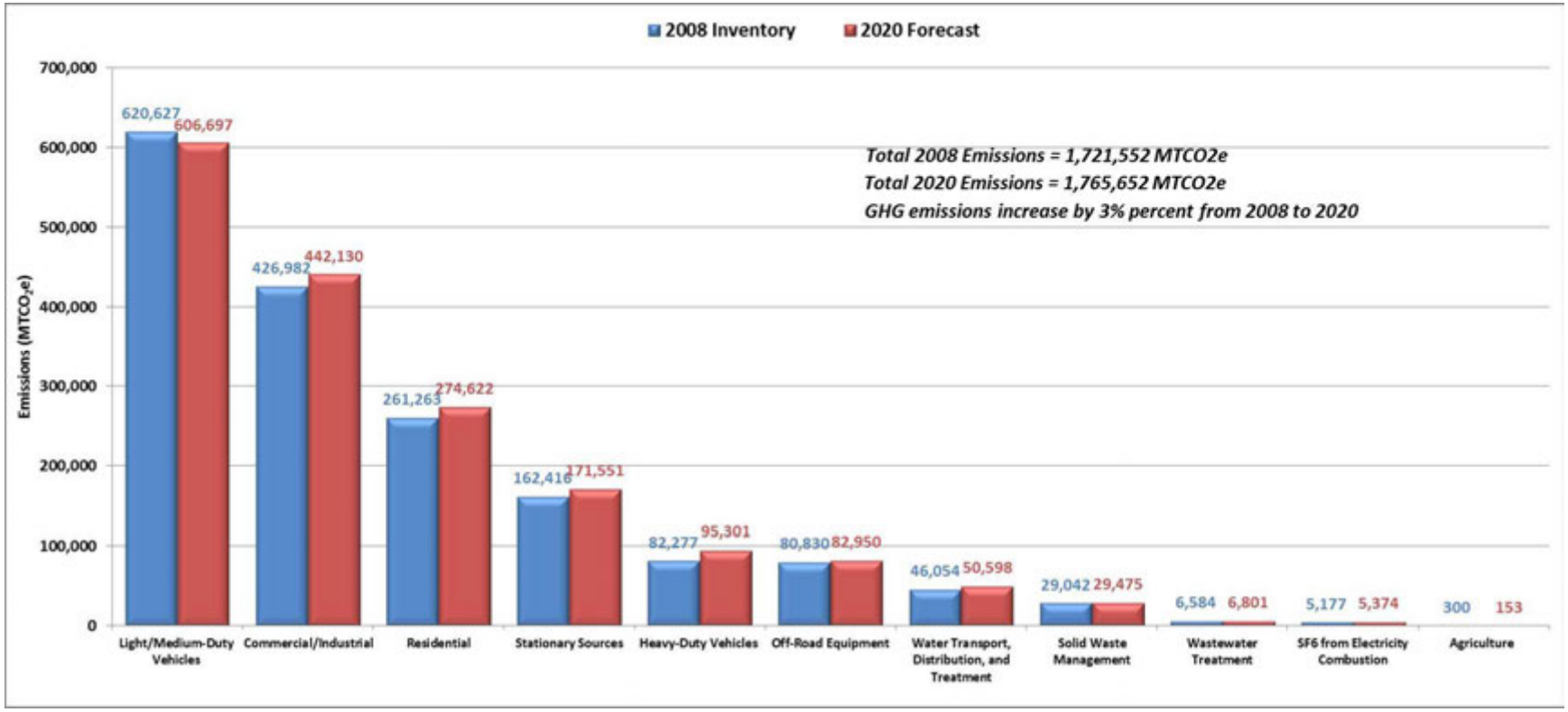


Figure 3-14b. Rancho Cucamonga GHG Emissions by Sector for 2008 and 2020



3.15 Redlands

Primary sources of GHG emissions in Redlands are on-road transportation (41%), building energy (38%), and stationary sources (12%). Emissions are projected to increase by 12% from 2008 to 2020 due to economic and population growth. In 2008, Redlands had higher than average per capita emissions (11.5 $MTCO_2e$) compared to other cities in the 21-city region (9.8 $MTCO_2e$ without cement) possibly due to higher commercial activity per population compared to the 21-city average (including hospitals, shopping centers, the University of Redlands, and other commercial facilties).

Table 3-15. Redlands 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	64,168	8%	73,419	8%
Commercial/Industrial Natural Gas	85,131	11%	95,912	11%
Residential Electricity	62,231	8%	71,203	8%
Commercial/Industrial Electricity	88,799	11%	99,921	11%
Stationary Sources	92,324	12%	109,197	12%
Light/Medium-Duty Vehicles	287,424	37%	304,619	35%
Heavy-Duty Vehicles	31,733	4%	44,899	5%
Off-Road Equipment	30,147	4%	33,528	4%
Agriculture	3,298	<1%	1,681	<1%
Landfills[a]	6,665	1%	8,587	1%
Solid Waste Management	9,726	1%	9,290	1%
Wastewater Treatment	2,773	<1%	3,072	<1%
Water Transport, Distribution, and Treatment	19,161	2%	22,242	3%
SF_6 from Electricity Combustion	1,831	<1%	2,080	<1%
Total Emissions	785,411	100%	879,650	100%

[a] Redlands owns and operates the California Street Landfill, so site-based emissions from this landfill were included in Redland's inventory. These emissions do not double-count the Scope 2 solid waste management emissions.

Figure 3-15a. Redlands GHG Emissions by Sector for 2008

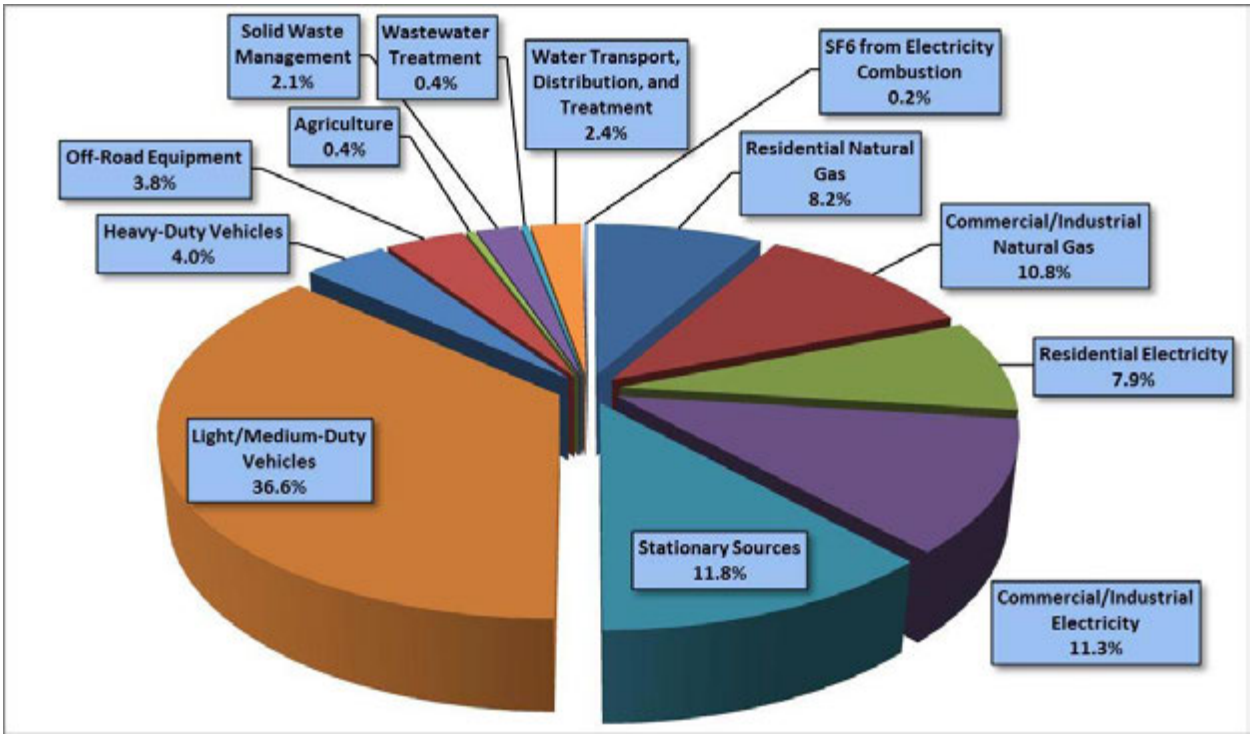
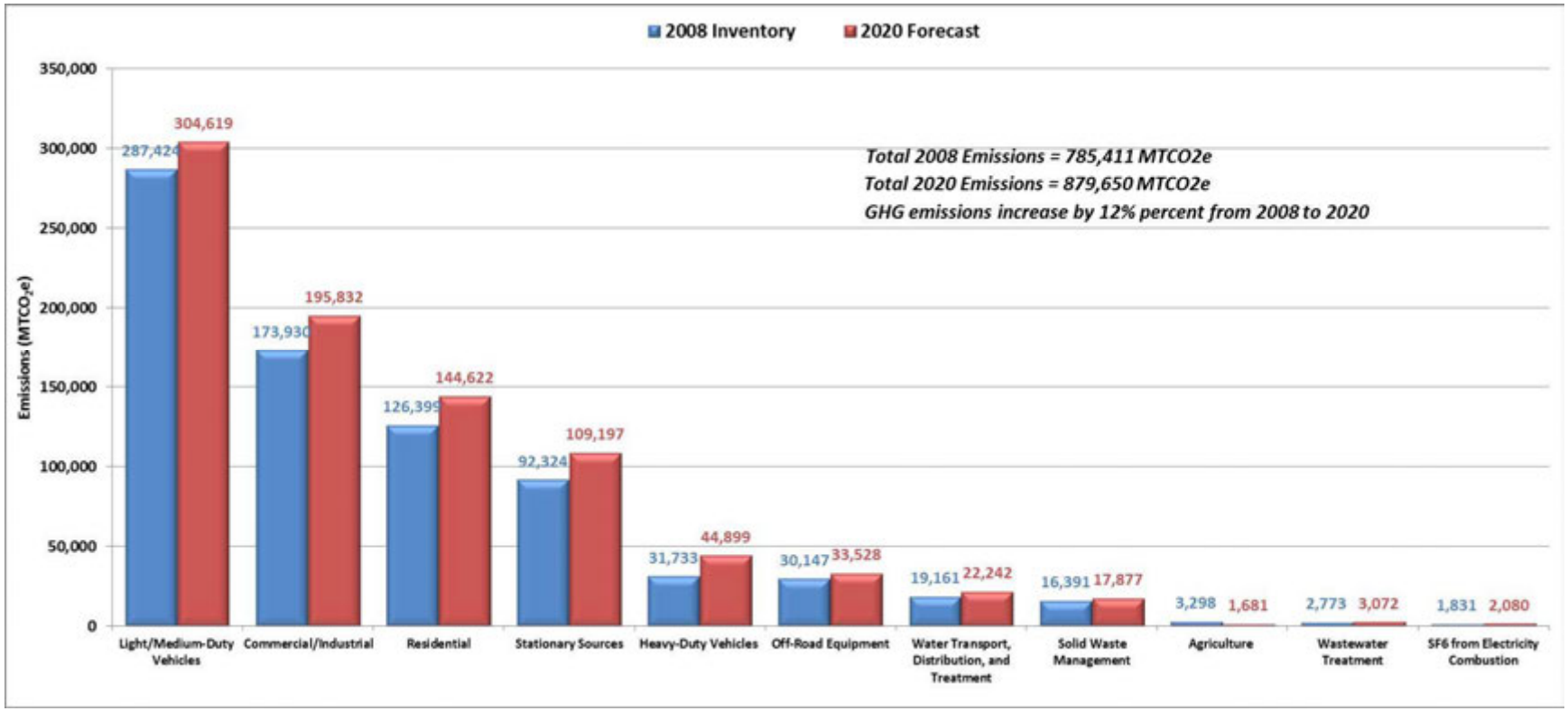


Figure 3-15b. Redlands GHG Emissions by Sector for 2008 and 2020



3.16 Rialto

Primary sources of GHG emissions in Rialto are transportation (45%), building energy (34%), and stationary sources (10%). Emissions are projected to increase by 16% from 2008 to 2020 due to economic and population growth. In 2008, Rialto had lower (6.8 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because it has less relatively less commercial and industrial activity compared to population than the average of other cities in the 21-city region.

Table 3-16. Rialto 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	58,722	9%	68,671	9%
Commercial/Industrial Natural Gas	31,838	5%	36,776	5%
Residential Electricity	55,411	8%	64,800	8%
Commercial/Industrial Electricity	86,255	13%	99,392	13%
Stationary Sources	67,952	10%	80,427	10%
Light/Medium-Duty Vehicles	260,057	38%	275,214	35%
Heavy-Duty Vehicles	41,945	6%	51,042	7%
Off-Road Equipment	40,061	6%	44,508	6%
Agriculture	245	<1%	125	<1%
Solid Waste Management	14,269	2%	15,708	2%
Wastewater Treatment	4,001	1%	4,476	1%
Water Transport, Distribution, and Treatment	14,297	2%	39,327	5%
SF_6 from Electricity Combustion	1,678	<1%	2,189	<1%
Total Emissions	676,731	100%	782,656	100%

Figure 3-16a. Rialto GHG Emissions by Sector for 2008

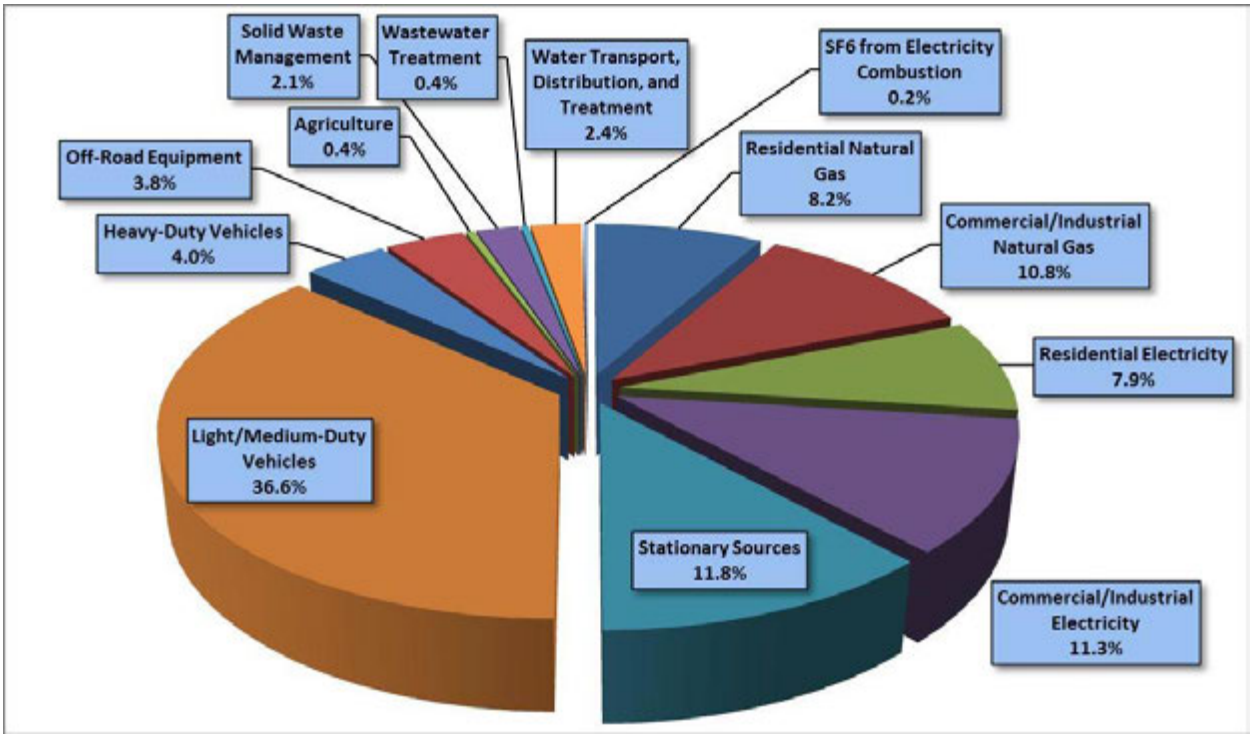
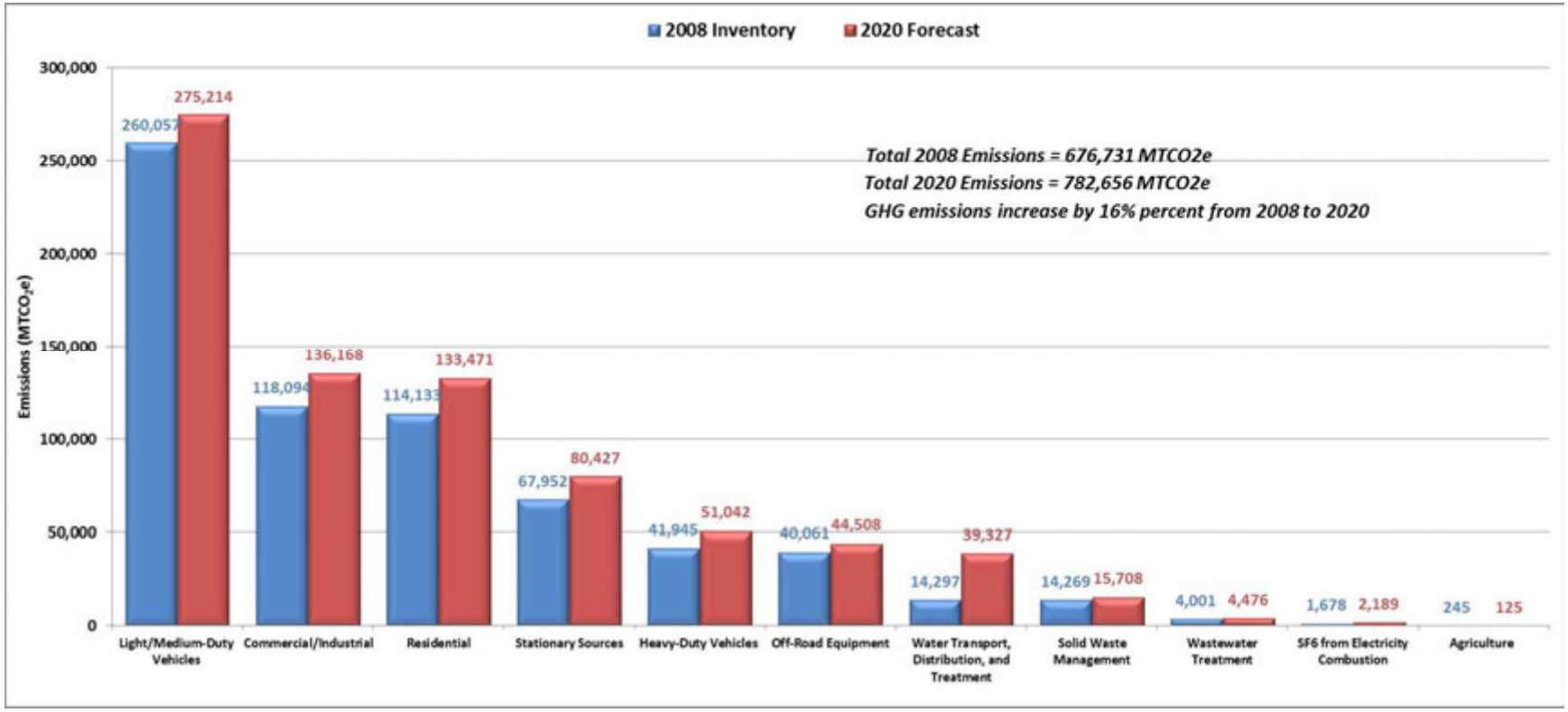


Figure 3-16b. Rialto GHG Emissions by Sector for 2008 and 2020



3.17 San Bernardino

Primary sources of GHG emissions in San Bernardino are on-road transportation (42%), building energy (30%), and stationary sources (17%). Emissions are projected to increase by 8% from 2008 to 2020 due to economic and population growth. In 2008, San Bernardino per capita emissions are slightly less (9.1 $MTCO_2e$) than the average (9.8 $MTCO_2e$ without cement) for cities in the 21-city region. San Bernardino has a higher jobs/resident ratio than the 21-city average which may indicate slightly higher commercial or industrial activity per population than the regional average.

Table 3-17. San Bernardino 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	128,284	7%	144,753	7%
Commercial/Industrial Natural Gas	81,191	4%	90,897	4%
Residential Electricity	119,743	6%	135,115	7%
Commercial/Industrial Electricity	245,031	13%	274,164	13%
Stationary Sources	322,801	17%	301,927	15%
Light/Medium-Duty Vehicles	719,798	38%	780,445	38%
Heavy-Duty Vehicles	90,779	5%	110,771	5%
Off-Road Equipment	96,602	5%	100,337	5%
Agriculture	1,909	<1%	973	<1%
Solid Waste Management	66,492	3%	72,386	3%
Wastewater Treatment	8,490	<1%	9,407	<1%
Water Transport, Distribution, and Treatment	25,365	1%	45,858	2%
SF_6 from Electricity Combustion	4,196	<1%	4,895	<1%
Total Emissions	1,910,681	100%	2,071,927	100%

Figure 3-17a. San Bernardino GHG Emissions by Sector for 2008

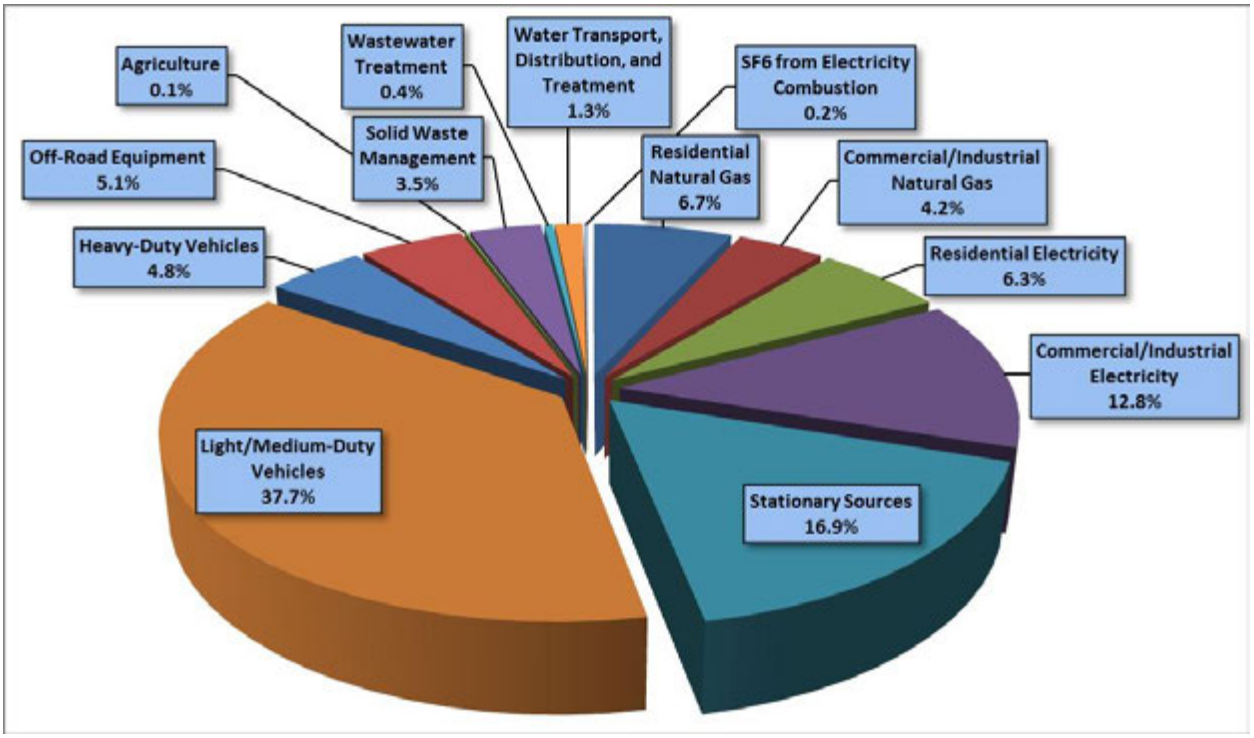
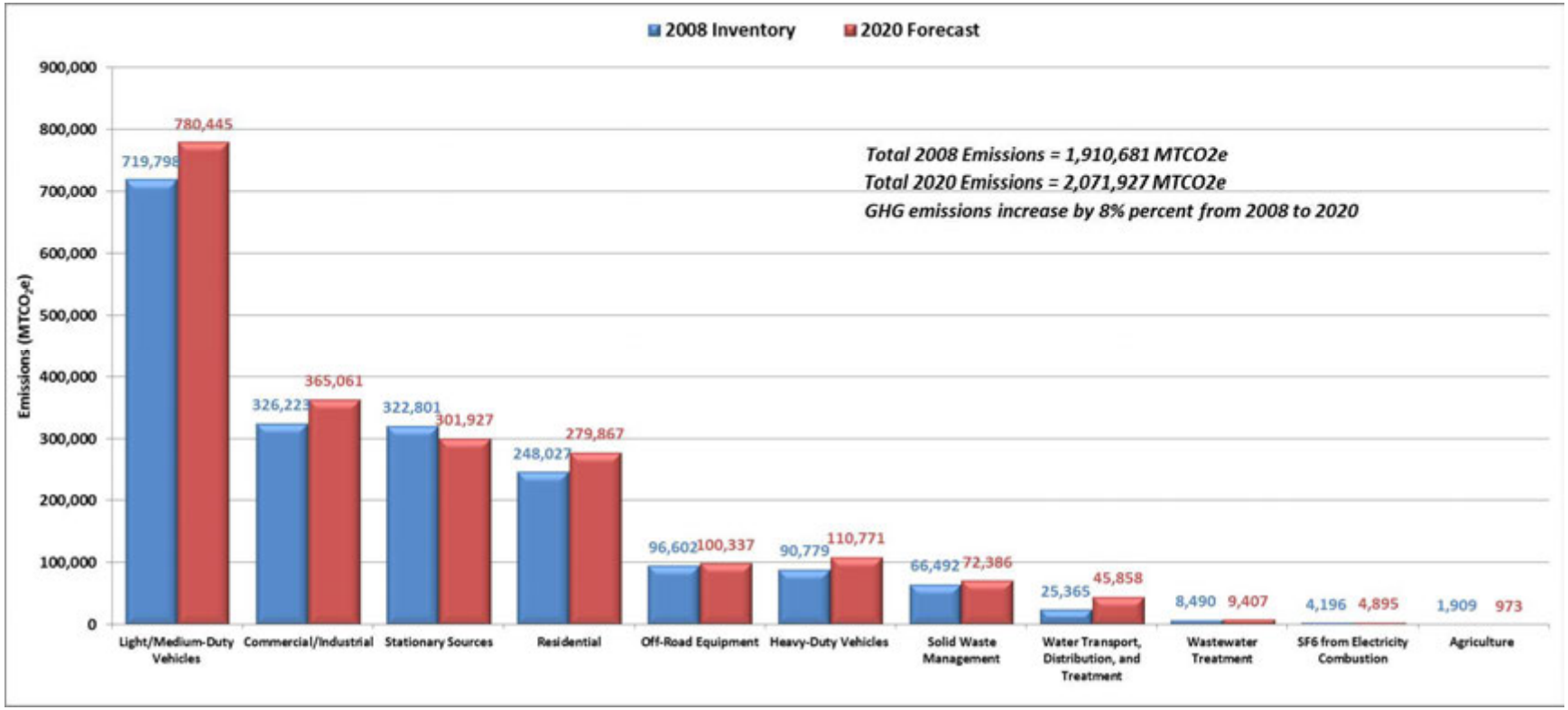


Figure 3-17b. San Bernardino GHG Emissions by Sector for 2008 and 2020



3.18 Twentynine Palms

Primary sources of GHG emissions in Twentynine Palms are on-road transportation (48%), building energy (28%), and stationary sources (9%). Emissions are projected to increase by 18% from 2008 to 2020 due to economic and population growth. In 2009, Twentynine Palms had far lower (5.0 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely in part because the city has relatively limited commercial and industrial activity (and very limited commercial and industrial building energy emissions) compared to its population level than the average of other cities in the 21-city region. The city has the lowest per capita residential natural gas use which is also a contributing factor.

Table 3-18. Twentynine Palms 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	9,117	7%	10,901	7%
Commercial/Industrial Natural Gas	2,800	2%	3,161	2%
Residential Electricity	14,686	12%	17,560	12%
Commercial/Industrial Electricity	7,563	6%	8,543	6%
Stationary Sources	10,952	9%	12,425	9%
Light/Medium-Duty Vehicles	49,656	40%	58,333	40%
Heavy-Duty Vehicles	9,521	8%	11,404	8%
Off-Road Equipment	5,494	4%	6,443	4%
Agriculture	0	0%	0	0%
Solid Waste Management	6,862	6%	9,640	7%
Wastewater Treatment	4,991	4%	5,919	4%
Water Transport, Distribution, and Treatment	2,314	2%	2,314	2%
SF_6 from Electricity Combustion	264	<1%	306	<1%
Total Emissions	124,220	100%	146,949	100%

Figure 3-18a. Twentynine Palms GHG Emissions by Sector for 2008

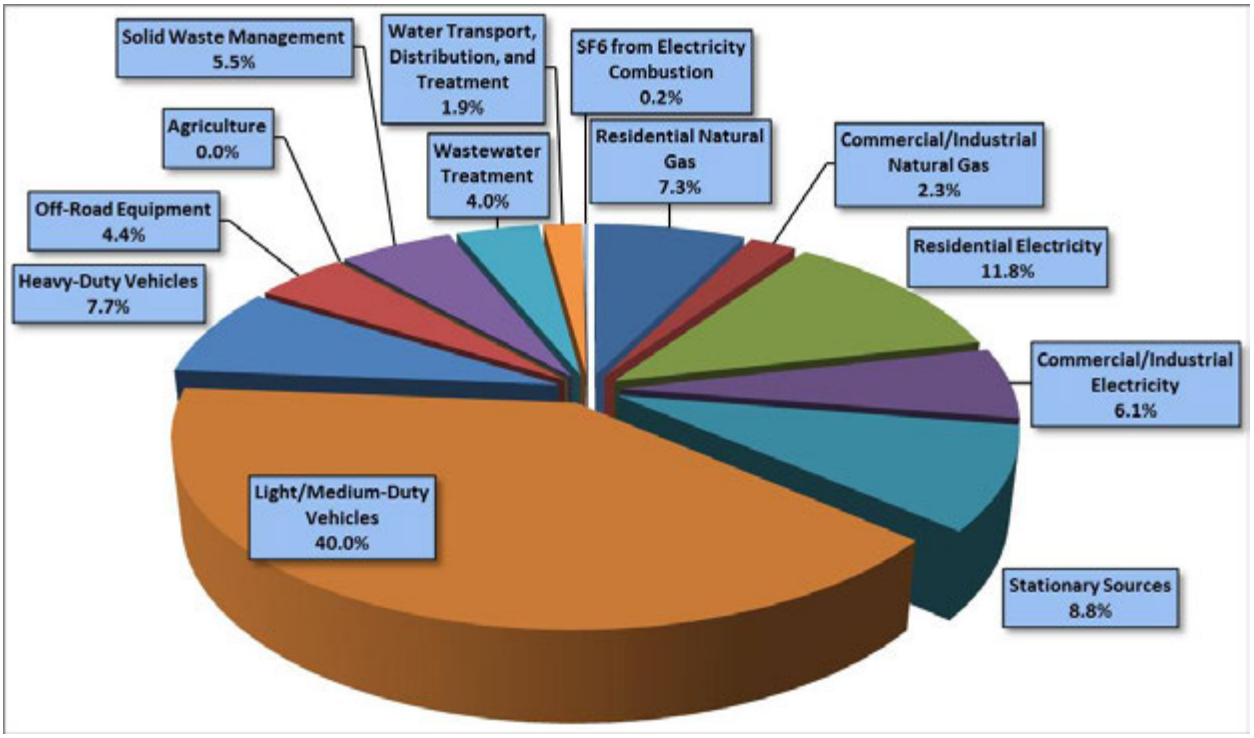
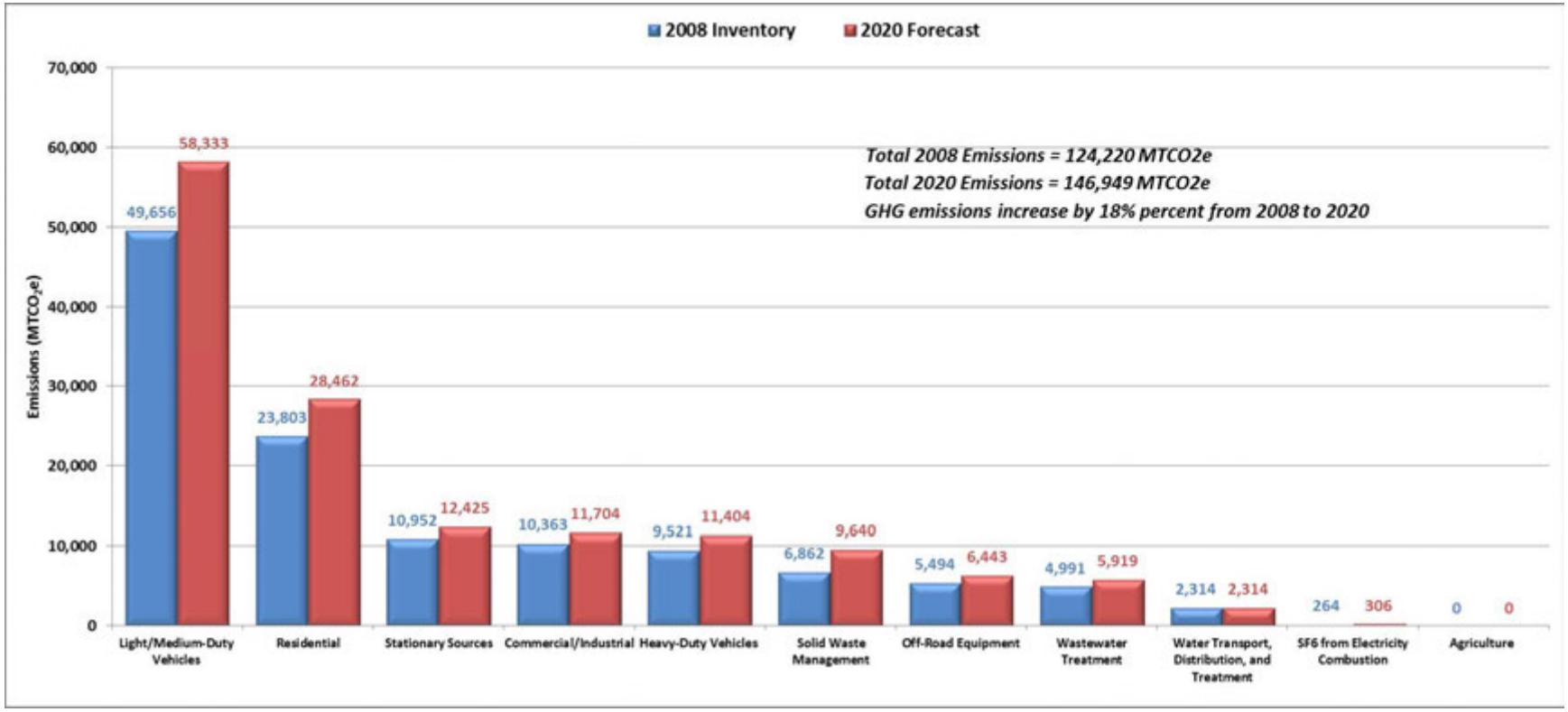


Figure 3-18b. Twentynine Palms GHG Emissions by Sector for 2008 and 2020



3.19 Victorville

The largest source of GHG emissions in Victorville is stationary sources (72%) due to the CEMEX cement plant), followed by building energy emissions (14%), and on-road transportation (12%). Emissions are projected to increase by 20% from 2008 to 2020 due to economic and population growth. Including emissions from the CEMEX plant, in 2008, Victorville had the highest per capita emissions among the cities in this study, 27.8 $MTCO_2e$ per person, because the plant is the single largest emissions source in the entire inventory area (compared to 21-city average of 11.2 $MTCO_2e$ with cement). Excluding emissions from the CEMEX plant, Victorville would have only average per capita emissions, 8.6 $MTCO_2e$ per person, which is lower than the average of other cities in the 21-city region (9.8 MTCO2e without cement). Victorville has a slightly lower jobs/resident ratio than the 21-city region.

Table 3-19. Victorville 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	79,063	3%	109,920	3%
Commercial/Industrial Natural Gas	90,566	3%	123,414	3%
Residential Electricity	73,392	2%	102,036	3%
Commercial/Industrial Electricity	196,673	6%	267,676	7%
Stationary Sources	2,235,411	72%	2,528,364	68%
Light/Medium-Duty Vehicles	306,842	10%	419,081	11%
Heavy-Duty Vehicles	56,441	2%	74,744	2%
Off-Road Equipment	38,613	1%	50,458	1%
Agriculture	9,095	<1%	4,635	<1%
Solid Waste Management	7,433	<1%	10,551	<1%
Wastewater Treatment	4,524	<1%	5,915	<1%
Water Transport, Distribution, and Treatment	6,361	<1%	21,298	1%
SF_6 from Electricity Combustion	2,973	<1%	4,206	<1%
Total Emissions	3,107,387	100%	3,722,297	100%

Figure 3-19a. Victorville GHG Emissions by Sector for 2008 with Cement Plant Emissions

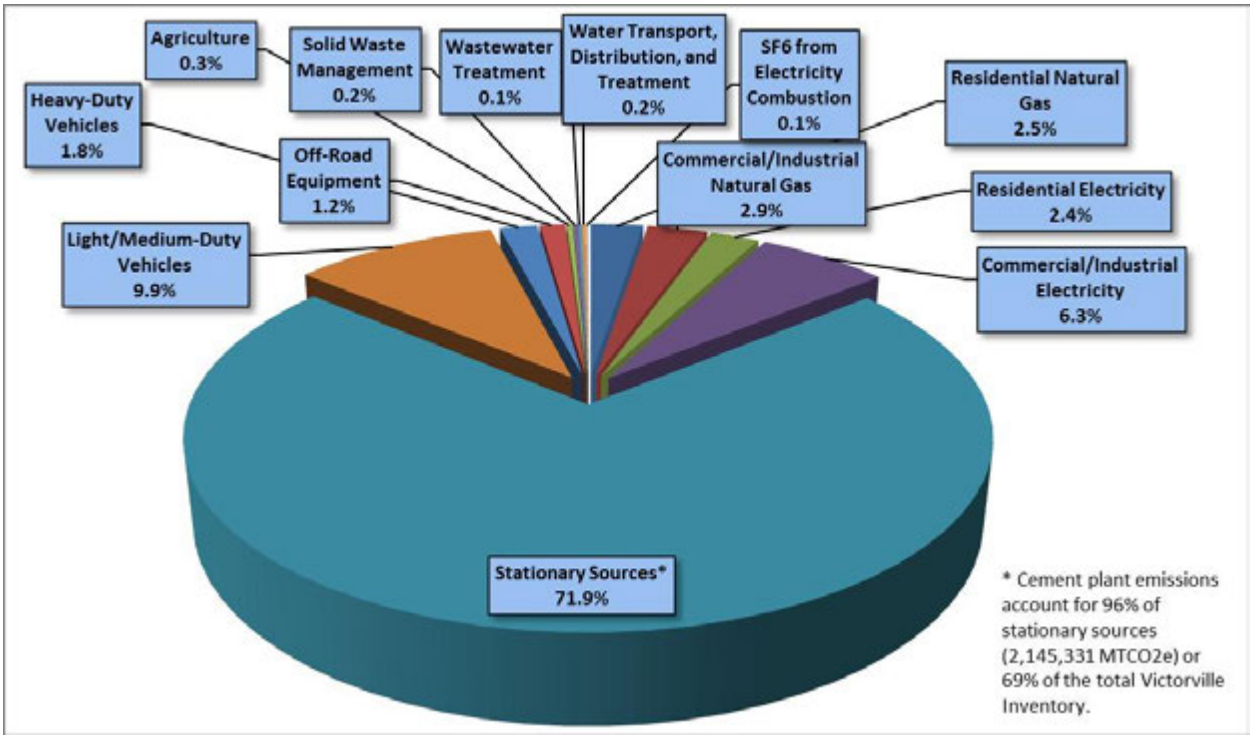


Figure 3-19b. Victorville GHG Emissions by Sector for 2008 and 2020 with Cement Plant Emissions

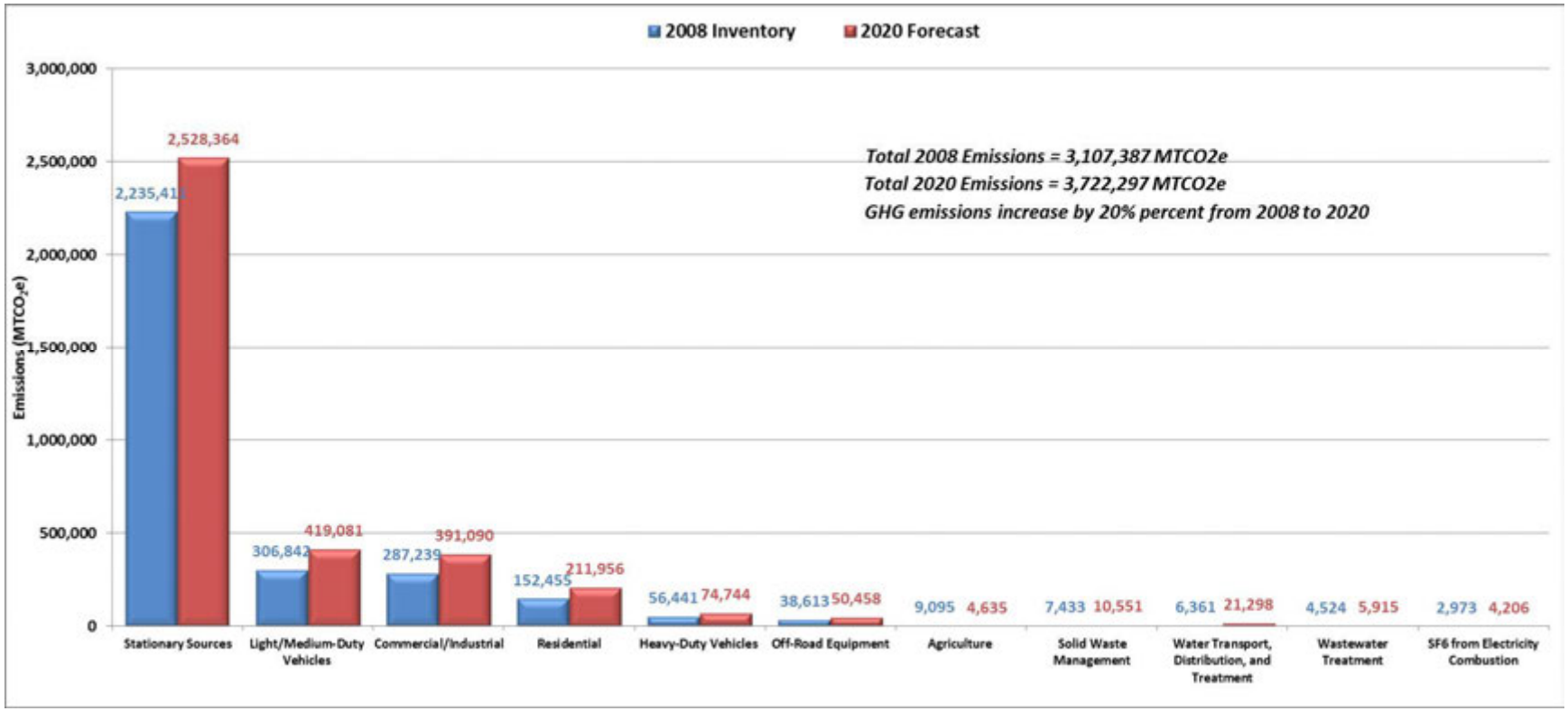


Figure 3-19c. Victorville GHG Emissions by Sector for 2008 without Cement Plant Emissions

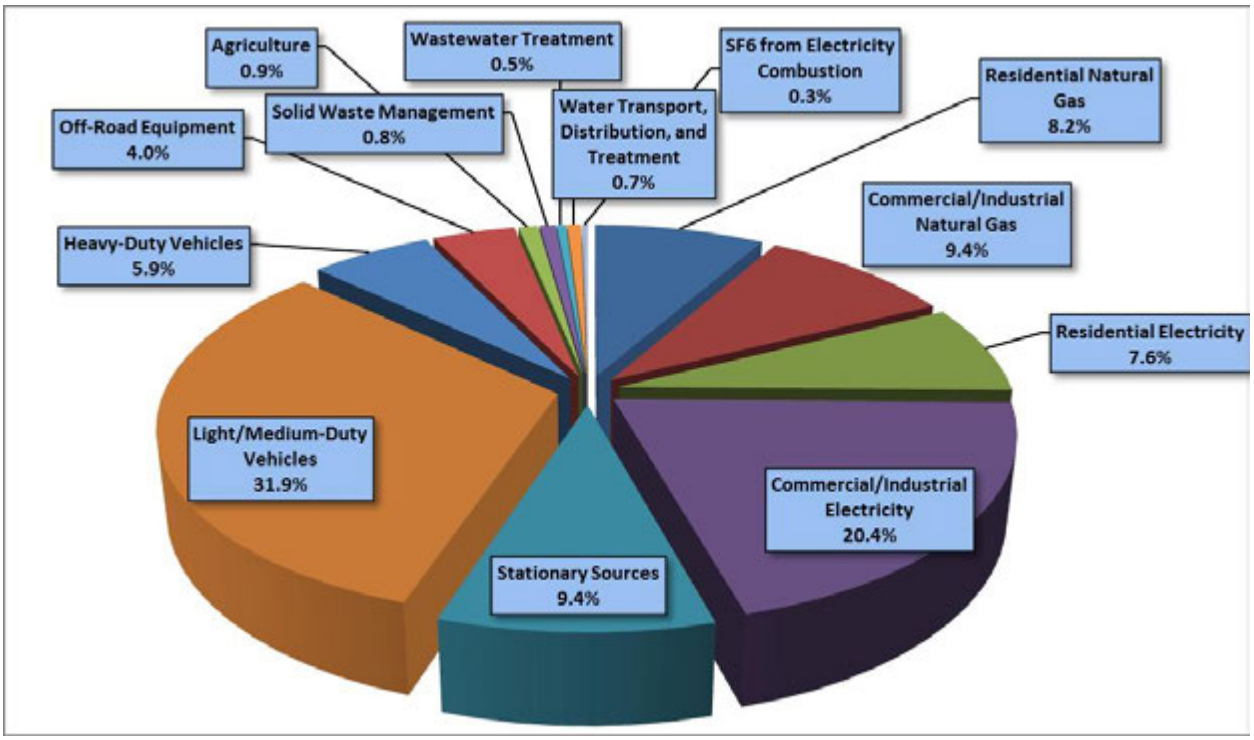
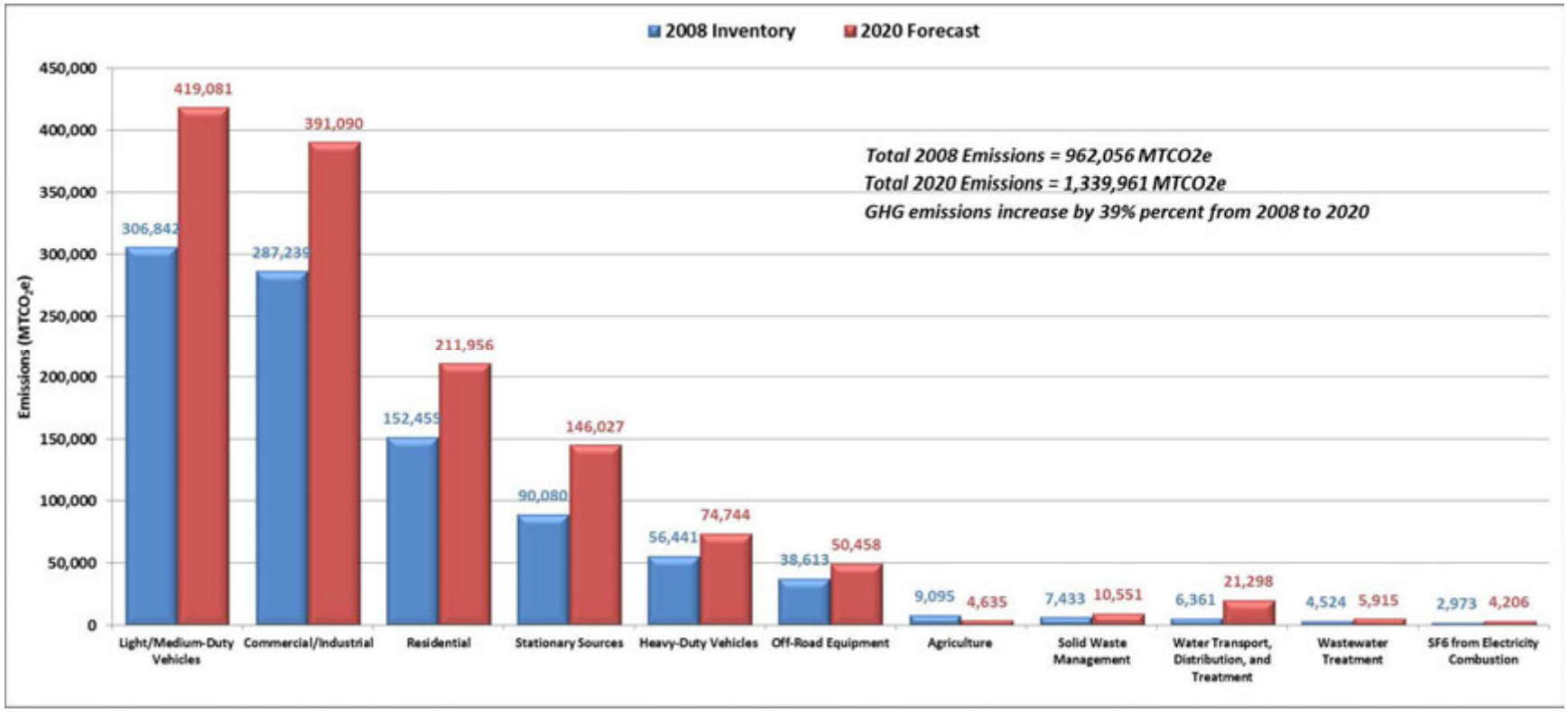


Figure 3-19d. Victorville GHG Emissions by Sector for 2008 and 2020 without Cement Plant Emissions



3.20 Yucaipa

Primary sources of GHG emissions in Yucaipa are on-road transportation (48%), building energy (35%), and stationary sources (7%). Emissions are projected to increase by 10% from 2008 to 2020 due to economic and population growth. In 2008, Yucaipa had lower (6.8 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city appears to have a smaller commercial and industrial sector compared to its population relative to the average of other cities in the 21-city region.

Table 3-20. Yucaipa 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	53,914	15%	61,377	16%
Commercial/Industrial Natural Gas	6,200	2%	6,938	2%
Residential Electricity	42,791	12%	48,715	13%
Commercial/Industrial Electricity	18,956	5%	21,196	6%
Stationary Sources	23,188	7%	26,466	7%
Light/Medium-Duty Vehicles	152,256	43%	156,289	41%
Heavy-Duty Vehicles	16,357	5%	20,104	5%
Off-Road Equipment	12,035	3%	13,167	3%
Agriculture	3,967	1%	2,022	1%
Solid Waste Management	11,875	3%	13,430	3%
Wastewater Treatment	2,071	1%	2,272	1%
Water Transport, Distribution, and Treatment	6,122	2%	11,147	3%
SF_6 from Electricity Combustion	730	<1%	872	<1%
Total Emissions	350,462	100%	383,994	100%

Figure 3-20a. Yucaipa GHG Emissions by Sector for 2008

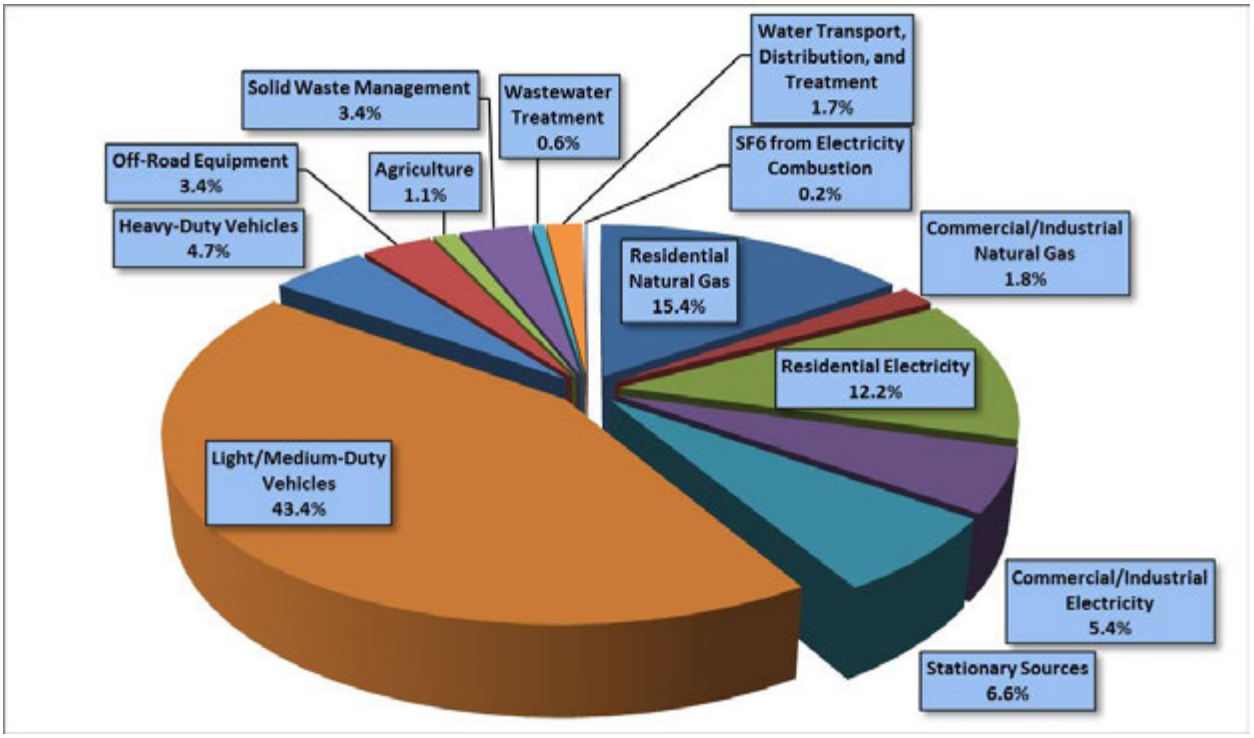
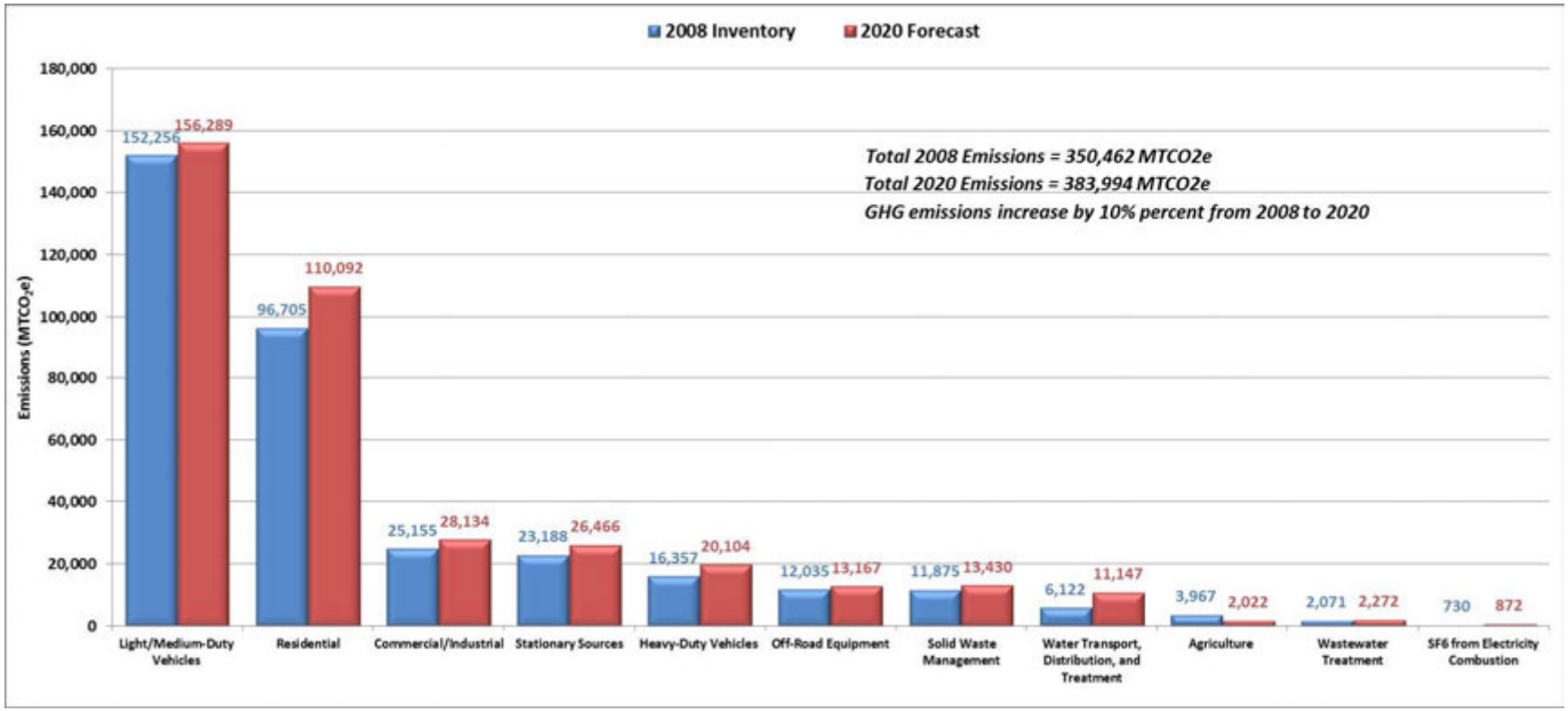


Figure 3-20b. Yucaipa GHG Emissions by Sector for 2008 and 2020



3.21 Yucca Valley

Primary sources of GHG emissions in Yucca Valley are on-road transportation (43%), building energy (32%), and stationary sources (10%). Emissions are projected to increase by 19% from 2008 to 2020 due to economic and population growth. In 2008, Yucca Valley had a lower (8.0 $MTCO_2e$) than average (9.8 $MTCO_2e$ without cement) per capita emissions likely because the city has less commercial and industrial activity compared to its population than the average of other cities in the 21-city region.

Table 3-21. Yucca Valley 2008 Community Greenhouse Gas Inventory and 2020 Forecast ($MTCO_2e$)

	2008 Inventory		2020 Forecast	
Sector	Emissions	Percent	Emissions	Percent
Residential Natural Gas	14,632	9%	17,472	9%
Commercial/Industrial Natural Gas	4,391	3%	4,867	2%
Residential Electricity	20,182	12%	24,099	12%
Commercial/Industrial Electricity	13,848	8%	15,350	8%
Stationary Sources	16,719	10%	29,491	15%
Light/Medium-Duty Vehicles	58,773	36%	66,731	34%
Heavy-Duty Vehicles	12,348	7%	13,696	7%
Off-Road Equipment	6,680	4%	7,419	4%
Agriculture	0	0%	0	0%
Solid Waste Management	10,992	7%	12,359	6%
Wastewater Treatment	4,138	3%	1,522	1%
Water Transport, Distribution, and Treatment	1,677	1%	2,231	1%
SF_6 from Electricity Combustion	384	<1%	448	<1%
Total Emissions	164,763	100%	195,685	100%

Figure 3-21a. Yucca Valley GHG Emissions by Sector for 2008

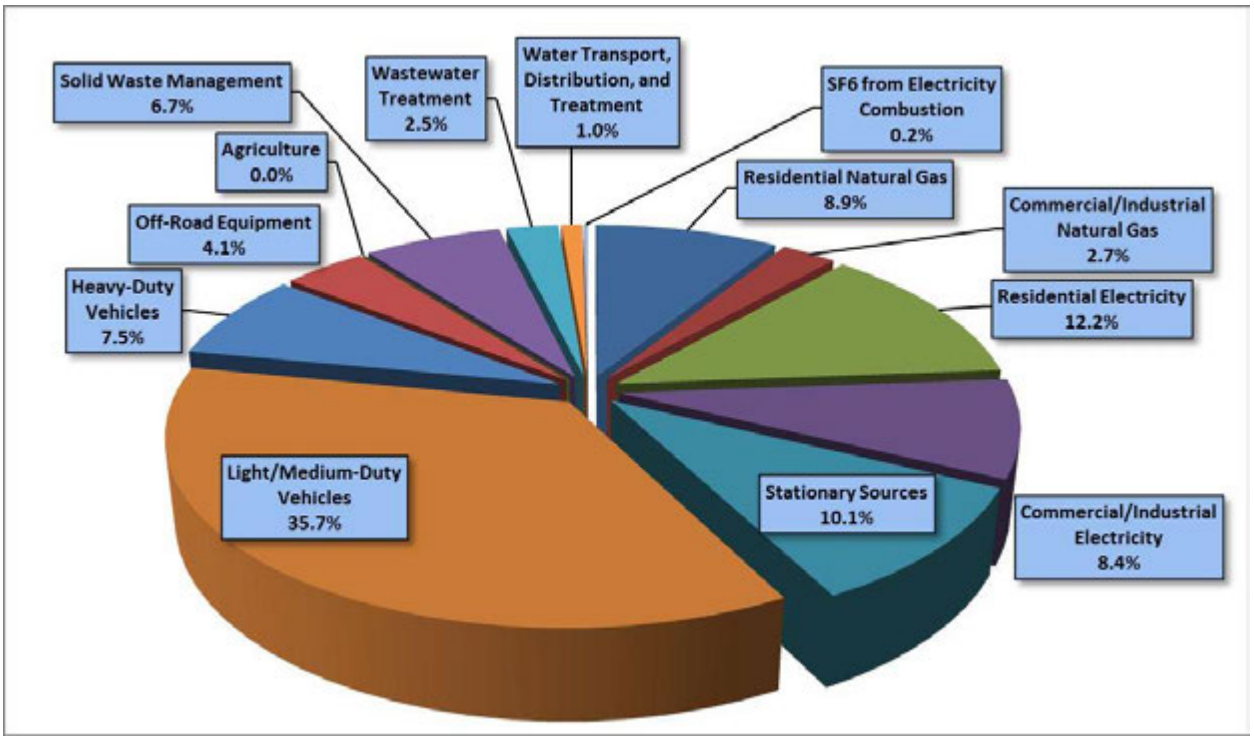
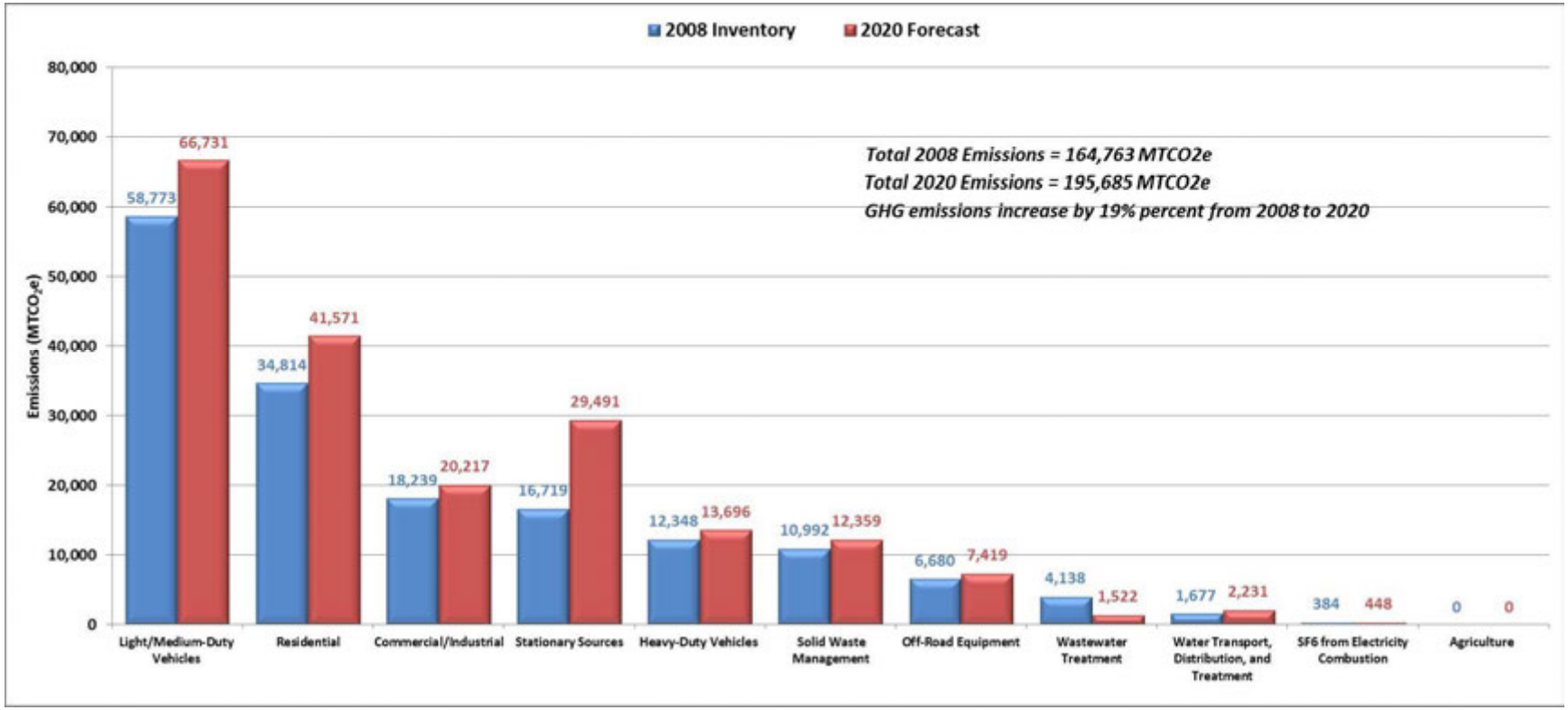


Figure 3-21b. Yucca Valley GHG Emissions by Sector for 2008 and 2020



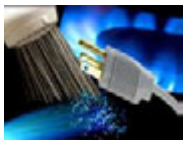
Section 4
Inventory Results by Sector

This section presents the 2008 San Bernardino Regional Community GHG Emissions Inventories and the 2020 BAU forecasts for each City. Data collection and calculation methods for each sector can be found in Appendix A. The results of the community inventory for 2008 and 2020 BAU forecast in $MTCO_2e$ are presented in Table 1-1 and Figure 1-1. Each subsection below describes a different sector of the inventory. Introductory information for each sector is followed by emissions. Additional discussions of each of these sources, including data acquisition, emissions calculations and methodologies, and data gaps, may be found in Appendix A.

4.1 Building Energy Use Emissions

Building energy use from residential, commercial, and industrial buildings is a large component of the regional GHG inventory, accounting for 31% of the total Regional Emissions in 2008. Building energy consumption includes electricity and natural gas usage[1]. Electricity use in buildings results in indirect emissions from the power plants that produce electricity outside of city boundaries. Natural gas consumption in buildings by furnaces and other appliance results in direct emissions where the natural gas is combusted. Electricity is also used for street lighting, which is a separate category below.

Primary Utilties Serving San Bernardino County Cities



Electricity
- Southern California Edison
- Victorville Municipal Utilities
- Needles Public Utilities
- Bear Valley Electric Services

Natural Gas
- Southwest Gas
- Southern California Gas
- Victorville Municipal Utilities

Table 4-1 and Figure 4-1 present the 2008 and 2020 BAU emissions inventory for building energy use for each city participating in the inventory. Building energy use emissions are generally a function of the size of the city, the number of residents, types and ages of buildings, composition of the power supply, and the number of employees.

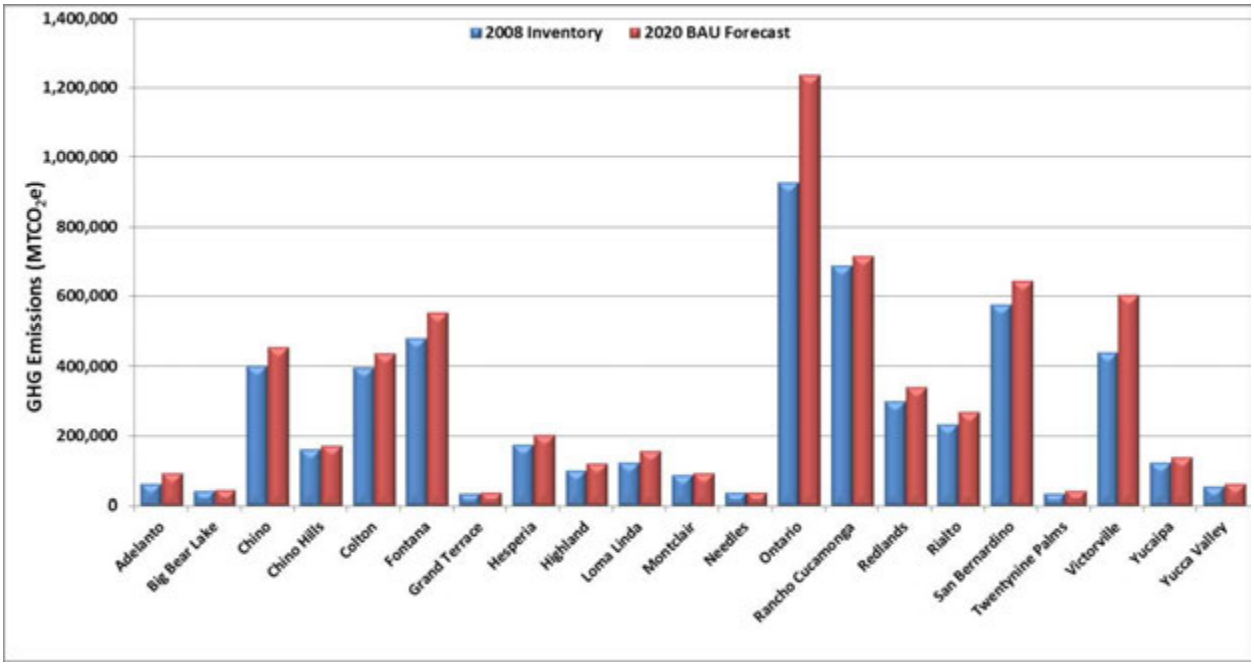
[1] Emissions from electricity or natural gas consumption by on-site stationary equipment are not included in the activity estimates for building energy. Please refer to Section 6.2, "Stationary Sources," for a discussion of these emissions.

Table 4-1. 2008 and 2020 BAU Forecast Building Energy Use Emissions by City and Sector

	2008 Inventory ($MTCO_2e$)				2020 BAU Forecast ($MTCO_2e$)			
City	Resi-dential	Commercial/ Industrial	Street Lighting[a]	Total	Resi-dential	Commercial / Industrial	Street Lighting	Total
Adelanto	34,075	25,248	3,447	62,770	52,867	33,894	5,092	91,852
Big Bear Lake	28,923	13,062	3	41,988	31,610	13,008	3	44,621
Chino	92,190	294,259	14,634	401,084	112,492	324,447	17,185	454,124
Chino Hills	115,756	40,786	4,761	161,303	121,470	45,828	4,888	172,186
Colton	122,115	273,116	1,478	396,709	145,689	289,067	1,721	436,477
Fontana	207,768	266,027	6,661	480,456	245,875	299,712	7,651	553,238
Grand Terrace	20,286	12,917	179	33,381	21,469	13,520	177	35,166
Hesperia	128,039	44,671	1,825	174,534	140,839	58,233	1,999	201,071
Highland	73,088	24,373	2,800	100,261	83,870	32,254	3,099	119,222
Loma Linda	34,290	86,590	2,388	123,269	41,342	112,366	2,774	156,482
Montclair	38,029	46,885	1,468	86,381	42,505	48,401	1,618	92,523
Needles	16,171	19,613	0	35,784	16,494	18,560	0	35,054
Ontario	186,558	734,204	7,647	928,409	255,470	971,406	10,131	1,237,006
Rancho Cucamonga	261,263	417,223	9,759	688,244	274,622	432,111	10,019	716,752
Redlands	126,399	169,148	4,783	300,330	144,622	190,567	5,265	340,454
Rialto	114,133	112,540	5,553	232,227	133,471	129,994	6,174	269,639
San Bernardino	248,027	317,595	8,628	574,249	279,867	355,561	9,500	644,929
Twentynine Palms	23,803	10,270	92	34,166	28,462	11,595	109	40,166
Victorville	152,455	282,014	5,225	439,693	211,956	384,303	6,788	603,046
Yucaipa	96,705	24,617	538	121,861	110,092	27,548	587	138,226
Yucca Valley	34,814	18,115	124	53,053	41,571	20,079	138	61,788
Total	2,154,886	3,233,273	81,993	5,470,152	2,536,654	3,812,452	94,915	6,444,021

[a] In the majority of this inventory report, street lighting is presented as a subcategory of the commercial/industrial sector. It is shown separately in this table to provide an additional level of detail. The Commercial/ Industrial category above does not include the 81,993 $MTCO_2e$ from streetlights.

Figure 4-1. 2008 and 2020 BAU Forecast Building Energy Use Emissions by City



4.2 Stationary Source Emissions

This source category represents emissions from fuel combustion (such as diesel, gasoline, and propane) and fugitive emissions of CH_4 and N_2O at facilities located in the cities. Fugitive and fuel combustion emissions from the CEMEX cement plant located in Victorville are also included in this category. Emissions from these sources account for approximately 23% of the total Regional Emissions in 2008.

GHG emissions from stationary sources result from fuel use other than natural gas consumption, which is accounted for in the building energy category (Section 5.1, "Inventory Definitions"). The following categories were included in this sector: oil and gas production (combustion), manufacturing and industry, food and agricultural processing, fuel combustion, coatings and related processes, cleaning and surface coatings, petroleum production and marketing, chemical production, mineral processes, industrial processes, asphalt paving and roofing, sewage treatment, service and commercial (combustion), residential (combustion), and cooking. GHG emissions from cement plants included in this inventory are those generated through fuel combustion (e.g., tires, coal) and clinker production. Emissions associated with electricity use were not included in this category because they were quantified as part of industrial building energy emissions (Section 5.1, "Inventory Definitions").

Table 4-2 and Figure 4-2 present the Regional (21 cities) 2008 and 2020 BAU emissions from stationary sources and the CEMEX cement plant, respectively. Stationary source emissions have been grouped into the following major source categories: industrial, commercial, sewage treatment, residential, agricultural, and miscellaneous. Figure 4-2 presents stationary source emissions by city

for 2008 and 2020. Stationary source emissions are generally a function of non-retail employment in each city.

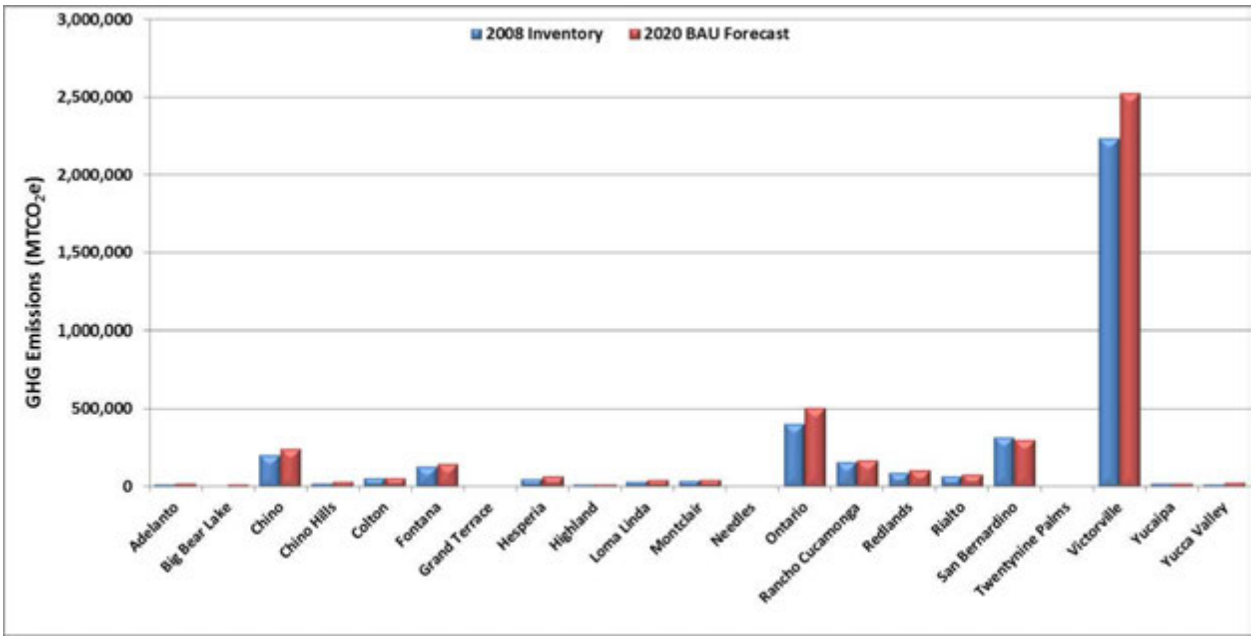
Table 4-2. 2008 Stationary Source Emissions by City ($MTCO_2e$)

City	Industrial	Commercial	Sewage	Residential	Agricultural	Misc.	Cement	Total
Adelanto	9,171	5,599	1,179	631	0	17	0	16,597
Big Bear Lake	3,326	9,678	428	101	467	19	0	14,019
Chino	69,694	54,443	8,960	1,529	72,874	151	0	207,650
Chino Hills	4,593	14,617	590	1,508	4,079	29	0	25,417
Fontana	15,601	36,191	2,006	1,054	583	75	0	55,509
Colton	51,063	62,412	6,565	3,921	7,814	148	0	131,922
Grand Terrace	2,466	4,318	317	238	0	9	0	7,348
Hesperia	16,605	20,282	2,135	1,812	9,334	48	0	50,216
Highland	5,417	8,411	696	1,071	0	19	0	15,615
Loma Linda	1,555	31,041	200	466	0	55	0	33,316
Montclair	11,020	24,706	1,417	728	4,302	51	0	42,224
Needles	1,748	5,194	225	98	117	10	0	7,391
Ontario	154,891	133,906	19,913	3,293	92,836	355	0	405,195
Rancho Cucamonga	61,920	84,262	7,961	3,292	4,788	194	0	162,416
Redlands	18,276	66,334	2,350	1,387	3,849	129	0	92,324
Rialto	29,157	27,840	3,748	2,000	5,135	71	0	67,952
San Bernardino	52,810	156,935	6,789	4,245	101,708	315	0	322,801
Twentynine Palms	1,956	4,846	251	504	3,386	10	0	10,952
Victorville	22,516	50,316	2,895	2,262	11,986	105	2,145,331	2,235,411
Yucaipa	5,187	15,220	667	1,036	1,048	30	0	23,188
Yucca Valley	3,391	6,611	436	418	5,849	14	0	16,719
Total	542,361	823,162	69,727	31,591	330,155	1,855	2,145,331	3,944,181

Table 4-3. 2020 BAU Stationary Source Emissions by City ($MTCO_2e$)

City	Industrial	Commercial	Sewage	Residential	Agricultural	Misc.	Cement	Total
Adelanto	11,586	7,887	1,587	932	0	23	-	22,015
Big Bear Lake	4,249	9,630	442	114	816	20	-	15,271
Chino	79,120	58,763	9,879	1,795	94,688	166	-	244,412
Chino Hills	6,119	15,915	663	1,548	9,096	32	-	33,375
Colton	17,737	37,915	2,131	1,226	1,516	79	-	60,605
Fontana	59,656	69,321	7,396	4,503	10,030	167	-	151,072
Grand Terrace	2,772	4,432	332	235	0	10	-	7,781
Hesperia	24,352	25,457	2,808	1,985	17,027	64	-	71,693
Highland	7,873	10,386	895	1,186	0	24	-	20,364
Loma Linda	4,591	39,906	264	541	0	72	-	45,375
Montclair	11,946	25,193	1,462	802	6,297	53	-	45,753
Needles	2,098	4,702	213	100	684	10	-	7,807
Ontario	199,292	180,090	26,346	4,363	100,987	470	-	511,548
Rancho Cucamonga	67,250	84,304	8,140	3,379	8,279	198	-	171,551
Redlands	25,387	72,495	2,647	1,526	6,997	145	-	109,197
Rialto	34,416	31,795	4,330	2,224	7,581	82	-	80,427
San Bernardino	69,116	172,134	7,601	4,674	48,050	352	-	301,927
Twentynine Palms	2,645	5,273	284	597	3,614	11	-	12,425
Victorville	40,256	65,148	3,945	2,939	33,597	143	2,382,337	2,528,364
Yucaipa	6,802	16,285	746	1,129	1,469	34	-	26,466
Yucca Valley	4,585	7,038	483	464	16,905	16	-	29,491
Total	681,849	944,070	82,595	36,261	367,635	2,172	2,382,337	4,496,918

Figure 4-2. 2008 and 2020 BAU Forecast Stationary Source Emissions by City



4.3 Light/Medium-Duty Vehicle Emissions

This source includes emissions from light/medium-duty vehicles associated with activity in each of the cities. Trips that have an origin and destination within each city are counted for that city. Trips that have either an origin and a destination, but not both, are accounted 50% to each city. Trips that neither begin nor terminate within a city's limits are omitted from that city's inventory.

Emissions originate from the combustion of fossil fuels (such as diesel, gasoline, compressed natural gas, etc.) to power light/medium-duty vehicles. These are direct emissions and accounted for approximately 30% of the 21-city region's total emissions in 2008.

Table 4-4 and Table 4-5 present the 2008 and 2020 BAU forecast vehicle miles travelled (VMT) and emissions inventory for light/medium-duty vehicle emissions for each city, respectively. Figure 4-3 presents 2008 and 2020 emissions for each city.

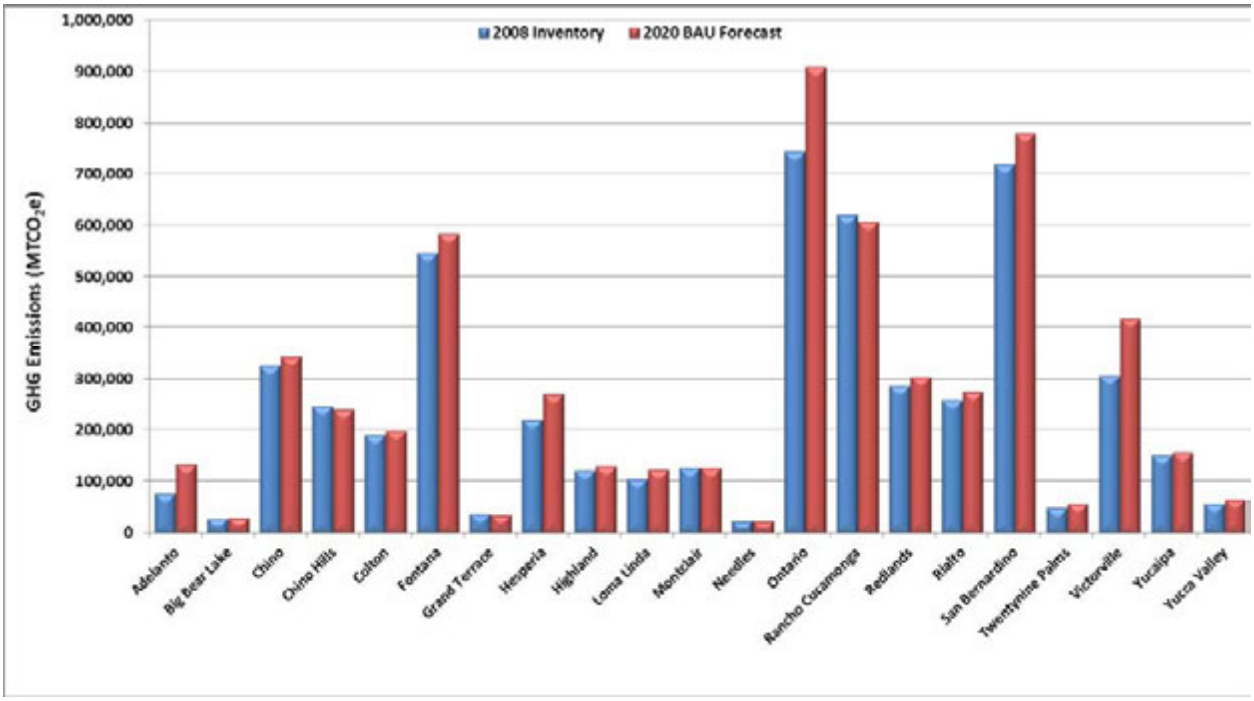
Table 4-4. 2008 Light/Medium-Duty Vehicle VMT and Emissions by City

		Greenhouse Gas Emissions ($MTCO_2e$)			
City	VMT	CO_2	CH_4	N_2O	CO_2e
Adelanto	173,710,309	75,270	4.6	5.2	76,971
Big Bear Lake	66,664,365	28,337	1.7	1.9	28,957
Chino	751,832,443	319,579	19.3	21.2	326,571
Chino Hills	571,110,367	242,760	14.7	16.1	248,071
Colton	440,389,555	187,195	11.3	12.4	191,290
Fontana	1,258,834,059	535,089	32.4	35.6	546,795
Grand Terrace	87,116,311	37,030	2.2	2.5	37,840
Hesperia	498,527,188	216,015	13.3	14.8	220,898
Highland	280,394,522	119,186	7.2	7.9	121,794
Loma Linda	242,642,100	103,139	6.2	6.9	105,396
Montclair	294,668,713	125,254	7.6	8.3	127,994
Needles	53,310,171	23,100	1.4	1.6	23,622
Ontario	1,719,665,936	750,532	45.4	49.9	744,248
Rancho Cucamonga	1,428,809,550	607,339	36.7	40.4	620,627
Redlands	661,707,769	281,270	17.0	18.7	287,424
Rialto	598,703,501	254,489	15.4	16.9	260,057
San Bernardino	1,657,122,284	704,388	42.6	46.8	719,798
Twentynine Palms	112,064,512	48,558	3.0	3.3	49,656
Victorville	692,487,451	300,059	18.5	20.6	306,842
Yucaipa	350,524,690	148,996	9.0	9.9	152,256
Yucca Valley	132,639,113	57,473	3.5	4.0	58,773
Total	12,072,924,909	5,165,058	313.2	345.0	5,255,879

Table 4-5. 2020 BAU Forecast Light/Medium-Duty Vehicle VMT and Emissions by City

City	VMT	Greenhouse Gas Emissions ($MTCO_2e$)			
		CO_2	CH_4	N_2O	CO_2e
Adelanto	307,686,093	133,375	5.6	2.8	134,374
Big Bear Lake	68,873,428	29,271	1.2	0.6	29,492
Chino	804,337,169	341,846	14.6	7.3	344,425
Chino Hills	561,449,027	238,618	10.2	5.1	240,418
Colton	468,532,001	199,128	8.5	4.3	200,630
Fontana	1,365,082,947	580,165	24.7	12.4	584,542
Grand Terrace	85,936,643	36,523	1.6	0.8	36,799
Hesperia	620,731,300	269,073	11.2	5.7	271,088
Highland	304,075,711	129,233	5.5	2.8	130,208
Loma Linda	289,100,863	122,869	5.2	2.6	123,796
Montclair	298,229,827	126,749	5.4	2.7	127,705
Needles	54,376,375	23,571	1.0	0.5	23,747
Ontario	2,143,145,704	961,861	41.0	20.6	909,985
Rancho Cucamonga	1,416,821,134	602,153	25.7	12.9	606,697
Redlands	711,378,483	302,338	12.9	6.5	304,619
Rialto	642,708,971	273,153	11.6	5.9	275,214
San Bernardino	1,822,574,784	774,600	33.0	16.6	780,445
Twentynine Palms	133,570,274	57,900	2.4	1.2	58,333
Victorville	959,604,343	415,967	17.4	8.9	419,081
Yucaipa	364,981,036	155,118	6.6	3.3	156,289
Yucca Valley	152,798,808	66,235	2.8	1.4	66,731
Total	13,575,994,920	5,839,745	248.0	125.2	5,824,618

Figure 4-3. 2008 and 2020 BAU Forecast Light/Medium-Duty Vehicle VMT and Emissions by City



4.4 Heavy-Duty Vehicles

This source includes emissions from heavy-duty vehicles associated with activity within each of the cities. Trips that have an origin and destination within each city are counted for that city. Trips that have either an origin and a destination, but not both, are accounted 50% to each city. Trips that neither begin nor terminate within a city's limits are omitted from that city's inventory.

Emissions originate from the combustion of fossil fuels (such as diesel, gasoline, compressed natural gas, etc.) to power heavy-duty on-road vehicles. These are direct emissions and accounted for approximately 5% of the 21-city region's total emissions in 2008.

Table 4-6 and Table 4-7 presents the 2008 and 2020 BAU forecast VMT and emissions inventory for heavy-duty vehicle emissions for each city, respectively. Figure 4-4 presents 2008 and 2020 emissions for each city. Heavy-duty vehicle emissions are generally a function of employment and goods movement activity in each city.

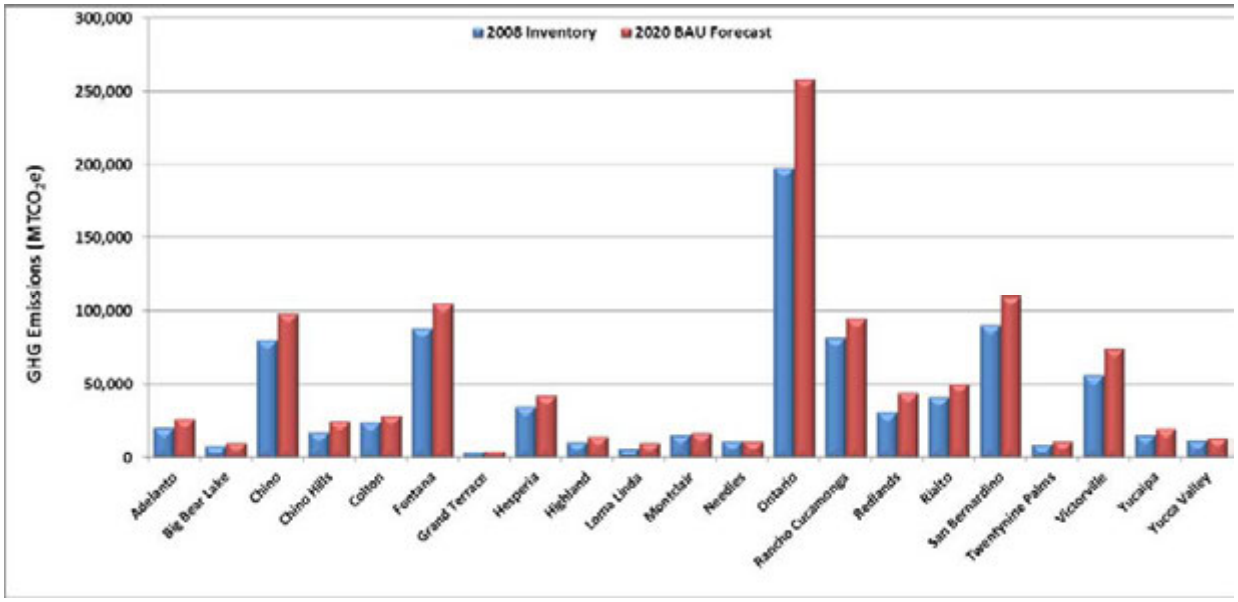
Table 4-6. 2008 Truck VMT and Emissions by City

		Greenhouse Gas Emissions ($MTCO_2e$)			
City	VMT	CO_2	CH_4	N_2O	CO_2e
Adelanto	16,915,360	20,406	0.6	0.4	20,537
Big Bear Lake	8,261,547	8,270	0.3	0.2	8,344
Chino	79,760,826	79,843	2.8	2.1	80,562
Chino Hills	17,460,480	17,479	0.6	0.5	17,636
Colton	24,301,442	24,327	0.8	0.6	24,545
Fontana	87,394,007	87,484	3.0	2.3	88,271
Grand Terrace	3,876,899	3,881	0.1	0.1	3,916
Hesperia	28,797,212	34,739	1.0	0.7	34,962
Highland	11,104,135	11,116	0.4	0.3	11,216
Loma Linda	6,390,018	6,397	0.2	0.2	6,454
Montclair	15,859,549	15,876	0.6	0.4	16,019
Needles	9,483,446	11,440	0.3	0.2	11,514
Ontario	189,552,185	201,988	7.0	5.4	197,772
Rancho Cucamonga	81,459,182	81,544	2.8	2.2	82,277
Redlands	31,418,008	31,451	1.1	0.8	31,733
Rialto	41,527,847	41,571	1.4	1.1	41,945
San Bernardino	89,876,700	89,970	3.1	2.4	90,779
Twentynine Palms	7,841,744	9,460	0.3	0.2	9,521
Victorville	46,488,272	56,081	1.6	1.1	56,441
Yucaipa	16,194,120	16,211	0.6	0.4	16,357
Yucca Valley	10,170,385	12,269	0.3	0.2	12,348
Total	824,133,364	861,801	29.0	21.8	863,147

Table 4-7. 2020 BAU Forecast Truck VMT and Emissions by City

		Greenhouse Gas Emissions ($MTCO_2e$)			
City	VMT	CO_2	CH_4	N_2O	CO_2e
Adelanto	22,365,301	27,007	0.4	0.3	27,098
Big Bear Lake	9,965,600	10,356	0.2	0.1	10,402
Chino	94,492,682	98,192	1.8	1.3	98,635
Chino Hills	24,229,240	25,178	0.5	0.3	25,291
Colton	28,193,492	29,297	0.5	0.4	29,429
Fontana	101,124,195	105,083	1.9	1.4	105,557
Grand Terrace	4,442,215	4,616	0.1	0.1	4,637
Hesperia	35,623,017	43,017	0.6	0.4	43,162
Highland	14,218,434	14,775	0.3	0.2	14,842
Loma Linda	9,742,623	10,124	0.2	0.1	10,170
Montclair	16,682,892	17,336	0.3	0.2	17,414
Needles	9,673,115	11,681	0.2	0.1	11,720
Ontario	230,247,137	274,789	4.9	3.7	259,186
Rancho Cucamonga	91,299,262	94,873	1.7	1.3	95,301
Redlands	43,013,375	44,697	0.8	0.6	44,899
Rialto	48,899,034	50,813	0.9	0.7	51,042
San Bernardino	106,119,507	110,274	2.0	1.5	110,771
Twentynine Palms	9,411,924	11,365	0.2	0.1	11,404
Victorville	61,688,531	74,493	1.1	0.7	74,744
Yucaipa	19,260,212	20,014	0.4	0.3	20,104
Yucca Valley	11,303,857	13,650	0.2	0.1	13,696
Total	991,995,643	1,091,631	18.9	13.9	1,079,504

Figure 4-4. 2008 and 2020 BAU Forecast Heavy-Duty Vehicle Emissions by City



4.5 Off-Road Equipment Emissions

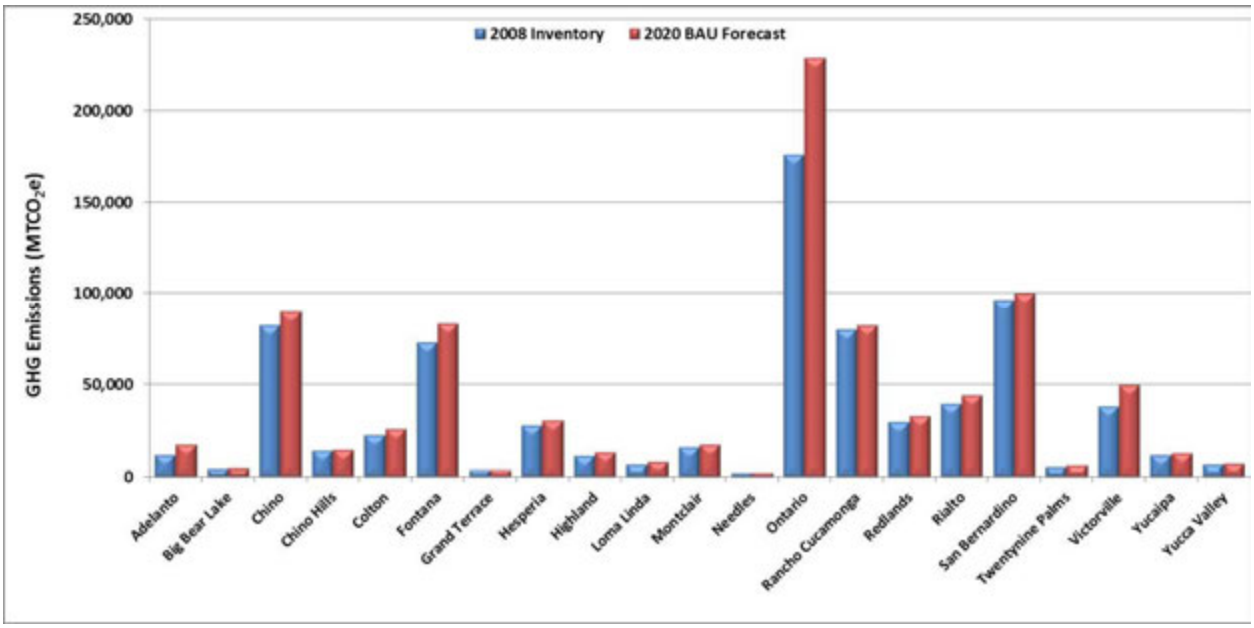
Off-road equipment emissions accounted for approximately 4% of the total Regional Emissions in 2008. These are direct emissions resulting from equipment fuel combustion. Off-road equipment includes recreational boats and vehicles and equipment for industry, construction, lawn and garden maintenance, military activities, and agricultural equipment.

Table 4-8 presents the 2008 and 2020 BAU emissions inventory for off-road equipment for each city. Figure 4-5 presents 2008 and 2020 emissions for each city. Off-road equipment emissions are generally a function of non-retail and industrial employment in each city. Recreational off-road equipment is included in this sector, but comprises only a small fraction (about 2%) of total off-road emissions.

Table 4-8. 2008 and 2020 BAU Forecast Off-Road Equipment Emissions by City

	2008 Greenhouse Gas Emissions ($MTCO_2e$)				2020 BAU Forecast ($MTCO_2e$)			
City	CO_2	CH_4	N_2O	CO_2e	CO_2	CH_4	N_2O	CO_2e
Adelanto	12,076	36	32	12,144	17,556	53	46	17,655
Big Bear Lake	4,338	13	11	4,362	4,836	14	13	4,863
Chino	82,451	244	213	82,908	90,161	267	233	90,661
Chino Hills	14,543	45	39	14,628	14,953	46	41	15,040
Colton	22,763	68	60	22,891	26,021	78	68	26,167
Fontana	73,237	220	193	73,650	83,508	251	220	83,979
Grand Terrace	3,887	12	10	3,909	3,900	12	10	3,922
Hesperia	27,791	84	74	27,949	30,870	93	82	31,045
Highland	11,669	36	31	11,736	13,243	41	36	13,319
Loma Linda	6,708	20	18	6,747	8,403	26	22	8,451
Montclair	16,382	49	43	16,474	17,817	53	47	17,917
Needles	2,535	8	7	2,549	2,573	8	7	2,587
Ontario	175,343	519	452	176,314	227,807	675	587	229,069
Rancho Cucamonga	80,380	240	210	80,830	82,488	247	215	82,950
Redlands	29,978	90	79	30,147	33,340	100	87	33,528
Rialto	39,837	120	105	40,061	44,259	133	116	44,508
San Bernardino	96,060	289	253	96,602	99,774	300	262	100,337
Twentynine Palms	5,463	17	15	5,494	6,406	20	17	6,443
Victorville	38,396	116	101	38,613	50,173	152	133	50,458
Yucaipa	11,966	37	32	12,035	13,092	40	35	13,167
Yucca Valley	6,642	20	18	6,680	7,378	22	20	7,419
Total	762,445	2,284	1,994	766,722	878,558	2,631	2,297	883,485

Figure 4-5. 2008 and 2020 BAU Forecast Off-Road Equipment Emissions by City



4.6 Agricultural Emissions

Agriculture emissions account for approximately 3% of the 21-city region's total regional community emissions in 2008. These are direct emissions resulting from livestock activity and the application of fertilizer. Emissions of CH_4 and N_2O can result from livestock production through enteric fermentation and manure management (Intergovernmental Panel on Climate Change 2006). Emissions of N_2O can result from anthropogenic inputs of nitrogen into soil through fertilizers by way of a direct (directly from the soils to which the nitrogen is added/released) and indirect (following volatilization of NH_3 and NO_X from managed soils) pathway (Intergovernmental Panel on Climate Change 2006). Both direct and indirect emissions of N_2O were calculated.

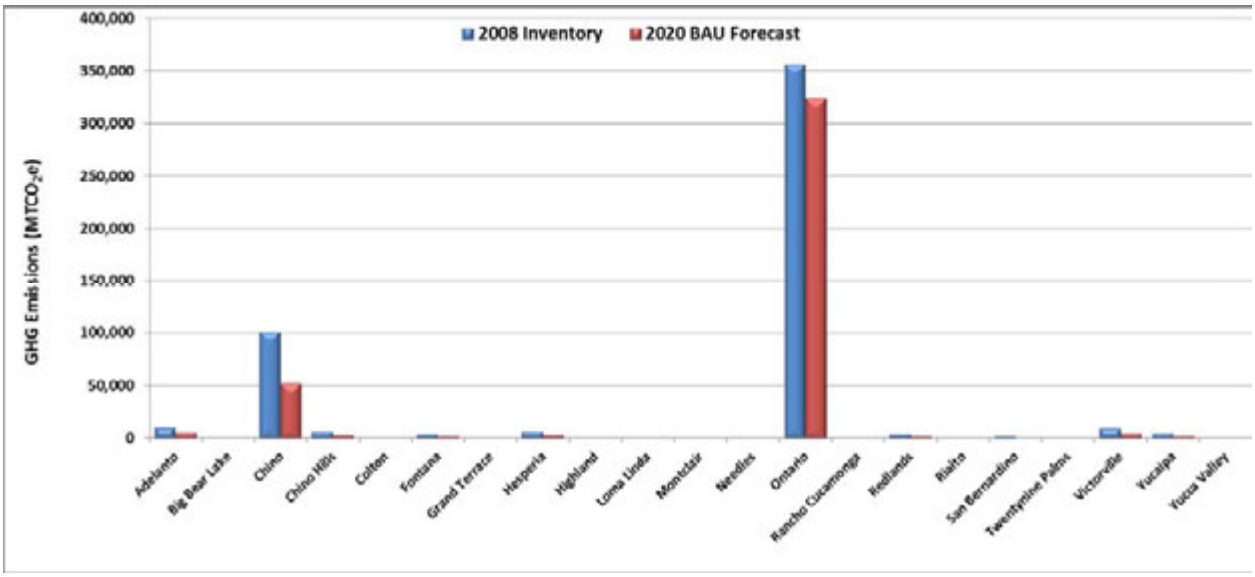
The three general sources of agricultural emissions evaluated in this inventory include livestock enteric fermentation, livestock manure management, and N_2O emissions from the application of fertilizer. See Appendix A for more detail.

Table 4-9 presents 2008 and 2020 BAU forecast agriculture emissions for each city. Figure 4-6 presents 2008 and 2020 emissions for each city. Agriculture emissions are a function of agricultural activity and farmland in each city. The majority of agricultural emissions occur in Chino and Ontario because there are large dairies located in these cities.

Table 4-9. 2008 and 2020 BAU Forecast Agriculture Emissions by City

	2008 Inventory ($MTCO_2e$)			2020 BAU Projection ($MTCO_2e$)		
City	CH_4	N_2O	CO_2e	CH_4	N_2O	CO_2e
Adelanto	408.2	3.5	9,664	208.0	1.8	4,925
Big Bear Lake	-	-	-	-	-	-
Chino	4,567.3	17.3	101,287	2,327.8	8.8	51,623
Chino Hills	245.1	1.8	5,691	124.9	0.9	2,900
Colton	32.8	0.1	731	16.7	0.1	373
Fontana	100.5	5.6	3,850	51.2	2.9	1,962
Grand Terrace	4.5	0.1	116	2.3	0.0	59
Hesperia	248.3	1.2	5,572	126.5	0.6	2,840
Highland	31.0	0.2	715	15.8	0.1	364
Loma Linda	25.8	0.4	675	13.1	0.2	344
Montclair	-	-	-	-	-	-
Needles	-	-	-	-	-	-
Ontario	15,985.2	65.9	356,131	14,515.6	59.9	323,390
Rancho Cucamonga	10.6	0.3	300	5.4	0.1	153
Redlands	123.9	2.2	3,298	63.2	1.1	1,681
Rialto	9.7	0.1	245	5.0	0.1	125
San Bernardino	85.3	0.4	1,909	43.5	0.2	973
Twentynine Palms	-	-	-	-	-	-
Victorville	407.5	1.7	9,095	207.7	0.9	4,635
Yucaipa	132.4	3.8	3,967	67.5	1.9	2,022
Yucca Valley	-	-	-	-	-	-
Total	22,418.1	104.7	503,245.6	17,794.2	79.6	398,369

Figure 4-6. 2008 and 2020 BAU Forecast Agriculture Emissions by City



4.7 Solid Waste Management Emissions

Total emissions from solid waste generated by the cities account for approximately 2% of the 21-city region's 2008 inventory. These emissions are fugitive emissions of CH_4 that occur at numerous landfills spread throughout the state. The materials disposed of by each city in the 21-city region are recycled, composted, or placed in a landfill. Landfill-related emissions from waste are primarily CH_4, which is released over time when waste decomposes. Organic waste that is buried in landfills decomposes under anaerobic conditions to produce CH_4. CH_4 is a GHG with a global warming potential (GWP) that is 21 times larger than that of CO_2.

Waste generated in the city will be either diverted (through recycling, composting, etc.) or transported to a landfill. Many of these landfills are outside the city. According to CalRecycle, the cities deposited waste to more than 60 landfills between 1995 and 2009; only 10 are located in one of the 21 cities (CalRecycle 2010a, 2010b). As such, the majority of these emissions will not occur within the boundaries of each city generating the waste, but each city is responsible for creating this waste.

There are 10 landfills located within the boundaries of the community inventories, several of which are closed. Landfills and their current status (i.e., open or closed) and characteristics are presented in Appendix A. The emissions from all of these landfills, even from those closed, are included as an informational item only (these emissions are known as site-based emissions). Because these landfills accept waste from many jurisdictions, landfill-related emissions are largely unrelated to city population, waste generated by city or county municipal facilities, and/or behavioral or regulatory changes related to waste generation that happen in the city. Although waste deposited in landfills located within city boundaries may originate from jurisdictions other than the city, the city may have some jurisdictional control over these landfills. As such, emissions are included below as an informational item but are not included the 21-city region's 2008 baseline GHG inventory or 2020 forecast.

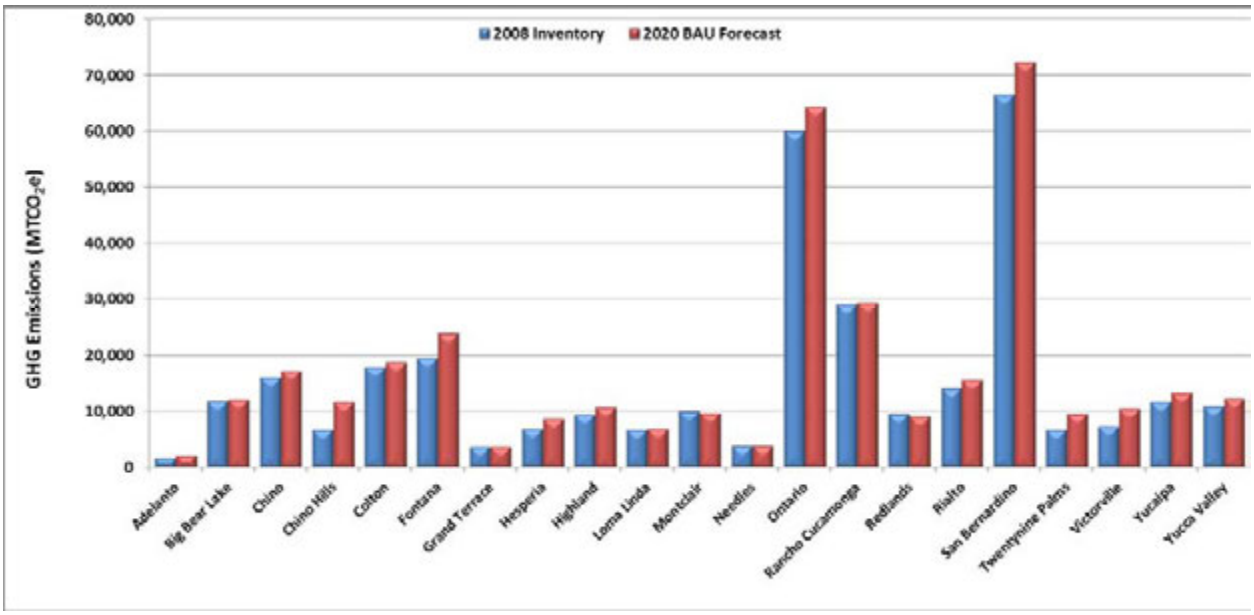
Table 4-10 presents 2008 and 2020 BAU emissions for generation-based solid waste emissions. Figure 4-7 presents 2008 and 2020 emissions for each city. Solid waste management emissions are generally a function of population and employment in each city.

Table 4-10. Generation-Based Solid Waste Management Emissions for 2008 and 2020 BAU Projections by City

	2008 Inventory		2020 BAU Forecast	
City	Waste Disposed (tons)	CH_4 Emissions ($MTCO_2e$)	Waste Disposed (tons)	CH_4 Emissions ($MTCO_2e$)
Adelanto	20,036	1,744	26,064	2,381
Big Bear Lake	15,473	11,929	16,686	12,250
Chino	95,529	16,239	94,013	17,305
Chino Hills	42,732	6,831	37,978	11,754
Colton	49,902	18,037	43,809	18,826
Fontana	200,700	19,570	180,338	24,052
Grand Terrace	12,348	3,863	8,223	3,895
Hesperia	76,151	7,007	72,463	8,858
Highland	35,871	9,533	28,647	10,957
Loma Linda	19,371	6,911	17,234	6,925
Montclair	37,599	10,108	35,726	9,873
Needles	3,986	3,915	5,083	3,989
Ontario	256,328	60,000	288,659	64,326
Rancho Cucamonga	160,725	29,042	135,538	29,475
Redlands [a]	19,416	16,391	13,807	17,877
Rialto	100,343	14,269	91,431	15,708
San Bernardino	214,382	66,492	201,006	72,386
Twentynine Palms	20,518	6,862	25,234	9,640
Victorville	95,637	7,433	111,540	10,551
Yucaipa	41,966	11,875	33,330	13,430
Yucca Valley	18,833	10,992	21,054	12,359
Total	1,537,845	339,044	1,487,861	376,817

[a] Redlands owns and operates the California Street Landfill, so site-based emissions from this landfill were included in Redland's inventory in this table. These emissions do not double-count the solid waste management emissions. Emissions from this landfill are 6,665 and 8,587 $MTCO_2e$ for 2008 and 2020, respectively.

Figure 4-7. 2008 and 2020 BAU Forecast Solid Waste Management Emissions by City



4.8 Wastewater Treatment Emissions

Total emissions from wastewater treatment account for approximately 0.4% of the 21-city region's 2008 inventory. There are five large wastewater treatment plants (WWTPs) located within the boundaries of this inventory that serve the majority of the 21-city region's residents and businesses. The Inland Empire Utilities Agency (IEUA) operates four of these plants; the other is operated by the City of San Bernardino's Municipal Water Department. GHG emissions result from electricity and/or natural gas used to power the facilities. These are indirect emissions and are included in the inventory in either the building energy or the water sectors, depending on where the WWTP is located. Additional emissions of CH_4 and N_2O result from the treatment and breakdown of waste in the facility. These are commonly referred to as *fugitive emissions*. Three of the five facilities capture the fugitive emissions (biogas) on site and use it for local power; the other two facilities do not capture and combust the biogas. About 80% of the total biogas produced by the 21-city region's WWTPs is assumed to be used for local power; the remaining biogas produces fugitive emissions that are included in the inventory.

Wastewater generated in each city will be sent to WWTPs, which may be outside the city. Consequently, some of these emissions will not occur within the boundaries of each city generating the wastewater, but each city is responsible for creating this wastewater. GHG emissions attributable to fugitive emissions at these facilities are listed in Table 4-11.

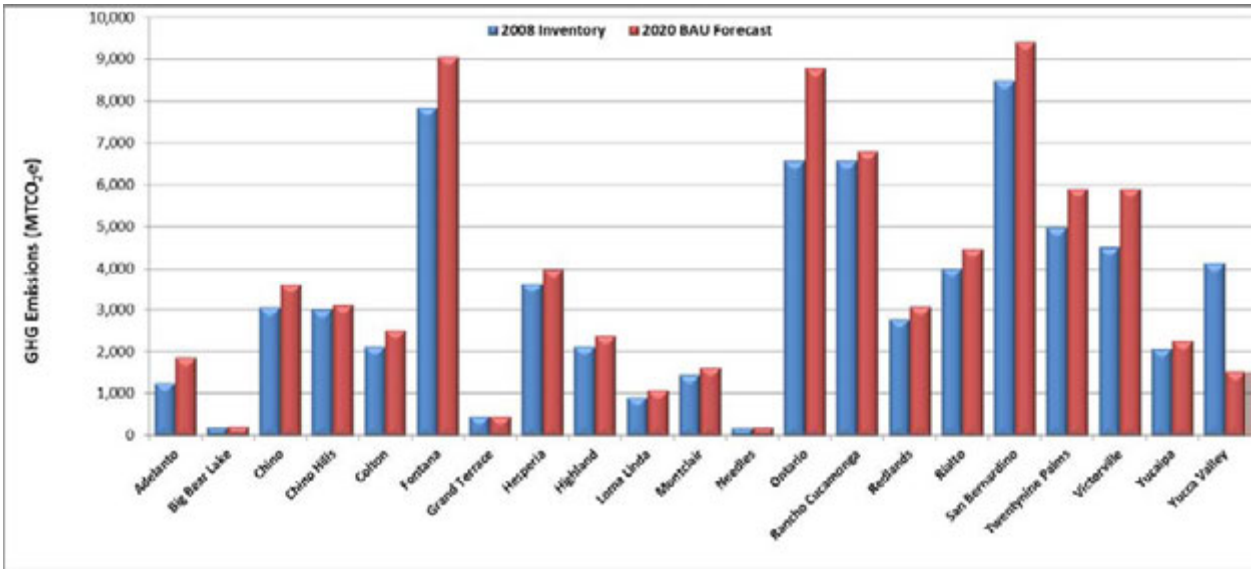
In addition, some cities rely on municipal septic systems as opposed to centralized WWTPs, including Twentynine Palms and Yucca Valley. Septic systems also release fugitive emissions of CH_4. These emissions are included in the inventory and in Table 4-11.

Table 4-11 and Figure 4-8 present 2008 and 2020 BAU forecast GHG emissions for wastewater treatment for each city. Wastewater treatment emissions are generally a function of population in each city.

Table 4-11. 2008 and 2020 BAU Forecast Fugitive Wastewater Treatment Emissions by City

	2008 Inventory (MT)			2020 BAU Forecast		
City	CH_4 Emissions	N_2O Emissions	Total Emissions (CO_2e)	CH_4 Emissions	N_2O Emissions	Total Emissions (CO_2e)
Adelanto	28.6	2.1	1,262	42.3	3.2	1,876
Big Bear Lake	4.6	0.3	203	5.2	0.4	229
Chino	69.3	5.2	3,057	81.4	6.1	3,613
Chino Hills	68.4	5.1	3,016	70.2	5.3	3,116
Colton	55.9	3.1	2,128	65.1	3.7	2,519
Fontana	177.9	13.3	7,842	204.3	15.4	9,064
Grand Terrace	10.8	0.8	476	10.7	0.8	474
Hesperia	82.2	6.1	3,624	90.0	6.8	3,995
Highland	48.6	3.6	2,143	53.8	4.1	2,387
Loma Linda	21.1	1.6	931	24.5	1.8	1,088
Montclair	33.0	2.5	1,455	36.4	2.7	1,614
Needles	4.4	0.3	196	4.5	0.3	201
Ontario	149.4	11.1	6,587	197.9	14.9	8,781
Rancho Cucamonga	149.3	11.1	6,584	153.3	11.6	6,801
Redlands	62.9	4.7	2,773	69.2	5.2	3,072
Rialto	90.7	6.8	4,001	100.9	7.6	4,476
San Bernardino	192.5	14.3	8,490	212.0	16.0	9,407
Twentynine Palms	237.7	0.0	4,991	281.9	0.0	5,919
Victorville	102.6	7.6	4,524	133.3	10.1	5,915
Yucaipa	47.0	3.5	2,071	51.2	3.9	2,272
Yucca Valley	197.1	0.0	4,138	62.6	0.7	1,522
Total	1,834.0	103.2	70,495	1,950.7	120.6	78,341

Figure 4-8. 2008 and 2020 BAU Forecast Wastewater Treatment Emissions by City



4.9 Water Transport, Distribution, and Treatment Emissions

Water consumption emissions accounted for approximately 1.4% of total 21-city region emissions in 2008. Each city's water consumption includes the following indirect emissions by activity: electricity consumption for water supply and conveyance, water treatment, water distribution, and wastewater treatment. The emissions were calculated based on whether the source of water was assumed to be located in each City and whether the water-related activity was occurring within each City. For local sources of water, the emissions resulting from water supply and conveyance, water treatment, water distribution, and wastewater treatment have been accounted for in the building energy sector, as these activities were assumed to be occurring within each city. Local sources of water can include groundwater and surface water. For non-local sources of water, such as the State Water Project (SWP), this sector includes the following:

- transporting water to each city from other areas in the state (water supply and conveyance),
- treatment of water at facilities not located in each city (water treatment),
- distributing this water to each city (water distribution), and
- treatment of wastewater at facilities not located in each city (wastewater treatment).

Where utility data are not available, emissions from water transport, distribution, and treatment can be estimated using an activity-based approach. The California Energy Commission (CEC) 2006 report, *Refining Estimates of Water-Related Energy Use in California*, provides proxies for embodied energy use for water in southern and northern California (California Energy Commission 2006a). This hybrid approach using both utility data and activity data was used to minimize double-counting of emissions for each city.

Table 4-12 presents water-related electricity consumption by city and the emissions associated with water supply and conveyance, water treatment, water distribution, and wastewater treatment for 2008. Table 4-13 presents the same information for the 2020 BAU forecast. Figure 4-9 presents 2008 and 2020 emissions for each city. Water transport, distribution, and treatment emissions are generally a function of population and employment in each city.

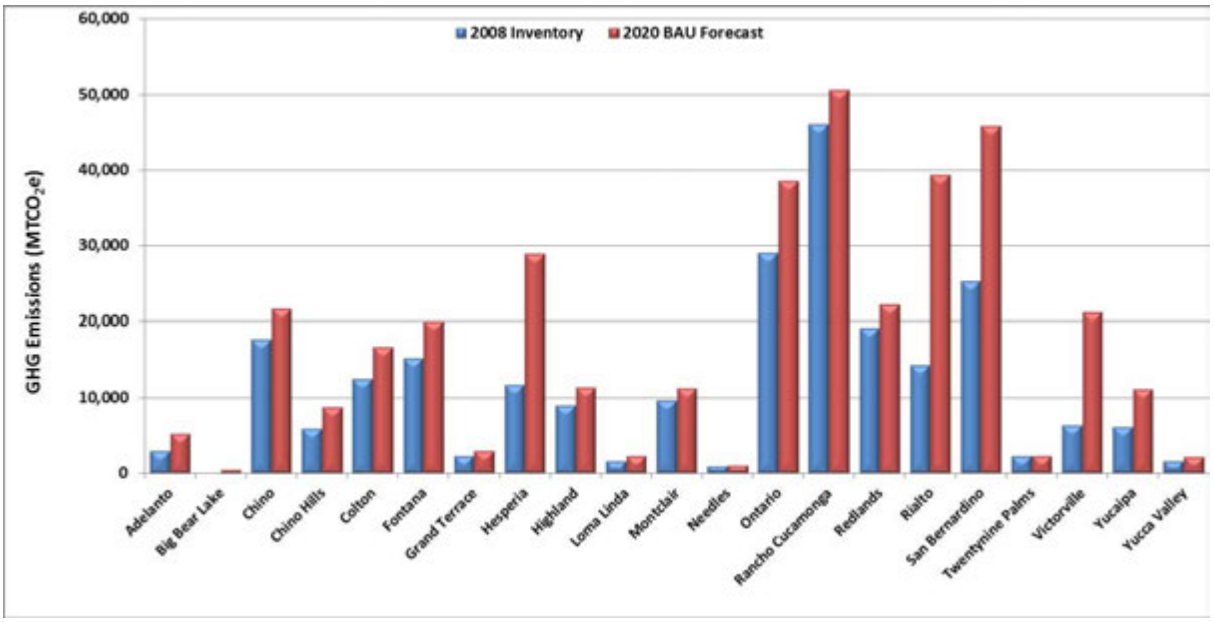
Table 4-12. 2008 Water Transport, Distribution, and Treatment GHG Emissions by City

City	Water-related Electricity Consumption (kWh)	2008 Greenhouse Gas Emissions (MT)			
		CO_2	CH_4	N_2O	CO_2e
Adelanto	10,597,422	3,033	2.9	9.3	3,045
Big Bear Lake	1,077,898	333	0.3	0.9	334
Chino	61,549,228	17,613	16.6	53.9	17,684
Chino Hills	20,567,292	5,886	5.5	18.0	5,909
Colton	13,284,289	12,492	0.0	0.0	12,492
Fontana	53,129,749	15,204	14.3	46.6	15,265
Grand Terrace	8,219,549	2,352	2.2	7.2	2,362
Hesperia	40,642,391	11,630	11.0	35.6	11,677
Highland	31,234,185	8,938	8.4	27.4	8,974
Loma Linda	5,693,374	1,629	1.5	5.0	1,636
Montclair	33,716,507	9,648	9.1	29.5	9,687
Needles	1,750,506	995	0.3	4.1	999
Ontario	101,090,029	28,928	27.2	88.6	29,044
Rancho Cucamonga	160,294,461	45,871	43.2	140.5	46,054
Redlands	66,691,862	19,085	18.0	58.4	19,161
Rialto	49,761,968	14,240	13.4	43.6	14,297
San Bernardino	88,284,365	25,264	23.8	77.4	25,365
Twentynine Palms	8,054,431	2,305	2.2	7.1	2,314
Victorville	22,140,833	6,336	6.0	19.4	6,361
Yucaipa	21,309,421	6,098	5.7	18.7	6,122
Yucca Valley	5,835,728	1,670	1.6	5.1	1,677
Total	804,925,489	239,550	213.2	696.2	240,459

Table 4-13. 2020 BAU Forecast Water Transport, Distribution, and Treatment Greenhouse Gas Emissions by City

City	Water-related Electricity Consumption (kWh)	2020 BAU Forecast (MT)			
		CO_2	CH_4	N_2O	CO_2e
Adelanto	18,174,893	5,201	4.9	15.9	5,222
Big Bear Lake	1,605,643	496	0.4	1.4	498
Chino	75,654,439	21,650	20.4	66.3	21,736
Chino Hills	30,592,385	8,754	8.2	26.8	8,790
Colton	17,800,823	16,739	0.0	0.0	16,739
Fontana	70,090,541	20,057	18.9	61.4	20,138
Grand Terrace	10,541,405	3,017	2.8	9.2	3,029
Hesperia	100,824,081	28,852	27.2	88.3	28,968
Highland	39,736,846	11,371	10.7	34.8	11,417
Loma Linda	8,117,401	2,323	2.2	7.1	2,332
Montclair	39,375,872	11,268	10.6	34.5	11,313
Needles	1,785,516	1,014	0.3	4.2	1,019
Ontario	134,262,920	38,421	36.2	117.6	38,575
Rancho Cucamonga	176,108,519	50,396	47.5	154.3	50,598
Redlands	77,415,995	22,154	20.9	67.8	22,242
Rialto	136,880,143	39,170	36.9	119.9	39,327
San Bernardino	159,610,978	45,675	43.0	139.9	45,858
Twentynine Palms	8,054,431	2,305	2.2	7.1	2,314
Victorville	74,129,843	21,213	20.0	65.0	21,298
Yucaipa	38,796,561	11,102	10.5	34.0	11,147
Yucca Valley	7,764,737	2,222	2.1	6.8	2,231
Total	1,227,323,971	363,402	325.8	1,062.4	364,790

Figure 4-9. 2008 and 2020 BAU Forecast Water Transport, Distribution, and Treatment Emissions by City



4.10 Indirect Emissions of Sulfur Hexafluoride due to Electricity Consumption

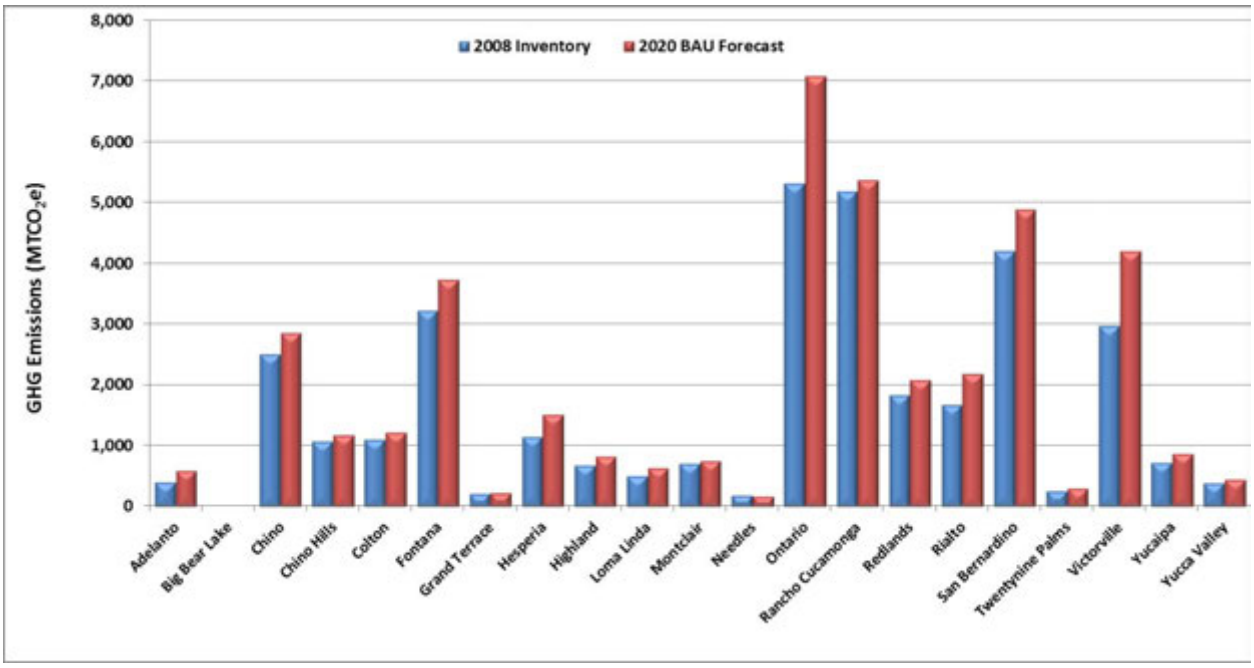
Emissions of SF_6 from transmission of electricity to each city accounted for approximately 0.2% of total 21-city region emissions in 2008. These emissions include leaked SF_6 from electrical transmission and distribution systems, and are an indirect emissions source. SF_6 is used to insulate power switching equipment and transformers (California Energy Commission 2006b). SF_6 emissions are based on electricity consumption in each city. See Appendix A for more detail.

Table 4-14 presents 2008 and 2020 BAU forecast GHG emissions of SF_6 from electricity consumption. Figure 4-10 presents 2008 and 2020 emissions for each city. SF_6 emissions are generally a function of population and employment in each city, as population and employment are good indicators of electricity consumption.

Table 4-14. 2008 and 2020 BAU Forecast Sulfur Hexafluoride Emissions from Electricity Consumption by City

	2008 Inventory		2020 BAU Forecast	
City	Total Electricity Consumption (kWh)	Total SF_6 Emissions ($MTCO_2e$)	Total Electricity Consumption (kWh)	Total SF_6 Emissions ($MTCO_2e$)
Adelanto	130,230,340	402	192,023,988	593
Big Bear Lake	6,834,379	21	7,603,699	23
Chino	809,256,413	2,501	923,759,672	2,855
Chino Hills	348,713,176	1,078	382,610,179	1,182
Colton	356,474,976	1,102	394,281,042	1,218
Fontana	1,044,339,474	3,227	1,208,730,436	3,735
Grand Terrace	68,504,541	212	74,035,469	229
Hesperia	371,499,352	1,148	489,549,102	1,513
Highland	222,461,464	687	265,949,627	822
Loma Linda	162,723,134	503	207,306,823	641
Montclair	228,542,834	706	246,047,983	760
Needles	58,550,624	181	57,376,267	177
Ontario	1,718,244,819	5,310	2,288,629,217	7,072
Rancho Cucamonga	1,675,327,298	5,177	1,738,937,891	5,374
Redlands	592,360,397	1,831	673,019,813	2,080
Rialto	542,840,773	1,678	708,357,337	2,189
San Bernardino	1,357,899,513	4,196	1,584,127,178	4,895
Twentynine Palms	85,494,018	264	98,909,738	306
Victorville	962,116,493	2,973	1,360,931,023	4,206
Yucaipa	236,222,797	730	282,125,997	872
Yucca Valley	124,280,456	384	145,069,989	448
Total	11,102,917,272	34,311	13,329,382,470	41,191

Figure 4-10. 2008 and 2020 BAU Forecast Sulfur Hexafluoride Emissions from Electricity Consumption by City



Section 5
Methods

This section presents the overall methods used to prepare the 2008 community GHG emissions inventories. This section discusses the inventory definitions, inventory protocols used, emissions factors, and analysis methods.

5.1 Inventory Definitions

Community Inventory. The community inventory includes GHG emissions occurring within a city's geographic or jurisdictional boundaries or as a result activity within those boundaries, and includes emissions most readily under the control or subject to the influence of that city. The boundaries of the community inventory are "geographical" such that the emissions included, or activities associated with emissions, must occur inside the jurisdictional boundary of the city, as long as the emissions source is subject to the city's jurisdiction. For direct emissions (such as natural gas combustion in buildings), if a city can have a substantial effect on those emissions by influencing energy use (such as through green building codes), then the direct emissions are included in the inventory. For indirect emissions (such as solid waste disposed outside of the county), if the city can have a substantial effect on those indirect emissions by influencing demand (such as waste minimization and diversion programs), then they are included in the inventory. By including emissions that are controlled by or subject to the influence of the cities, the inventory can form the basis for local climate action planning. The year 2008 was chosen for the current community inventories because it was the most recent year with the necessary data to perform a comprehensive inventory, and it was a year for which transportation emissions could be compared to regional SCAG study base years for the next Regional Transportation Plan. The inventory includes any measures or programs (such as those designed to reduce GHG emissions) implemented prior to the base year.

Municipal Inventory. The municipal inventory includes GHG emissions associated with the city's services and municipal operations. Municipal inventories are not calculated or presented in this report, but have been developed or will be developed by individual cities on their own.

Some emissions sources are included in both inventories, as there are overlaps in the operational boundaries of the community and municipal inventories. For example, in the community inventory, light/medium-duty vehicle emissions include emissions from all passenger vehicles traveling in each city. The corresponding municipal inventory category is vehicle fleet emissions, which operate mostly in each city, but may also operate outside of individual city boundaries. The overlap between the community and municipal inventories for the transportation sector would be those city vehicle emissions that occur in each city because these emissions are accounted for in the transportation modeling for that city. Emissions from city-operated vehicles traveling outside each city's boundaries would be included in the municipal inventory but only partially in the community inventory for that same city because they would be split with other jurisdictions in their community inventories.

BAU 2020 Forecast. The 2020 emissions forecast represents BAU emissions associated with each city's community emissions in 2020. This forecast accounts for any active programs (such as those

designed to reduce emissions) that were already in place in 2008 (since these programs would have affected the 2008 baseline inventory). The 2020 BAU forecast does not account for any programs implemented after 2008, or changes to programs that occurred after 2008.

Unit of Measure: The unit of measure used throughout this GHG inventory is the metric ton of CO_2 equivalent ($MTCO_2e$). This is the international unit that combines the differing impacts of all greenhouse gases into a single unit, by multiplying each emitted gas by its GWP. GWP is the measure of how much a given mass of GHG contributes to global warming. GWP compares the relative warming effect of the GHG in question to CO_2.[1]

Emissions Type: GHG emissions can be defined as either *direct* (emissions that occur at the end use location such as natural gas combustion for building heating) or *indirect* (emissions that result from consumption at the end use location but occur at another location such as emissions from electricity). This report addresses both types of emissions. In addition, all references to *emissions* are equivalent to *GHG emissions.*

5.2 2020 Business-as-Usual Forecast

A BAU projection was developed for the year 2020 (2020 BAU forecast). This projection estimates the level of emissions resulting from each city in 2020. Because it does not account for any programs that would reduce emissions and are implemented after the inventory base year (2008), this projection reflects the impacts of city growth. The projection does, however, account for the prior impact of any programs that were implemented prior to 2008, as these programs have already lowered the baseline year emissions. Any measures or programs implemented prior to 2008 are accounted for in the 2008 inventory.

As such, the projection can be used to determine the magnitude of the reductions that need to be achieved by 2020 (relative to current emissions) to achieve each city's emissions-reduction target. The BAU projections are based on current energy consumption and anticipated growth rates provided by the cities, SCAG, CARB, and other appropriate data sources, as listed in this report. Consistent with California's BAU projections, the 2020 BAU emissions projection does not assume the implementation of any federal, state, or local reduction measures but projects the future emissions based on current energy and carbon intensity in the existing economy. The specific assumptions associated with the energy growth rates are provided in Section 5.5, "Analysis Methods."

As the population and workforce in each city grow, emissions will increase over time. Total 21-city region emissions (for the inventoried cities) are projected to increase by approximately 18% from 2008 to 2020. The increase from 2008 to 2020 will occur primarily in the building energy use and stationary source sectors, as they are primarily tied to growing population and employment. Agriculture emissions will decrease over time as the activity occurring at the dairies in Chino and

[1] The GWP of CO_2 is, by definition, one (1). The GWP values used in this report are based on the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (SAR) and United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines and are as follows: CO_2 = 1, CH_4 = 21, N_2O = 310, SF_6 = 23,600 (Intergovernmental Panel on Climate Change 1996; United Nations Framework Convention on Climate Change 2006). Although the IPCC Fourth Assessment Report (AR4) presents different GWP estimates, the current inventory standard relies on SAR GWPs to comply with reporting standards and consistency with regional and national inventories (EPA 2010b).

Ontario is anticipated to decline. Population, employment, and housing projections were provided by SCAG. Additional growth data were collected from other sources, as detailed below and in Appendix A.

The methods and assumptions for the projections discussed in the following sections are intended to produce a reasonable estimate of emissions for 2020. Although these assumptions are supported by established inventory protocols and widely used inventory methodologies, the methods for estimating 2020 BAU forecast emissions for the 21-city region is subject to certain limitations. Specifically, in cases where future emission factor data are limited, the emission factors were assumed to remain constant from the current year's inventory. In addition, emissions were estimated based on historical and projected trends in associated emissions-generating activities. However, it is possible that future emissions may not actually follow these trends.

5.3 Inventory Protocols

Numerous widely accepted protocols for estimating GHG emissions were used to prepare the community and municipal inventory. The protocols used in the development of this inventory include those following (listed in order of applicability for the inventory):

- ICLEI U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (ICLEI–Local Governments for Sustainability USA 2012). This protocol establishes a number of requirements for reporting community GHG emissions. The protocol requires inclusion of five basic emissions generating activities: use of purchased electricity, use of fuel in stationary applications, use of on-road motor vehicles, water consumption, and solid waste disposal. The protocol also recommends (but does not require) inclusion of other emissions sectors over which a jurisdiction has control or substantial influence. This inventory includes all the five basic emissions generating activities, as well as additional emission sectors under the control of cities in San Bernardino County (such as wastewater treatment and agricultural activity).
- CARB LGOP (2010). This protocol is the standard for estimating emissions resulting from government buildings and facilities, government fleet vehicles, wastewater treatment and potable water treatment facilities, landfill and composting facilities, and other operations.
- California Climate Action Registry and General Reporting Protocol (2009). This protocol provides guidance for preparing GHG inventories in California.
- CARB California Greenhouse Gas Inventory Data 1990–2006 (2010a). CARB's documentation provides background methods, activity data, protocols, and calculations used for California's statewide inventory.
- CEC Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004 (2006b). This inventory provides useful methods and emission factors for statewide GHG emissions inventorying.
- EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2008 (2010a). This inventory provides useful methods and emission factors for nationwide GHG emissions inventorying.
- Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (2006). This document is the international standard for inventories and provides much of the baseline methods used in the national and statewide emissions inventories.

Direct and indirect emissions were quantified and included in the community inventories. For example, direct emissions associated with on-site natural gas use are included because these emissions occur within each city and are subject to each respective city's influence or control. Indirect GHG emissions associated with electricity use are included because these emissions can occur outside of each city but are subject each respective city's influence or control.

5.4 Emission Factors

Emission factors and references are summarized in Table 5-1. These emission factors were used to calculate GHG emissions from activity data, such as kilowatt-hour (kWh) of electricity consumed for lighting or gallons of gasoline fuel combusted for on-road transportation.

Table 5-1. Greenhouse Gas Emission Factors

Source	Emission Factor	Reference
Energy and Stationary Fuels		
Electricity	0.28617 kg CO_2/kWh[a]	CCAR 2010 (2007 data)
	0.94032 kg CO_2e/kWh[b]	Lincus Inc. 2012 (2011 data); CARB 2012
	0.309 kg CO_2/kWh[c]	EPA 2010b (2007 data)
	0.56817 kg CO_2/kWh[d]	EPA 2010b (2007 data)
	0.000013 kg CH_4/kWh[e]	EPA 2010b (2007 data)
	0.000009 kg CH_4/kWh[f]	EPA 2010b (2007 data)
	0.000003 kg N_2O/kWh[e]	EPA 2010b (2007 data)
	0.000008 kg N_2O/kWh[f]	EPA 2010b (2007 data)
	0.000129 g SF_6/kWh	CARB 2010a
Natural Gas	53.3 kg CO_2/GJ	IPCC 2006
	0.005 kg CH_4/GJ	IPCC 2006
	0.0001 kg N_2O/GJ	IPCC 2006
Vehicle Fuels		
Diesel	10.15 kg CO_2/US Gallon	CCAR 2009
	0.00015 kg CH_4/US Gallon	IPCC 2006
	0.00015 kg N_2O/US Gallon	IPCC 2006
Gasoline	8.78 kg CO_2/US Gallon	CCAR 2009
	0.00013 kg CH_4/US Gallon	IPCC 2006
	0.0002 kg N_2O/US Gallon	IPCC 2006
Propane	5.79 kg CO_2/US Gallon	CCAR 2009
	0.000992 kg CH_4/US Gallon	CCAR 2009 and NAFA 2010
	0.002631 kg N_2O/US Gallon	CCAR 2009 and NAFA 2010
CNG	1.906992 kg CO_2/m3	IPCC 2006
	0.011127 kg CH_4/m3	IPCC 2006
	0.00099kg N_2O/m3	IPCC 2006
Water-Related Electricity Intensities for Southern California		
Water supply and	9,727 kWh/MG	CEC 2006a

Source	Emission Factor	Reference
conveyance		
Water Treatment	111 kWh/MG	CEC 2006a
Water Distribution	1,272 kWh/MG	CEC 2006a
Wastewater Treatment	1,911 kWh/MG	CEC 2006a
SF_6 from Electricity Consumption	0.000129 g SF_6/kWh	CARB 2010b

[a] Emission factor applies to electricity delivered to Southern California Edison (SCE) customers.
[b] Emission factor applies to electricity delivered to the City of Colton (Colton Public Utilities).
[c] Emission factor applies to electricity delivered to the City of Big Bear (emission factor for the CAMX eGRID region).
[d] Emission factor applies to electricity delivered to the City of Needles (emission factor for the AZNM eGRID region).
[e] Emission factor applies to electricity delivered to all cities except Needles (emission factor for the CAMX eGRID region).
[e] Emission factor applies to electricity delivered to the City of Needles (emission factor for the AZNM eGRID region).
CO_2 = carbon dioxide; CH_4 = methane; IPCC = Intergovernmental Panel on Climate Control; KWh/MG = kilowatt hour per million gallons; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; kg = kilogram; N_20 = nitrous oxide. CCAR = California Climate Action Registry; NAFA = National Association of Fleet Administrators; SF_6 = sulfur hexafluoride; CNG = compressed natural gas.

5.5 Analysis Methods

As defined above, the community inventories include GHG emissions occurring within the boundaries of each city in the 21-city region. The following emissions sectors are included in the community inventories. The data source for each emission sector also is listed.

- **Residential:** natural gas (direct emissions) and electricity consumption (indirect emissions) for the residential sector. Data provided by utilities.
- **Commercial / Industrial:** natural gas (direct emissions) and electricity consumption (indirect emissions) for the commercial and industrial sectors. Data provided by utilities.
- **Stationary Sources:** cement plants, fuel combustion, industrial process emissions etc. Data provided by SCAQMD countywide inventory and by CARB.
- **Light/Medium-Duty Vehicles:** fuel consumption for light-duty and medium-duty passenger vehicles traveling in each city.
- **Heavy-Duty Vehicles:** fuel consumption for heavy-duty trucks traveling in each city.
- **Off-Road Equipment:** fuel consumption for off-road vehicles and equipment in each city. Data provided by the OFFROAD model.
- **Agriculture:** enteric fermentation, manure management, and fertilizer application from dairy operations. Data provided by the California Department of Food and Agriculture's Production Statistics and other sources provided by San Bernardino County.

- **Solid Waste Management:** CH_4 emissions from waste generated by each city and deposited in landfills. Data provided by CalRecycle.
- **Wastewater Treatment:** fugitive emissions from domestic wastewater treatment. Data provided by CARB.
- **Water Transport, Distribution, and Treatment:** electricity consumption associated with water importation. Data provided by the CEC.
- **SF_6 from Electricity Consumption:** fugitive emissions of SF_6 from the transport of electricity to the city. Data provided by utilities and CARB.

The inventory was conducted primarily using ICF's proprietary Greenhouse Gas Inventory Database (GHG:ID) tool and supplemented with additional emissions calculations. This tool is designed to help clients develop a transparent GHG inventory that conforms to widely accepted protocols and provides information required to form corporate GHG strategy. For San Bernardino Regional emissions, the tool was modified to include solid waste management emissions, wastewater treatment emissions, and water conveyance emissions.

Table 5-2 presents the emissions sectors included in the community inventory, the data source for each emission sector, the methods for scaling 21-city regional emissions to each city where appropriate, and the methods for projecting emissions to 2020. Population, housing, and employment estimates and forecasts for 2008 and 2020 are presented in Table 5-3. These projections were used to forecast emissions in 2020.

Table 5-2. Community Inventory Data Sources and Methods

Sector	Emission Sources	Source of Data	Scaling Methods	Projection Methods
Residential	Electricity consumption Natural gas consumption Other fuel consumption by type (natural gas, LPG, fuel oil, diesel, gasoline, etc.)	Electricity records from utilities (city-level data)[b] Gas records from utilities (city-level data)[c]	None	Growth in households
Commercial	Electricity consumption Natural gas consumption Other fuel consumption by type (natural gas, LPG, fuel oil, diesel, gasoline, etc.)	Electricity records from utilities (city-level data)[b] Gas records from utilities (city-level data)[c]	None	Growth in employment
Industrial	Electricity consumption Natural gas consumption Other fuel consumption by	Electricity records from utilities (city-level data)[b] Gas records from utilities (city-level data)[c]	None	Growth in employment

Sector	Emission Sources	Source of Data	Scaling Methods	Projection Methods
	type (natural gas, digester gas, LPG, fuel oil, landfill gas and diesel)			
Stationary Sources	Cement plant process emissions Fuel combustion Industrial process emissions	SCAQMD (countywide data)	City population and employment[a]	Population and employment growth factors
Light/Medium -Duty Vehicles	Light and medium-duty passenger vehicle fuel combustion	SCAG's regional travel demand model	VMT accounting methods recommended by Regional Targets Advisory Committee	SCAG's regional travel demand model uses socioeconomic growth forecasts.
Heavy-Duty Vehicles	Heavy-duty truck fuel combustion	SCAG's regional travel demand model	VMT accounting methods recommended by Regional Targets Advisory Committee	SCAG's regional travel demand model uses socioeconomic growth forecasts.
Off-road Equipment	Off-road vehicles and equipment fuel combustion	OFFROAD2008	Population and employment	Population and employment growth forecasts[d]
Agricultural Emissions	Enteric fermentation and manure management from dairy and other agricultural operations, fertilizer application from farm operations	Department of Food and Agriculture's Production Statistics (county-level data) Regional Water Quality Control Board livestock counts (city-level data) Department of Conservation, Division of Land Resource Protection Farmland Mapping and Monitoring Program (county-level data)	Quantity of dairy, cattle, and swine; grazing land use	Linear projection of farmland acreage from 2008 to 2050 (no activity in 2050)
Solid Waste Management	Methane emissions from landfilled waste	City SWMD (city-level data) CalRecycle (city-level data) EPA Landfill Methane Outreach Program (2009)(LMOP) database (statewide data) CARB Landfill Emissions Report	None	Population growth forecasts

Sector	Emission Sources	Source of Data	Scaling Methods	Projection Methods
		(statewide data)		
Wastewater Treatment and Discharge	CH_4 and N_2O emissions from the treatment of wastewater from domestic sources (municipal sewage)	Inland Empire Utilities Agency (county-level data) CARB California GHG inventory	Population	Related to population growth forecasts[e]
Water Transport, Distribution, and Treatment	Indirect electricity emissions for water supply and irrigation infrastructure	California Energy Commission Urban Water Management Plans (UWMP) (city-level data)	None	UWMP forecasts
SF_6 from electricity consumption	Fugitive emissions of SF_6 from the transport of electricity to the city	Electricity records from utilities (city-level data)[b] California Energy Commission, Urban Water Management Plan (city-level data)	None	Varies based on source of electricity CARB emission factors

[a] No scaling factor was used for cement plants.
[b] Electric utilities include SCE, Bear Valley Electric Services (BVES), Colton Public Utilities (CPU), Needles Public Utility Authority (Needles PUA), and Victorville Municipal Utility Services (VMUS).
[c] Natural Gas utilities include Southern California Gas Company (SCG), Southwest Gas (SWG), and VMU.
[d] Specific growth forecasts are based on individual emissions sources within these sectors (i.e., for off-road, residential equipment emissions were projected based on population, while industrial equipment emissions were based on non-retail employment).
[e] Solid waste emissions are based on past waste generated by each city, so the 2020 forecast accounts for past population growth in each city. See Appendix A for more detail.

Table 5-3. San Bernardino Population, Housing, and Employment Estimates and Forecasts

	Population			Households[a]			Employment		
City	2008	2020	Growth Factor[b]	2008	2020	Growth Factor[b]	2008	2020	Growth Factor[b]
Adelanto	31,200	46,084	1.48	7,670	11,900	1.55	5,432	7,313	1.35
Big Bear Lake	5,019	5,619	1.12	2,196	2,400	1.09	6,212	6,423	1.03
Chino	75,596	88,772	1.17	20,135	24,569	1.22	48,495	53,470	1.10
Chino Hills	74,571	76,558	1.03	22,870	23,999	1.05	9,302	10,452	1.12
Colton	52,103	60,652	1.16	14,955	17,842	1.19	24,023	25,529	1.06
Fontana	193,913	222,717	1.15	48,573	57,482	1.18	47,622	53,652	1.13
Grand Terrace	11,768	11,644	0.99	4,303	4,554	1.06	3,019	3,160	1.05
Hesperia	89,617	98,163	1.10	26,266	28,892	1.10	15,537	20,438	1.32
Highland	52,986	58,646	1.11	15,436	17,713	1.15	6,037	7,757	1.28
Loma Linda	23,027	26,746	1.16	8,675	10,459	1.21	17,597	23,281	1.32
Montclair	35,987	39,667	1.10	9,346	10,446	1.12	16,527	17,049	1.03
Needles	4,844	4,941	1.02	1,918	1,956	1.02	3,323	3,145	0.95
Ontario	162,871	215,765	1.32	44,639	61,128	1.37	114,339	151,279	1.32
Rancho Cucamonga	162,792	167,118	1.03	53,564	56,303	1.05	62,462	63,869	1.02
Redlands	68,576	75,494	1.10	24,701	28,262	1.14	41,435	46,682	1.13
Rialto	98,923	109,970	1.11	25,137	29,396	1.17	22,877	26,425	1.16
San Bernardino	209,924	231,151	1.10	59,310	66,924	1.13	101,253	113,357	1.12
Twentynine Palms	24,905	29,538	1.19	8,048	9,623	1.20	3,211	3,625	1.13
Victorville	111,872	145,345	1.30	31,423	43,687	1.39	33,705	45,930	1.36
Yucaipa	51,217	55,821	1.09	18,176	20,692	1.14	9,761	10,923	1.12
Yucca Valley	20,652	22,953	1.11	8,254	9,856	1.19	4,575	5,071	1.11
Total	1,562,363	1,793,364	N/A	455,595	538,083	N/A	596,744	698,830	N/A

[a] Includes single family and multifamily dwelling units.

[b] Represents the total growth between the forecast year and the existing year. For example, between 2008 and 2020, population in Adelanto is anticipated to increase by a factor of 1.48.

Sources: Forecast data provided by SCAG 2012a, and developed for the 2012 Regional Transportation Plan.

5.6 Inventory Limitations and Recommendations

This inventory identifies GHG emissions from regional activities in the 21-city region and serves as a baseline for emission reduction measures and as a starting point for future GHG emissions inventories. Future updates to the GHG emissions inventories presented in this report should be conducted annually to ensure that the inventory remains accurate and that data gaps are resolved in a timely manner. Annual updating also would enable efficient tracking of the effectiveness of any GHG reduction measures put in place to address these emission sources.

5.6.1 Emissions Sinks

Based on guidance provided by CARB, GHG emissions sinks[2] were not included in this report. Because these existing urban and natural forests are part of global atmospheric carbon cycling, ICLEI's Community Inventory Protocol (2012) recommends that this emissions sink be disclosed but not combined with other anthropogenic emissions in an emissions inventory. As such, carbon stocks and GHG emissions sinks were not included in the community inventories for each city. As methodologies are developed for this area, it may benefit individual jurisdictions to add emission sinks to the inventories where sinks or changes in sinks represent a meaningful part of the local inventory. Given the local setting, the 21-city region likely has relatively limited emissions sinks due to the relative lack of large forested areas or wetland areas within city limits. The most substantial carbon sinks in the county are likely the national forest areas that are under federal jurisdiction.

5.6.2 Activity Data

Although considerable efforts were made to obtain activity data from 2008, in some cases these data were unavailable and data from another year were substituted (i.e., year 2007 stationary source data and natural gas combustion data for some cities in the commercial/industrial sector). In addition, data obtained for certain sectors were provided in an aggregated format. For example, building energy use data provided by the major utilities supplying electricity and natural gas to the cities were aggregated by general sector (i.e., residential or commercial plus industrial) instead of by specific activity or entity. In addition, natural gas consumption data for some cities were estimated because the 15/15[3] rule does not permit the utilities to disclose natural gas consumption for these cities. A greater level of detail and disaggregation would strengthen this inventory and greatly increase the potential for the cities and the Partnership to identify, quantify, and monitor effective emission reduction actions. Specific data gaps and limitations are identified and discussed on a sector-by-sector basis below.

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[2] A GHG emissions sink is a natural or human-made reservoir that absorbs and stores more CO_2 or other GHG from the atmosphere than it releases.

[3] The 15/15 Rule was adopted by the California Public Utilities Commission (CPUC) in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. 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 complied 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 have been screened once already using the 15/15 Rule, the customer be dropped from the information provided. In addition to the 15/15 Rule, the CPUC further determined that no information about customers with demands above 500 kW should be included in the distributed information.

5.6.3 High Global Warming Potential Gases

Emissions from the use of substitutes for ozone-depleting substances (ODS) (primarily hydrofluorocarbons [HFCs], and perfluorocarbons [PFCs])[4] were not included in the inventories. These substances are high GWP gases but are not specifically recommended for quantification in regional inventories. Quantification of these emissions is based on statewide emissions factors regarding a suite of possible sources, and thus scaling those emissions to the regional or local scale likely introduces considerable uncertainty. In addition, the cities have limited or nonexistent jurisdiction or influence over these emissions.

5.6.4 On-Road Transportation

The VMT by speed bin data from SCAG was available at the county level and could not be made available at the city level. It would take significant data processing effort from SCAG to make city-level data available. Therefore, ICF used the proportion of the county's VMT in each speed bin to disaggregate each city's VMT by speed bin in order to apply the appropriate emission factors to calculate emissions. This method assumes that all cities have a VMT by speed distribution that is the same as the overall county. Although the impact on the inventory is not likely to be significant, if city-level VMT were available by speed bin, it would lead to a more accurate inventory.

5.6.5 2020 Business-as-Usual Forecasts

The 2020 BAU emissions forecasts are based largely on estimates, forecasts, and growth factors and not actual activity data for those years. BAU emissions for 2020 are projected based on the most appropriate growth data available for each sector. For example, 2020 energy use emissions are estimated based on projected population, employment, and housing growth. Where possible, 2020 BAU projections were made using the best available information and estimates provided by city staff and experts on individual sectors. For many sectors (e.g., residential fuel combustion), projections were based on the future population estimate for the city using data provided by SCAG. This method assumes that emissions will remain proportionate to the current population, which may not be completely accurate. For example, per capita energy consumption may change over time as habits and technology change. For some sectors, especially where emissions are tied to infrastructure (e.g., stationary sources, agriculture) rather than population, estimates were made based on an anticipated maximum or buildout of infrastructure. It is possible that the ratio of certain emissions sources (e.g., natural gas combustion in commercial buildings) to a quantity of infrastructure (e.g., commercial square feet) may also change over time.

[4] Emissions of HFCs and PFCs occur from their use in refrigeration and air conditioning systems. These high global warming potential (GWP) compounds were phased in as ODS substitutes. The majority of anthropogenic high GWP GHGs include SF_6, HFCs, and PFCs

Section 6
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