City of Yucaipa

Climate Action Plan Annex

September 2015

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CITY OF YUCAIPA CLIMATE ACTION PLAN

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Acronyms and Abbreviations

20X2020 goal	20% reduction in urban per capita use by December 31, 2020
AB	Assembly Bill
ATVs	all-terrain vehicles
AVL	automatic vehicle location
BAPIS	Bus Arrival Prediction Information System
BAU	Business-as-Usual
BRT	Bus Rapid Transit
BVES	Bear Valley Electric Service
CAA	Clean Air Act
CAFE	Corporate Average Fuel-Economy
Cal-EPA	California Environmental Protection Agency
CAP	climate action plan
CARB	California Air Resources Board
CCAs	Community Choice Aggregations
CCR	California Code of Regulations
CEC	California Energy Commission
CEEP	Community Energy Efficiency Program
CEQA	California Environmental Quality Act
CFL	compact fluorescent
CH_4	methane
CIC	CAP Implementation Coordinator
CIT	CAP Implementation Team
CLEO	Custom Language Efficiency Outreach
CO_2	carbon dioxide
CPUC	California Public Utilities Commission
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
ESPs	energy service providers
°F	degrees Fahrenheit
FED	Functional Equivalent Document
FY	fiscal year
GHG	greenhouse gas
GPS	global positioning system
GTFS	General Transit Feed Specification
GWh	gigawatt-hours
GWP	global warming potential
HERS	Home Energy Rating System
HFCs	hydrofluorocarbons
HQTA	High Quality Transit Areas
HVAC	heating/venting and air conditioning

I	Interstate
IEUA	Inland Empire Utilities Agency
IOU	investor-owned utilities
IPCC	Intergovernmental Panel on Climate Change
ITS	Intelligent Transportation Systems
IVR	Interactive Voice Response
kW	kilowatts
LCFS	Low Carbon Fuel Standard
LED	light emitting diode
LFGTE	landfill-gas-to-energy
LRTP	Long Range Transit Plan
MCAP	municipal inventory and reduction plan
MEU	Mobile Energy Unit
$MMTCO_2e$	million MTCO2e
MPOs	metropolitan planning organizations
$MTCO_2e$	metric tons of carbon dioxide equivalent
MW	megawatt
N_2O	nitrous oxide
NPV	Net Present Values
ODS	ozone-depleting substances
PACE	Property Assessed Clean Energy
Partnership	San Bernardino Associated Governments and Participating San Bernardino County Cities Partnership
PFCs	perfluorinated carbons
Plan	San Bernardino County Regional Greenhouse Gas Reduction Plan
PPAs	Power Purchase Agreements
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
PS	GHG Performance Standard for New Development
QR	Quick Response
Reporting Rule	Greenhouse Gas Reporting Rule
RHNA	Regional Housing Needs Allocation
RPS	Renewable Portfolio Standard
RTPs	Regional Transportation Plans
SANBAG	San Bernardino Associated Governments
SB	Senate Bill
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCGC	Southern California Gas Corporation
SCS	sustainable communities strategy
SF_6	sulfur hexafluoride

TDM	Transportation Demand Management
TRP	trip reduction plan
TSM	Transportation Systems Management Plan
UC	University of California
VERA	Voluntary Emission Reduction Agreement
VMT	vehicle miles traveled
WWTPs	wastewater treatment plants

Chapter 1
Introduction

1.1 What Is This Document?

This Climate Action Plan (CAP) for the City of Yucaipa (City) presents the greenhouse gas (GHG) inventories, identifies the effectiveness of California initiatives to reduce GHG emissions, and identifies local measures that were selected by the City to reduce GHG emissions under the City's jurisdictional control to achieve the City's identified GHG reduction target. The City of Yucaipa participated in the San Bernardino County Regional Greenhouse Gas Reduction Plan (Plan) which presents the collective results of all local efforts to reduce GHG emissions consistent with statewide GHG targets expressed in Assembly Bill (AB) 32, the "Global Warming Solutions Act of 2006" and Senate Bill (SB) 375. Yucaipa used the technical information within the Plan in the development of the CAP.

This CAP builds on the regional work and refines it to provide City-specific information and to develop the local implementation plan for City-selected GHG reduction measures. This CAP identifies how the GHG reduction measures will be implemented and monitored by the City going forward to ensure that progress is being made toward the GHG reduction target.

1.2 Benefits of a Regional GHG Reduction Plan

Participating cities in the SANBAG effort, including the City of Yucaipa, chose to prepare GHG inventories and evaluate local GHG reduction measures in concert. SANBAG, Yucaipa and the other Partnership cities see several advantages to this approach.

Economies of Scale: Although many aspects of GHG planning and policy making are unique to each city, certain steps are standard and are conducted in exactly the same way by all cities. These steps include: GHG inventory data collection; GHG inventory calculations; forecast of 2020 GHG emissions; review of standard GHG reduction measures; quantification of the benefit of state level GHG reduction measures; and preparation of basic regulatory language and text common to GHG reduction plan documents in California. Completing these standard steps together saves both money and time for all Partnership cities.

Assurance of Standard Methods, Data, and Baseline Year: Even though GHG inventory protocols are standard and communities generally follow the recommended protocols, some subtle differences exist that can limit comparability between cities. Of particular importance to a comparison are the selection of baseline year, the type of data that was collected, methodologies, and boundaries. With a regional inventory and reduction plan, Partnership cities can be assured of an "apples to apples" comparison across all sectors for city-to-city comparisons as well as city-to-region comparisons.

Regional Communication and Education: Similar to most communities in California and across the U.S., San Bernardino cities are undertaking a GHG inventory and reduction plan for the first time. As city staff, stakeholders, and residents go through this process, each learns lessons that can be shared with other communities. The ability to share information benefits all Partnership cities.

Regional View: Certain sectors of GHG emissions are the result of activity that occurs only within the boundary of a city, for example residential natural gas use. Other emissions, such as on-road transportation, are the result of activity that occurs across jurisdictional boundaries and both jurisdictions are responsible for the emission. For certain sectors, looking only at the GHG emissions of a single city is

of limited utility and GHG reduction planning cannot be undertaken alone. This Plan supports both city-specific and regional planning.

Programmatic EIR to Simplify CEQA Compliance: The State California Environmental Quality Act (CEQA) Guidelines require lead agencies to describe, calculate, or estimate the amount of GHG emissions that would result from a project. CEQA Guidelines (Section 15183.5) also allow individual projects to tier off of a larger (and certified) GHG reduction plan. Thus, individual projects do not need to each conduct a GHG analysis as part of CEQA if they can demonstrate consistency with the larger plan. By completing a common basic plan and a subsequent programmatic EIR, all projects in the region can tier off the EIR and be considered less than significant under CEQA if they show consistency with the regional plan. The Program EIR was completed and certified by SANBAG in March 2014.

1.3 SANBAG's Role

The *San Bernardino County Regional Greenhouse Gas Reduction Plan* has been sponsored and facilitated by SANBAG, the regional transportation planning agency in San Bernardino County. SANBAG is leveraging its role as a transportation planning agency and the regional scope of its authority to reduce GHG emissions in several emissions sectors in the region. As a regional agency, SANBAG is in a unique position to support coordinated city efforts and facilitate regional dialogue and cooperation on GHG issues. As the transportation agency, SANBAG also has a critical role in reducing the region's GHG emissions. On-road transportation contributes 35% of the region's GHG emissions. SANBAG worked closely with Southern California Association of Governments (SCAG) in the development and adoption of SCAG's *2012–2035 Regional Transportation Strategy and Sustainable Communities Strategy*, the benefits of which are captured for the region in this analysis. SANBAG is also spearheading efforts to expand Metrolink and is leading other regional efforts related to energy efficiency and renewable energy. SANBAG is planning to implement a regional energy efficiency and water conservation improvement loan program (AB 181 and AB 474 - PACE) for retrofits to existing buildings and is participating in a regional joint solar power purchase agreement.

1.4 How Has the City Used the Regional Plan in Yucaipa's CAP?

The San Bernardino County Regional GHG Reduction Plan has been used for several purposes for the City of Yucaipa in the development of this CAP.

Reference Document: The Regional Plan established a baseline GHG inventory for the City and the region as a whole. This baseline is referenced for all future GHG analyses and planning. This document contains basic terms and concepts and regulatory information that is useful for future planning (city-specific or regional) or in communicating to a larger audience.

Climate Action Plan Template: The Regional Plan provided the technical information to support the City's selection of appropriate targets and GHG emissions reduction measures that could be included in the City's CAP. The Regional Plan was provided in an electronic format that allowed more rapid preparation of the CAP. The City has developed its own schedule, funding, and implementation plan consistent with the City's existing infrastructure and procedures and in tune with the City's unique priorities and needs.

Outline for a Local Climate Action Plan: The CEQA guidelines adopted pursuant to SB 97 specify that a GHG reduction plan must include the following elements in order to allow for tiering under CEQA.

Elements that have already been developed as part of the Regional Plan are identified and areas where local refinement was provided by the City are also noted.

- An inventory of GHG emissions (included in the Regional Plan).
- A forecast of future GHG emissions (included in the Regional Plan).
- An identified GHG reduction goal (included in the Regional Plan).
- Measures to reduce GHG emissions under the control of the jurisdiction (included in the Regional Plan).
- Implementation actions to ensure that the measures result in actual reductions (included in the Regional at a general level and then refined by the City to be specific to the City's procedures).
- Monitoring of the plan's success over time (included in the Regional Plan and then requires local refinement).
- Adaptation and revision of the plan over time as needed to meet the adopted goal (included as part of the implementation plan for this CAP).

The Regional Plan provided many of the required components of a GHG reduction plan, as listed above. Since the Regional Plan contained only basic implementation steps that would apply to all cities, the primary effort by the City of Yucaipa was to identify the specific schedule, funding, and implementation actions which are critical to the success of the GHG reduction effort.

1.5 Next Steps

SANBAG's adoption of the San Bernardino County Regional GHG Reduction Plan and certification of the Programmatic EIR for the Plan occurred in March 2014. The City of Yucaipa prepared this CAP based upon the information within the Plan and relies on the Programmatic EIR, with an addendum for the modifications to make it specific to Yucaipa for environmental review of the CAP. The City has developed its implementation and monitoring program to carry the GGH reduction measures forward and included those within this CAP.

The Draft CAP was made available for public review by City residents and stakeholders and the CAP was developed in consideration of public comments and brought to the City Council for adoption on September 14, 2015.

The City of Yucaipa will be working together with SANBAG, the other Partnership cities and with stakeholders, residents, and businesses within the community to implement GHG reduction measures and track success of the CAP.

Chapter 2
Background Information

2.1 Greenhouse Gas Reduction and Climate Action Planning In California

This section describes important laws, policies and documents related to GHG emissions, including AB 32, SB 375, the Renewable Portfolio Standard, Pavley fuel economy standards (AB 1493), and the Low Carbon Fuel Standard (LCFS). This section also briefly discusses pending national legislation and the challenges associated with GHG reduction and climate action planning at the state level. Figure 2-1 displays a timeline of key state and federal regulatory activity.

2.1.1 Federal Regulation

Although there is currently no comprehensive federal law specifically related to climate change or the reduction of GHGs, regulation under the federal Clean Air Act is being implemented with the U.S. Environmental Protection Agency (EPA) in a lead role. The following federal regulations are related to climate change and GHG emissions.

Mandatory Greenhouse Gas Reporting Rule (2009)

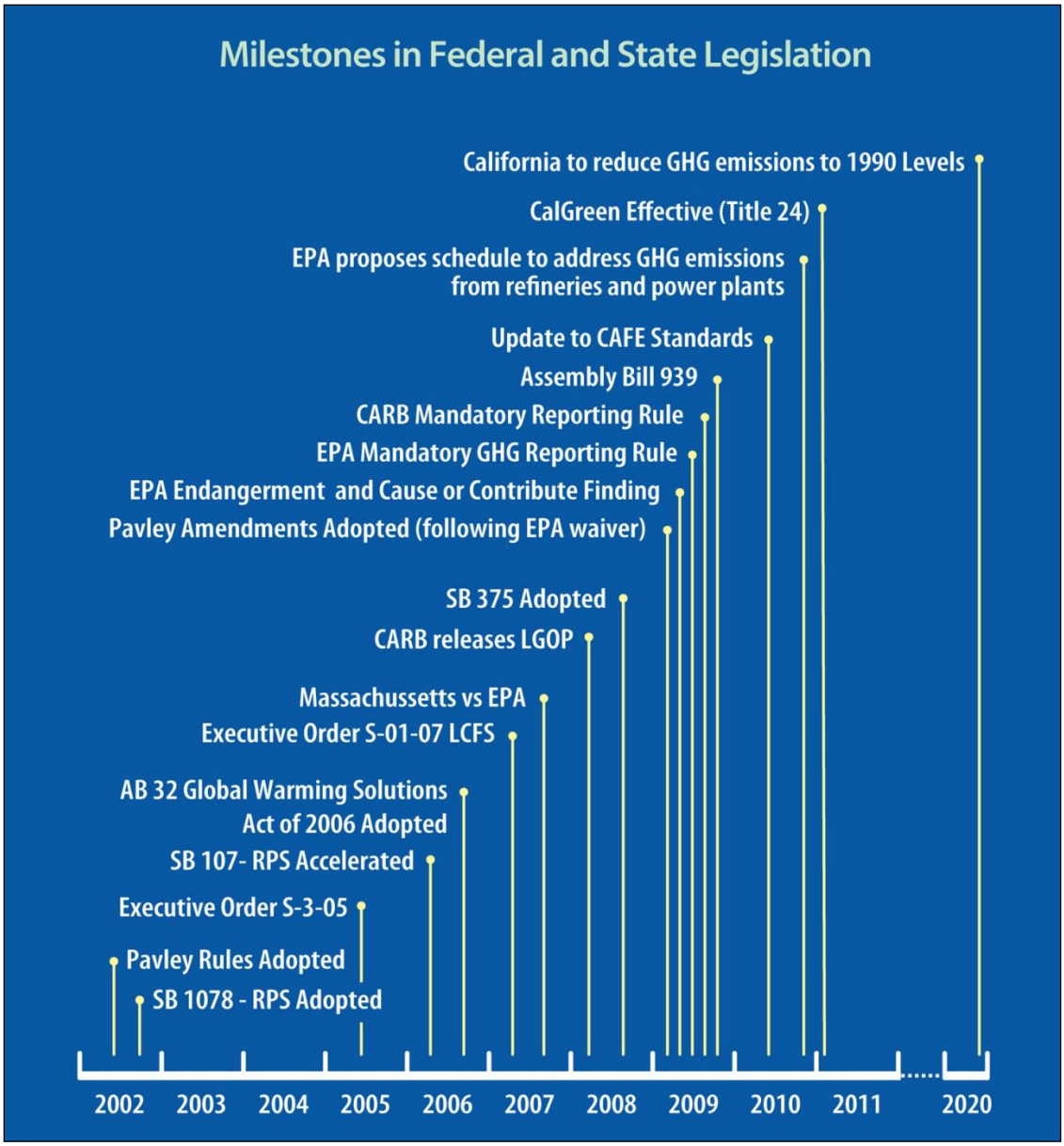
On September 22, 2009, EPA released its final Greenhouse Gas Reporting Rule (Reporting Rule). The Reporting Rule is a response to the fiscal year (FY) 2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110-161), which required EPA to develop "mandatory reporting of greenhouse gasses above appropriate thresholds in all sectors of the economy…" The Reporting Rule applies to most entities that emit 25,000 metric tons of carbon dioxide equivalent ($MTCO_2e$) or more per year. Starting in 2010, facility owners were required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. The Reporting Rule also mandates recordkeeping and administrative requirements in order for EPA to verify annual GHG emissions reports.

U.S. Environmental Protection Agency Endangerment and Cause and Contribute Findings (2009)

On December 7, 2009, EPA signed the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act (CAA.) Under the Endangerment Finding, EPA finds that the current and projected concentrations of the six key well-mixed GHGs—carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorinated carbons (PFCs), sulfur hexafluoride (SF_6), and hydrofluorocarbons (HFCs)—in the atmosphere threaten the public health and welfare of current and future generations. Under the Cause or Contribute Finding, EPA found that the combined emissions of these well-mixed GHGs from new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

These findings did not by themselves impose any requirements on specific industries or other entities. However, this action was a prerequisite to finalizing EPA's corporate average fuel economy (CAFE) standards for light-duty vehicles for future years.

Figure 2-1. Milestones in Federal and State Legislation and Regulation



Updates to Corporate Average Fuel Economy Standards (2010/2012)

The current CAFE standards (for model years 2011 to 2016) incorporate stricter fuel economy requirements promulgated by the federal government and the state of California into one uniform standard. Additionally, automakers are required to cut GHG emissions in new vehicles by roughly 25% by 2016 (resulting in fleet average of 35.5 miles per gallon or mpg by 2016). Rulemaking to adopt these new standards was completed in 2010. California agreed to allow automakers who show compliance with the national program to also be deemed in compliance with state requirements. The federal government

issued new standards in summer 2012 for model years 2017–2025, which will require a fleet average in 2025 of 54.5 mpg.

2.1.2 State Regulation

California has adopted statewide legislation addressing various aspects of climate change and GHG emissions mitigation. Much of this legislation is not directed at citizens or jurisdictions specifically, but rather establishes a broad framework for the state's long-term GHG reduction and climate change adaptation program. Several executive orders related to the state's evolving climate change policy have also been adopted. The following state regulations related to climate change and GHGs may apply to implementation of the climate change element.

Executive Order S-03-05 (2005)

Signed by Governor Arnold Schwarzenegger on June 1, 2005, Executive Order S-3-05 asserts that California is vulnerable to the effects of climate change. To combat this concern, Executive Order S-3-05 established the following GHG emissions reduction targets for state agencies.

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80% below 1990 levels.

Executive orders are binding only on state agencies. Accordingly, EO S-03-05 will guide state agencies' efforts to control and regulate GHG emissions but will have no direct binding effect on local government or private actions. The secretary of the California Environmental Protection Agency (Cal-EPA) is required to report to the governor and state legislature biannually on the impacts of global warming on California, mitigation and adaptation plans, and progress made toward reducing GHG emissions to meet the targets established in this executive order.

Assembly Bill 1493—Pavley Rules (2002, Amendments 2009)

Known as "Pavley I," AB 1493 standards were the nation's first GHG standards for automobiles. AB 1493 requires the California Air Resources Board (CARB) to adopt vehicle standards that will lower GHG emissions from new light-duty autos to the maximum extent feasible beginning in 2009. Additional strengthening of the Pavley standards (referred to previously as "Pavley II", now referred to as the "Advanced Clean Cars" measure) has been proposed for vehicle model years 2017–2025. Together, the two standards are expected to increase average fuel economy to roughly 43 miles per gallon by 2020 (and more for years beyond 2020) and reduce GHG emissions from the transportation sector in California by approximately 14%. In June 2009, EPA granted California's waiver request enabling the state to enforce its GHG emissions standards for new motor vehicles beginning with the current model year.

EPA and CARB have worked together on a joint rulemaking to establish GHG emissions standards for model-year 2017–2025 passenger vehicles. As noted above, the federal government completed rulemaking in summer 2012 resulting in adoption of new standards that would lead to fleet average of 54.5 mpg in 2025.

Senate Bills 1078 (2002), Senate Bill 107 (2006) and Senate Bill 2 (2011)—Renewable Portfolio Standard

SB 1078 and SB 107, California's Renewable Portfolio Standard (RPS), obligates investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. The California Public Utilities Commission (CPUC) and California Energy Commission (CEC) are jointly responsible for implementing the program. Senate Bill 2 (2011) set forth a longer-range target of procuring 33% of retail sales by 2020.

Assembly Bill 32—California Global Warming Solutions Act (2006)

In September 2006, the California State Legislature adopted AB 32, the California Global Warming Solutions Act of 2006. AB 32 establishes a cap on statewide GHG emissions and sets forth the regulatory framework to achieve the corresponding reduction in statewide emission levels. Under AB 32, CARB is required to take the following actions.

- Adopt early action measures to reduce GHGs.
- Establish a statewide GHG emissions cap for 2020 based on 1990 emissions.
- Adopt mandatory reporting rules for significant GHG sources.
- Adopt a scoping plan indicating how emission reductions would be achieved through regulations, market mechanisms, and other actions.

Adopt regulations needed to achieve the maximum technologically feasible and cost-effective reductions in GHGs.

There is presently discussion by CARB and some members of the California legislature about establishing a reduction target in law for the period after 2020, including 2030 and possibly 2050, but the timing for potential legislation is uncertain.

Executive Order S-01-07—Low Carbon Fuel Standard (2007)

Executive Order S-01-07 mandates: (1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020, and (2) that an LCFS for transportation fuels be established in California. The executive order initiated a research and regulatory process at CARB. CARB developed the LCFS regulation pursuant to the authority under AB 32 and adopted it in 2009.[1]

Senate Bill 375—Sustainable Communities Strategy (2008)

SB 375 provides for a new planning process that coordinates land use planning, regional transportation plans, and funding priorities in order to help California meet the GHG reduction goals established in AB 32. SB 375 requires regional transportation plans, developed by metropolitan planning organizations (MPOs) to incorporate a sustainable communities strategy (SCS) in their regional transportation plans (RTPs). The goal of the SCS is to reduce regional vehicle miles traveled (VMT) through land use

[1] The CARB approved the LCFS on April 23, 2009 and the regulation became effective on January 12, 2010 (California Air Resources Board 2011). The U.S. District Court for the Eastern District of California ruled in December 2011 that the LCFS violates the Commerce Clause of the U.S. Constitution. The CARB appealed this ruling in 2012 and on September 18, 2013, a 9th U.S. Circuit Court of Appeals panel upheld the LCFS, ruling that the program does not violate the Commerce Clause, and remanded the case to the Eastern District.

planning and consequent transportation patterns. SB 375 also includes provisions for streamlined CEQA review for some infill projects such as transit-oriented development.

SCAG is the MPO responsible for the southern California region that includes San Bernardino County and the City of Yucaipa. SCAG adopted an RTP/SCS in April 2012 designed to reduce passenger and light-duty vehicle per capita GHG emissions by 8% by 2020 and by 13% by 2035 compared to 2005 per capita GHG emissions levels. The RTP/SCS includes a combination of land use and transportation strategies to reduce VMT and associated GHG emissions. However, it should be noted the land use pattern in the SCS is not mandatory as local land use agencies retain their jurisdiction and authority over land use planning. The Regional Housing Needs Allocation (RHNA) must be consistent with the SCS and local cities must meet the RHNA for their city in their housing elements, but the RHNA does not specify the location or design of new housing, which is a prerogative of local planning.

California Energy Efficiency Standards for Residential and Nonresidential Buildings—Title 24 (2008), Green Building Code (2011), Title 24 Update (2014)

California has adopted aggressive energy efficiency standards for new buildings and has been continually updating them for many years. The latest updated standards were adopted in 2008. Also, in 2008, the California Building Standards Commission adopted the nation's first green building standards, which include standards for many other built environment aspects apart from energy efficiency. The California Green Building Standards Code (proposed Part 11, Title 24) was adopted as part of the California Building Standards Code (24 California Code of Regulations [CCR]). Part 11 establishes voluntary standards that became mandatory in the 2010 edition of the code, including planning and design for sustainable site development, energy efficiency (in excess of the California Energy Code requirements), water conservation, material conservation, and internal air contaminants. The voluntary standards took effect on January 1, 2011. The latest update of the Title 24 energy efficiency standards was adopted in mid-2012 and went into effect July 1, 2014.

California Air Resources Board Greenhouse Gas Mandatory Reporting Rule Title 17 (2009)

In December of 2007, CARB approved a rule requiring mandatory reporting of GHG emissions from certain sources, pursuant to AB 32. Facilities subject to the mandatory reporting rule started to report their emissions from the calendar year 2009 and had to have those emissions verified by a third party in 2010. In general the rule applies to facilities emitting more than 25,000 $MTCO_2e$ in any given calendar year or electricity generating facilities with a nameplate generating capacity greater than 1 megawatt (MW) and/or emitting more than 25,000 $MTCO_2e$ per year. Additional requirements also apply to cement plants and entities that buy and sell electricity in the state.

State CEQA Guidelines (2010)

The State CEQA Guidelines require lead agencies to describe, calculate, or estimate the amount of GHG emissions that would result from a project. Moreover, the State CEQA Guidelines emphasize the necessity to determine potential climate change effects of the project and propose mitigation as necessary. The State CEQA Guidelines confirm the discretion of lead agencies to determine appropriate significance thresholds, but require the preparation of an environmental impact report (EIR) if "there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with adopted regulations or requirements" (Section 15064.4).

The guidelines were updated in 2010 to address GHG emissions. State CEQA Guidelines section 15126.4 includes considerations for lead agencies related to feasible mitigation measures to reduce GHG emissions, which may include, among others, measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision; implementation of project features, project design, or other measures which are incorporated into the project to substantially reduce energy consumption or GHG emissions; offsite measures, including offsets that are not otherwise required, to mitigate a project's emissions; and, measures that sequester carbon or carbon-equivalent emissions.

Greenhouse Gas Cap-and-Trade Program (2011)

On October 20, 2011, CARB adopted the final cap-and-trade program for California. The California cap-and-trade program will create a market-based system with an overall emissions limit for affected sectors. The program is currently proposed to regulate more than 85% of California's emissions and will stagger compliance requirements according to the following schedule: (1) electricity generation and large industrial sources (2012); (2) fuel combustion and transportation (2015). The first auction was in late 2012 with the first compliance year was in 2013.

2.1.3 Local Governments

The AB 32 Scoping Plan lays out California's plan for achieving the GHG reductions required by AB 32. Specifically the Scoping Plan describes a list of measures that the state will undertake, and the expected GHG reductions associated with these measures before 2020. Because the state does not have jurisdictional control over many of the activities that produce GHG emissions in California, the AB 32 Scoping Plan articulates a unique role for local governments in achieving the state's GHG reduction goals. The AB 32 Scoping Plan recommends local governments reduce GHG emissions from both their municipal operations and the community at large to a level that is 15% below current levels. The 15% recommendation was based on CARB's estimate of 2005–2008 emissions at the time of the scoping plan because at that time CARB had not yet completed actual inventories for those years. In subsequent years, CARB completed the inventories for the 2005–2008 years. In order to meet the AB 32 target of 1990 levels, the state would have to reduce its emissions by 9 to 11% below 2005–2008 levels. CARB has not updated its recommendations to local governments since the 2008 adoption of the Scoping Plan.

In response to the AB 32 and the AB 32 Scoping Plan, many jurisdictions across California have completed a GHG Inventory and Reduction Plan, commonly called a Climate Action Plan or CAP. These plans generally address two types of emissions:

- The "community inventory"—emissions that arise from the community at large (residents, businesses, and their associated activities within the jurisdictional boundary).
- The "municipal inventory"—emissions that arise from the county/city's operations only (county/city buildings, vehicle fleet, activities required to provide services to the jurisdiction).

More than 50 jurisdictions in southern California have completed a community or municipal CAP, or both, including the City of Los Angeles, San Bernardino County, Anaheim, Beverly Hills, Pasadena, Hesperia, Apple Valley, and many others.

2.2 What Are We Already Doing?

This section describes large scale GHG planning efforts in southern California, including regional transportation planning; utility programs; SANBAG; and efforts in unincorporated San Bernardino County and several cities in San Bernardino County.

2.2.1 Regional Transportation Planning

On April 4, 2012, the Regional Council of SCAG adopted the *2012–2035 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS): Towards a Sustainable Future.* The RTP/SCS is the culmination of a multi-year effort involving stakeholders from across the SCAG Region. SCAG has prepared RTPs for the southern California region for over 30 years, with the primary goal of increasing mobility for the region's residents and visitors.

The 2012–2035 RTP/SCS includes the following key points.

- A strong commitment to reduce emissions from transportation sources to comply with SB 375, improve public health, and meet the National Ambient Air Quality Standards as set forth by the federal Clean Air Act. As such, the 2012–2035 RTP/SCS contains a regional commitment for the broad deployment of zero- and near-zero criteria pollutant emission transportation technologies in the 2023–2035 time frame and clear steps to move toward this objective. This strategy will have many co-benefits, including energy security, cost certainty, increased public support for infrastructure, GHG reduction, and economic development.
- A transportation infrastructure investment strategy that will benefit southern California, the state, and the nation in terms of economic development, competitive advantage, and overall competitiveness in the global economy in terms of attracting and retaining employers in the southern California region.
- A blueprint for improving quality of life for southern California residents by providing more choices for where they will live, work, and play, and how they will move around. It emphasizes transit and active transportation to allow residents to lead healthier, more active lifestyles.
- It is important to note that the land use pattern adopted in the SCS is not a mandatory land use pattern and no local government is obligated to amend their general plans to be consistent with the assumed land use pattern in the SCS if there are differences between a city's general plan and the land use pattern assumed in the SCS. SB 375 gave no authority to MPOs for local land use planning which is reserved for the authority of local cities and counties.

2.2.2 Utility Incentive Programs

Local and regional utility providers, including Southern California Edison, Southern California Gas Company, Southwest Gas Corporation, and Bear Valley Electric Service, have a wide range of incentive programs aimed at promoting energy efficiency and renewable energy use. These are summarized below.

Southern California Edison Programs

- **Income Qualified Programs—Energy Management Assistance Program:** This program helps income-qualified households conserve energy and reduce their electricity costs. Southern California Edison (SCE) pays all the costs of purchasing and installing energy-efficient appliances and equipment, which are free to eligible customers.
- **Mobile Energy Unit:** The Mobile Energy Unit (MEU) promotes energy-efficiency solutions and energy management for both residential and business customers.
- **Energy Solutions:** SCE provides their customers with a home energy survey, residential energy guides, and energy saving tips.
- **Energy Management Solutions:** SCE provides its commercial customers with energy management solutions by industry sector in order to cut costs and greenhouse gas emissions.

- **Refrigerator & Freezer Recycling Program:** SCE hauls away old refrigerators and freezers for free and provides a $50 incentive to customers.
- **Home Energy Efficiency Survey:** SCE provides its residential customers a 15-minute survey and helps them find tips to maximize savings, and useful information about rebates that they can qualify for. The results are customized for each household.
- **Incentives For Home Energy Upgrades:** SCE provides home energy-efficiency product rebates on products such as compact fluorescent (CFL) and energy efficiency lighting, Energy Star® refrigerators, energy efficiency water heaters, Energy Star air conditioners, whole-house fans, and energy-efficient evaporative cooling systems.
- **Plug-In Electric Vehicle Survey & Checklist:** SCE provides a survey and checklist to help customers with electric vehicles set up their homes.
- **Renewables Standard Contract Program:** SCE provides a standardized procurement process (for renewable power generation projects not to exceed 20MW) that leads to quicker execution of the project, relative to other procurement processes.
- **New Solar Homes Partnership:** The New Solar Homes Partnership program, part of the California Solar Initiative, provides financial incentives and other support for installing eligible solar generating systems on new residential buildings—single family, income-eligible, and multifamily housing.
- **California Solar Initiative Thermal Program:** SCE offers incentive rebates for electric-displacing solar water heating systems in its service territory.
- **Multifamily Affordable Solar Housing:** This program is part of the California Solar Initiative. It offers incentives for installing eligible photovoltaic systems for qualifying multifamily affordable housing. It is designed to subsidize photovoltaic systems in multifamily housing, which will offset electricity loads and provide economic benefits for housing property owners and managers as well as building tenants.
- **Solar Training Classes:** Through the California Solar Initiative, SCE provides multiple solar training classes for homeowners, contractors, commercial entities, and thermal contractors.
- **Solar Rooftop Program:** SCE incurs photovoltaic installation costs and leases rooftop space from building owners in this solar rooftop program.
- **Self-Generation Incentive Program:** SCE customers with a demand of 30 kilowatts (kW) or more can receive a cash incentive from $0.60 to $4.50 per watt for installing qualifying electricity generating equipment under SCE's Self Generation Incentive Program.
- **Green Jobs Education Initiative:** The Green Jobs Education Initiative helps students pursue education in green jobs fields. SCE's commitment of $1 million provides grants of $100,000 each to ten California community colleges that offer green jobs training programs.

Southern California Gas Company Programs

- **Direct Assistance Program:** Southern California Gas Corporation (SCGC) offers no-cost energy-saving home improvements and furnace repair or replacement services for qualified limited-income renters and homeowners.
- **Conservation Tips:** SCGC provides useful tips for residential customers to conservation energy.
- **Instant Rebate Program:** Customers may receive instant rebates for energy efficient products.
- **Residential Rebates:** SCGC offers money-saving rebates on qualifying energy-efficient appliances or upgrades for residential customers. Qualified appliances include clothes washers,

dishwashers, low-flow showerheads, furnaces, insulation, natural gas storage water heaters, and natural gas tankless water heaters.

- **Rebates for Property Managers:** The Multifamily Rebate Program offers rebates for the installation of qualified energy-efficient products in apartment dwelling units and common areas of apartments, condominium complexes, and mobile home parks.
- **Energy Efficiency Starter Kit:** The kit includes three faucet aerators and a low-flow showerhead to help save energy and water.
- **Home Energy Efficiency Survey:** Customers may save money and resources by taking a free Home Energy Efficiency Survey. When customers take the survey, they get customized gas, electricity, and water saving tips on the best ways to use appliances in their homes.
- **Financing for Energy Efficiency Upgrades:** Customers can qualify for $2,500 to $20,000 to purchase and install energy-efficient upgrades with the Home Energy Upgrade Financing program.
- **Comprehensive Mobile Home Program:** Qualifying mobile home customers are provided with no-cost energy conservation evaluations, installations of low-flow showerheads and faucet aerators, and gas energy-efficiency improvements, such as duct test and seal of heating/venting and air conditioning (HVAC) systems.
- **LivingWise® School Program:** This program combines classroom learning and home retrofit/audit projects completed by sixth grade students and their parents. It provides a LivingWise® Activity Kit for each customer.
- **Upstream High Efficiency Gas Water Heater Rebate Program:** This program offers rebates to distributors and wholesalers for high-efficiency gas water heaters to reduce or remove the price differential between these appliances and standard gas water heaters.
- **On-Demand Efficiency (Recirculation Loops for Central Domestic Hot Water Heaters):** This program installs on-demand intelligent pumps in central domestic hot water systems with recirculation loops in multifamily buildings to help reduce unnecessary natural gas consumption.
- **High Efficiency Hot Water Distribution Program (Solar):** This program helps customers install new solar pool heating systems to augment an existing gas pool heater. This program is for qualified apartment complexes that heat swimming pools throughout the year.
- **Multifamily Direct Installation Programs:** Qualifying owners and managers of multifamily buildings are provided with no-cost energy audits, products, and their installation. No-cost products include super low-flow energy-efficient showerheads, kitchen aerators, bathroom aerators, and pipe wrap for hot water distribution systems.
- **CoolGas Replacement Program:** This program provides incentives, based on calculated energy savings, for the replacement of smaller (50 tons or less), older, inefficient natural gas air conditioning systems with new energy-efficient units and quality installation procedures.
- **Domestic Hot Water Controls Project:** This program installs domestic hot water controller technology on the hot water systems in hotels and motels to reduce natural gas consumption by a minimum of 25 therms per hotel room, per year.
- **Energy Challenger:** This program offers business customers an interactive online assessment to develop practical energy-efficiency recommendations.
- **Home Energy Rating System (HERS) Rater Advanced Training Program:** This program will provide advanced training and education delivered both in the classroom and online. Training is for currently certified HERS raters and energy analysts involved in new construction.

- **Program for Resources Efficiency in Private Schools:** This program is to help private grade schools, colleges and universities, preschools, and trade and technical schools reduce energy use and energy costs. Program activities and services will include customer screening, comprehensive energy audit reports, rebates, bonuses, and installation support services.
- **Small Industrial Facility Upgrades:** The program is targeted at small industrial customers to deliver natural gas savings. Program offerings include, but are not limited to, improvements for heat recovery; process equipment replacement and equipment modernization; furnace and oven improvements and excess air reduction; onsite audits to identify energy savings opportunities; and design assistance to help customers understand the best ways to achieve energy savings.
- **Steam Trap and Compressed Air Survey:** This program will provide comprehensive compressed air and steam surveys and evaluations to small through large industrial customers. Survey activities carried out onsite will include a baseline of the customer's current energy consumption; field analysis of energy-consuming equipment; application of best practices; use of standard engineering protocols for design; identification of alternate methods of accomplishing the same task with less energy input; and methods to maintain quality, reliability, and safety of plant operations while achieving the energy-savings objectives.
- **Custom Language Efficiency Outreach (CLEO) Program:** This program promotes SCGC energy-efficiency programs and education/training to customers in SCGC's service territory who speak Chinese, Korean, Vietnamese, and Indian languages. The program will also address the needs of the African American community. Offerings include interactive workshops, community booths and energy surveys, and low-cost and no-cost recommendations.
- **Property Assessed Clean Energy (PACE) Energy Savings Project:** This program promotes energy-efficiency programs in the SCGC service area. The primary focus is ethnic minority communities (Vietnamese, Indian, Chinese, Korean, and Hispanic) for customers with historically low participation in SCGC energy-efficiency programs.
- **California Sustainability Alliance Program:** This program includes public and private organizations dedicated to increasing and accelerating adoption of sustainability best practices in the planning, design, construction, and operations of new and existing facilities and communities to increase efficient utilization of resources and develop self-sustaining community initiatives and capabilities.
- **Portfolio of the Future Program:** This program is designed to identify the market commercialization of emerging technologies that can improve energy efficiency and reduce reliance on natural gas supplies in the southern California market at a quick pace.
- **Vendor Participation Program:** Suppliers and installers of insulation, steam traps, boilers and other qualifying products can apply for rebates on behalf of their customers.
- **Seminars & Training at the Energy Resource Center:** SCGC teaches the latest in energy-efficient equipment and technologies. SCGC also sponsors seminars about energy-efficient equipment, kitchen ventilation, food safety, equipment maintenance, industry trends, and more.
- **Zero Percent On-Bill Financing:** Working in conjunction with rebate and incentive programs, SCGC offers qualified customers purchasing qualified natural gas equipment 0%, unsecured financing.
- **Energy Efficiency Benchmarking:** SCGC benchmarking allows building owners and managers to track and assess the energy performance of their buildings at no charge.

2.2.3 SANBAG's Long Range Transit Plan

SANBAG's *Long Range Transit Plan* (LRTP) (San Bernardino Associated Governments 2009) addresses San Bernardino County's current and future travel challenges, including addressing growing travel demand. The goal of the LRTP is to provide transit facilities and services to support this demand. The LRTP prioritizes goals and projects for transit growth and connects land use and transportation strategies. The draft LRTP considers four major alternatives to transit mobility, one of which will be designated the "final alternative." The LRTP identifies premium transit routes and station locations that helped to develop the SCS for areas in the County.

2.3 Basic Terms and Concepts

This section defines terms and explains basic concepts inherent to understanding GHG inventories and reductions, as well as the basics of climate change science. Important terms like *community inventory* and *business-as-usual* are defined below, along with a description of global warming and major greenhouse gases.

2.3.1 Basic Terms

Assembly Bill 32 (AB 32): The California Global Warming Solutions Act of 2006, widely known as AB 32, requires CARB to develop and enforce regulations for the reporting and verification of statewide GHG emissions. The heart of the bill is the requirement that statewide GHG emissions must be reduced to 1990 levels by the year 2020 of the AB 32 Scoping Plan.

AB 32 Scoping Plan: The Scoping Plan for AB 32 was developed by CARB and approved in December 2008. The plan has a range of GHG reduction actions, which include direct regulations, compliance mechanisms, monetary and nonmonetary incentives, voluntary actions, and market based mechanisms such as a cap and trade system. CARB has already adopted numerous regulations and rulemaking for reducing GHG emissions to achieve the emissions cap by 2020. In August 2011, the Scoping Plan was reapproved by the Board, and includes the Final Supplement to the Scoping Plan Functional Equivalent Document (FED). The Scoping Plan was updated in 2014 to track progress toward meeting the AB-32 target.

Business-as-Usual (BAU): BAU represents a future scenario that does not consider the possible reduction of GHG emissions that may result from any legislation or regulation that would go into effect after the baseline year. The BAU projections are estimates of future emissions based on energy and carbon intensity in the existing economy with the expected increases in population and economic growth in the future.

Community Inventory: The community inventory includes GHG emissions occurring in association with the land uses within the jurisdictional boundaries of the City's planning areas, and generally consists of emissions sources that the City can influence or control. The inventory includes emissions that occur both inside and outside the jurisdictional boundaries, but only to the extent that such emissions are due to land uses and activities within the City.

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 that occur at the power plant itself but result from residential electricity use of in- home appliances or other uses). This report addresses both types of emissions. In this report, the term emission refers to GHG emissions and not to emissions of air quality pollutants.

Unit of Measure: The unit of measure used throughout this GHG inventory is $MTCO_2e$. Presenting inventories in CO_2 equivalence allows characterization of the complex mixture of GHG as a single unit taking into account that each gas has a different global warming potential (GWP). A million $MTCO_2e$ is abbreviated as $MMTCO_2e$.

2.3.2 Emissions Sectors Explained

GHG emissions and reductions presented in this document are done so in terms of "sectors." The term sector refers to the type of emissions or the type of activity that produces the emission. For example, the on-road transportation sector includes emissions from the cars and trucks driven on the region's roads and freeways. A brief description of each sector considered in this document follows in Table 2-1, with a list of the GHG reduction measures included in this CAP that work in that sector. Chapter 4 contains a glossary of all GHG reduction measures and Appendix B contains a detailed description of the methods used to calculate the associated GHG reductions.

Table 2-1. Emissions Sectors and Reduction Measures

Sector	How GHG emissions are avoided through State or Local measures in this CAP	Associated Reduction Measures
Building Energy Emissions result from the use of electricity and natural gas by residential and commercial buildings.	New construction built to a high energy-efficiency standard; retrofits to existing buildings to make them more energy efficient; changes in behavior or building management to be more efficient; and the increased use of renewable energy to power buildings.	State-1, State-2, State-3, State-4, State-5; Energy-7, Energy-8,; PS-1.
On-road Transportation Emissions result from the burning of gasoline and diesel fuel by light, medium and heavy duty vehicles that travel on the region's roads and freeways.	Increased fuel economy of all vehicles; reduced carbon content of the fuel; reduced vehicle miles traveled (increased use of alternative modes of transportation, carpooling, alternative work schedules and smart growth).	State-6, State-7, State-8; On-Road-2; PS-1.
Off-Road Transportation Emissions result from the burning of gasoline and diesel fuel by off-road equipment and vehicles.	Increased fuel economy of all vehicles and equipment; reduced carbon content of the fuel; idling limitations, and increased use of electric or alternatively fueled vehicles and equipment.	State-7;
Agriculture Emissions result from the application of fertilizer and the management of manure. Emissions also result from the burning of gasoline and diesel fuel by agricultural equipment, but these emissions are captured in the Off-Road equipment sector.	N/A	N/A
Solid Waste Management Emissions result from the decay of garbage under the anaerobic conditions present in landfills. This sector captures both the waste that is generated by San Bernardino County residents in the inventory year and the waste that was historically generated by any person or business that has sent waste to a landfill located within San Bernardino County.	Waste reduction and increased methane capture at relevant landfills.	State-9; County-1; PS-1.
Wastewater Treatment Emissions result from the energy used to power plants and pump water and also from the chemical and biological breakdown of the waste.	Increased energy efficiency at wastewater treatment plants, water conservation and installation of biogas capture and gas to energy technologies.	Wastewater-3.

Sector	How GHG emissions are avoided through State or Local measures in this CAP	Associated Reduction Measures
Water Conveyance Emissions result from the energy used to bring water from outside the jurisdiction to the border of a jurisdiction, including deliveries from the state water project or Colorado River.	More efficient water pumping equipment and both indoor and outdoor water conservation.	Water-3, Water-4; PS-1.

2.3.3 Climate Change and Global Warming

Climate change is a term used to describe large-scale shifts in existing (i.e., historically observed) patterns in earth's climate system. Although the climate has historically responded to natural drivers, recent climate change has been unequivocally linked to increasing concentrations of GHGs in earth's lower atmosphere and the rapid timescale on which these gases have accumulated (Intergovernmental Panel on Climate Change 2007a). The rapid loading of GHGs into the atmosphere is primarily due to the burning of fossil fuels since the industrial revolution.

Higher concentrations of heat-trapping GHGs in the atmosphere result in increasing global surface temperatures, a phenomenon commonly referred to as *global warming*. In absence of anthropogenic (i.e., manmade) emissions, GHGs play a critical role in maintaining the earth's temperature for successful habitation by humans and other forms of life.

Increases in fossil fuel combustion and deforestation have exponentially increased concentrations of GHGs in the atmosphere since the industrial revolution. Rising atmospheric concentrations of GHGs in excess of natural levels have increased global surface temperatures, which in turn result in changes to the earth's climate system. Warming of the earth's lower atmosphere induces large-scale changes in planetary systems, including ocean circulation patterns, precipitation patterns, global ice cover, and biological distributions (Intergovernmental Panel on Climate Change 2007a, 2007b). Some of those changes would result in specific impacts at the state and local level.

The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. The IPCC identifies the following compounds as key anthropogenic GHGs: CO_2, CH_4, N_2O, PFCs, SF_6, and HFCs (Intergovernmental Panel on Climate Change 2007a). Each is discussed in detail below.

To simplify reporting and analysis, methods have been established to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the GWP methodology defined in IPCC reference documents (Intergovernmental Panel on Climate Change 1996, 2001:241–280). IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e, which compares the gas in question to that of the same mass of CO_2 (CO_2 has a GWP of 1 by definition).

Table 2-2 lists the global warming potential of CO_2, CH_4, N_2O, PFCs, SF_6, and HFCs; their lifetimes; and abundances in the atmosphere.

Table 2-2. Lifetimes and Global Warming Potentials of Several Greenhouse Gases

Greenhouse Gases	Global Warming Potential (100 years)	Lifetime (years)	2005 Atmospheric Abundance
CO_2 (ppm)[a]	1	50–200	379
CH_4 (ppb)	21	9–15	1,774
N_2O (ppb)	310	120	319
CF_4 (ppt) [a]	6,500	50,000	74
C_2F_6 (ppt) [a]	9,200	10,000	2.9
SF_6 (ppt)	23,900	3,200	5.6
HFC-23 (ppt)	11,700	264	18
HFC-134a (ppt)	1,300	14.6	35
HFC-152a (ppt)	140	1.5	3.9

Sources: Intergovernmental Panel on Climate Change 1996, 2001:388–390.

Notes: ppm = parts per million
ppb = parts per billion
ppt = parts per trillion
[a] CF_4 and C_2F_6 are PFCs

2.3.4 Principal Greenhouse Gases

Carbon Dioxide

CO_2 is the most important anthropogenic GHG and accounts for more than 75% of all GHG emissions caused by humans. Its atmospheric lifetime of 50–200 years ensures that atmospheric concentrations of CO_2 will remain elevated for decades, even after mitigation efforts to reduce GHG concentrations are promulgated (Intergovernmental Panel on Climate Change 2007a). The primary sources of anthropogenic CO_2 in the atmosphere include the burning of fossil fuels (including motor vehicles), gas flaring, cement production, and land use changes (e.g., deforestation, oxidation of elemental carbon). CO_2 can be removed from the atmosphere by photosynthetic organisms (e.g., plants and certain bacteria).

Atmospheric CO_2 has increased from a preindustrial concentration of 280 parts per billion (ppb) to 391 parts per million (ppm) in 2005 (Carbon Dioxide Information Analysis Center 2012).

Methane

CH_4, the main component of natural gas, is the second most abundant GHG and has a GWP of 21 (Intergovernmental Panel on Climate Change 1996). Sources of anthropogenic emissions of CH_4 include growing rice, raising cattle, using natural gas, landfill outgassing, and mining coal (National Oceanic and Atmospheric Administration 2005). Certain land uses also function as a both a source and sink for CH_4. For example, the primary terrestrial source of CH_4 are wetlands, whereas undisturbed, aerobic soils act as a CH_4 sink (i.e., they remove CH_4 from the atmosphere).

Atmospheric CH_4 has increased from a pre-industrial concentration of 715 ppb to 1,871 ppb in 2005 (Carbon Dioxide Information Analysis Center 2012).

Nitrous Oxide

N_2O is a powerful GHG, with a GWP of 310 (Intergovernmental Panel on Climate Change 1996). Anthropogenic sources of N_2O include agricultural processes (e.g., fertilizer application), nylon production, combustion of fossil fuel by power plants, nitric acid production, and vehicle emissions. N_2O also is used in rocket engines, racecars, and as an aerosol spray propellant. Natural processes, such as nitrification and denitrification, can also produce N_2O, which can be released to the atmosphere by diffusion. In the United States more than 70% of N_2O emissions are related to agricultural soil management practices, particularly fertilizer application.

N_2O concentrations in the atmosphere have increased 19%, to 319 ppb in 2008 from pre-industrial levels of 270ppb to 322 ppb (World Meteorological Association, 2008).

Perfluorinated Carbons

The most abundant PFCs are CF_4 (PFC-14) and C_2F_6 (PFC-116). These human-made chemicals are emitted largely from aluminum production and semiconductor manufacturing processes. PFCs are extremely stable compounds that are destroyed only by very high-energy ultraviolet rays, which results in very long lifetimes. They have high GWPs ranging from 6,500 for CF_4 to 9,200 for C_2F_6 (Intergovernmental Panel on Climate Change 1996)

Sulfur Hexafluoride

SF_6 is a human-made chemical used as an electrical insulating fluid for power distribution equipment, in the magnesium industry, semiconductor manufacturing, and also as a tracer chemical for the study of oceanic and atmospheric processes (U.S. Environmental Protection Agency 2006). In 2005, atmospheric concentrations of SF_6 were 7.4 parts per trillion (ppt) and steadily increasing (Carbon Dioxide Information Analysis Center 2012). SF_6 is the most powerful of all GHGs listed in IPCC studies, with a GWP of 23,900 (Intergovernmental Panel on Climate Change 1996).

Hydrofluorocarbons

HFCs are human-made chemicals used in commercial, industrial, and consumer products and have high GWPs ranging from 140 to 11,700 (U.S. Environmental Protection Agency 2006). HFCs are generally used as substitutes for ozone-depleting substances (ODS) in automobile air conditioners and refrigerants. As seen in Table 2-2, the most abundant HFCs, in descending order, are HFC-134a, HFC-23, and HFC-152a.

2.3.5 Greenhouse Gas Inventories and Emissions Sources

A GHG inventory is a quantification of all GHG emissions and sinks within a selected physical and/or economic boundary. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person). Although many processes are difficult to evaluate, several agencies have developed tools to quantify emissions from certain sources.

The majority (83%) of GHG emissions in the United States result from burning fossil fuels. Fossil fuels are burned to create electricity, which powers homes, commercial buildings, and vehicles. Energy used to power buildings is the primary source of GHGs in California and the nation. Vehicle emissions are a close second, comprising approximately 30% of total national emissions and 37% of total statewide emissions (U.S. Environmental Protection Agency 2010; California Air Resources Board 2010). Other sources of

GHG emissions include agriculture, land clearing, the landfilling of waste, refrigerants, and certain industrial processes.

Table 2-3 outlines the most recent global, national, and statewide GHG inventories to help contextualize the magnitude of San Bernardino County's GHG emissions.

Table 2-3. Global, National, State, and Local GHG Emissions Inventories

Emissions Inventory	CO_2e (metric tons)
2011 IPCC Global GHG Emissions Inventory	45,913,000,000
2012 EPA National GHG Emissions Inventory	6,526,000,000
2012 CARB State GHG Emissions Inventory	458,680,000

Sources: World Resources Institute 2014; U.S. Environmental Protection Agency 2014; California Air Resources Board 2014.

2.3.6 Impacts of Climate Change on Southern California

Increases in the globally averaged atmospheric concentration of GHGs would cause the lower atmosphere to warm, in turn inducing a myriad of changes to the global climate system. These large scale changes would have unique and potentially severe impacts in the western United States, California, and the region surrounding the county. Current research efforts coordinated through CARB, CEC, Cal-EPA, University of California (UC) system, and others are examining the specific changes to California's climate that would occur as the earth's surface warms.

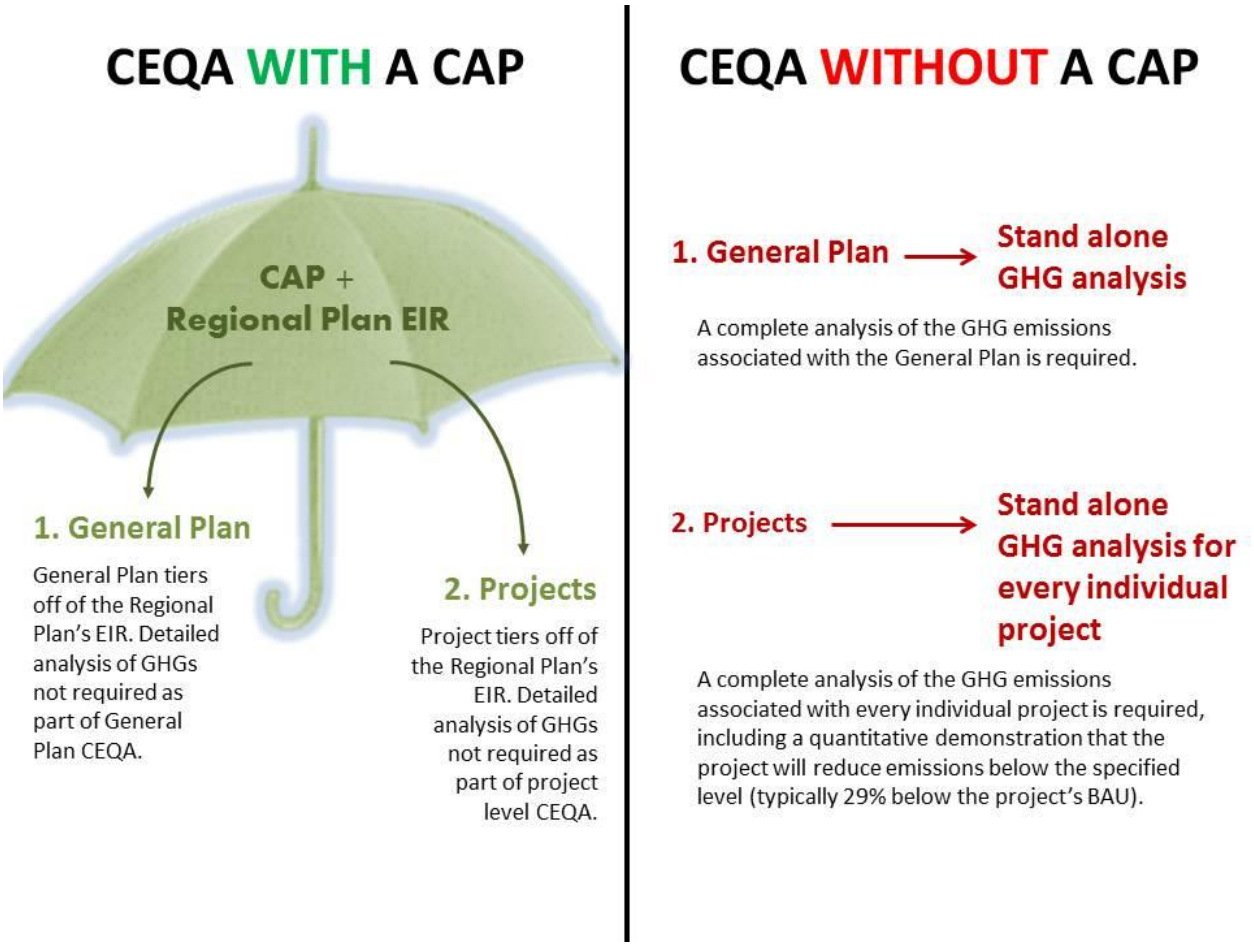
Existing evidence indicates that climate change could impact the natural environment in the following ways, among others.

- Rising sea levels along the coastline.
- Extreme-heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent.
- An increase in the frequency, intensity, and duration of conditions that are conducive to forming air pollution, further exacerbating air quality issues.
- An increase in heat-related human deaths, infectious diseases, and a higher risk of respiratory problems caused by deteriorating air quality.
- Reduced water supplies (all end uses).
- Potential increase in the severity of winter storms, affecting peak stream flows and flooding.
- Changes in growing season conditions that could affect agriculture, causing variations in crop quality and yield.
- Changes in distribution of plant and wildlife species due to changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects.
- Decreased Sierra snowpack and altered timing and amount of snowmelt; effects on California water supplies and water management including those serving southern California.
- Increased frequency and intensity of wildfires.

2.4 Relationship of Climate Action Plans to CEQA and Local General Plans

This section describes the general relationship of CAPs to CEQA and the local general plans, including legal requirements and evolving practice throughout California. Figure 2-2 illustrates these relationships.

Figure 2-2. CAP, General Plans and CEQA



As a discretionary action, prior to adoption of the GHG reduction plan by local cities, CEQA review is required. SANBAG has prepared an EIR that analyzes the physical impacts of the measures selected by the Partnership cities on the environment. This analysis was used to complete CEQA compliance prior to consideration of adopting of the portions of the plan applicable to SANBAG and to each individual city.

Amendments to the CEQA guidelines in March 2010 describe that CEQA project evaluation of GHG emissions can tier off a programmatic analysis of GHG emissions provided that the GHG analysis (or CAP) includes the following (CEQA Guidelines Section 15183.5).

- *Quantify greenhouse gas emissions*, both existing and projected over a specified time period, resulting from activities within a defined geographic area. This Plan has quantified all primary sectors of GHG emissions within each city for 2008 and 2020. Partnership cities may choose to adopt portions of this document as their individual CAP or build upon the information here to

develop a more comprehensive CAP document.

- *Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by a CAP would not be cumulatively considerable.* This Plan includes the different proposed reduction targets of each of the Partnership cities. The collective measures proposed by the Partnership cities, in combination with state measures, would reduce emissions by 16% below 2008 levels and by 27% below 2020 BAU levels, which are roughly consistent with the recommendations in the AB 32 Scoping Plan for municipalities to support the overall AB 32 reduction targets
- *Identify and analyze the GHG emissions* resulting from specific actions or categories of actions anticipated within the geographic area. This Plan analyzes community emissions for each Partnership city as a whole and includes predicted growth expected by 2020.
- *Specify measures or a group of measures, including performance standards* that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level. This Plan identifies both specific measures and project-level reduction standards (where selected by individual cities) to achieve the overall reduction target.
- *Monitor the plan's progress.* This Plan outlines general monitoring steps. Individual CAPs that utilize this Plan as a base would include locally-specific identification of monitoring actions..
- *Adopt the GHG Reduction Strategy in a public process following environmental review.* For each city that chooses to do so, a CAP would be adopted in a public process. The EIR prepared for this Plan can be used to support local city compliance with CEQA.

Once adopted, subsequent project-level CEQA evaluations of greenhouse gas emissions can tier off of the adopted city CAP, provided that they are being fully implemented by the Partnership city where the project is located, and that the specific project is consistent with all applicable requirements from the relevant adopted city CAP.

The South Coast Air Quality Management District (SCAQMD) adopted an interim GHG significance threshold for stationary source projects where the SCAQMD is the lead agency. SCAQMD does not currently have GHG significance thresholds for development projects. 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 recommends that stationary source projects, consistent with an adopted qualified GHG reduction plan that meets the standards described in the CEQA guidelines, can be presumed to have no significant GHG emissions and do not need to be evaluated against SCAQMD's recommended mass emissions thresholds. For stationary source projects not consistent with an adopted qualified GHG reduction plan, if they exceed a screening significance threshold level of 10,000 $MTCO_2e$ of emissions per year, then the project must demonstrate design features and/or other measures to mitigate GHG emissions to the maximum extent feasible, or implement offsite mitigation (GHG reduction projects) to reduce GHG emission impacts to less than the proposed screening level. SCAQMD has draft thresholds for land use projects (residential and commercial development) that similarly allow for tiering off a qualified GHG reduction plan and use of numeric thresholds where a qualified plan has not been adopted.

As noted above, CEQA Guidelines Section 15183.5 establishes opportunities for tiering for qualified GHG reduction plans. Accordingly, emissions associated with projects that are consistent with the city-adopted GHG reduction plans can be considered less than significant and their contributions to cumulative emissions are not considered cumulatively considerable. Clearly, projects that are consistent with the city-adopted plans would still create emissions; however, they can be approved knowing that overall emissions projected to occur in 2020 would be less than the emissions that would occur in 2020 under BAU. This determination only relies on an individual city's actions relative to its GHG emissions.

Provided that a project is within a jurisdiction with a qualified GHG reduction plan that is being implemented in full, tiering can be used. If some of the Partnership cities choose not to adopt CAPs or choose to adopt different targets or measures than described in this Plan, this would not affect the ability of other cities to tier their project analysis from their adopted plans, provided the plans are being implemented.

Chapter 3
Emissions and Reduction Profile

3.1 Introduction

This chapter presents the GHG inventory, 2020 BAU forecast, and GHG emission reductions for the City of Yucaipa. The following information is presented in this chapter.

1. **City Summary**—Presents background information including location, socioeconomics, and key points of interest. Demographic information consistent with the 2010 U.S. Census is summarized. An overview of the City's emissions and selected reduction measures is also provided.
2. **Emission Reductions Graphics**—Three graphics are presented here: 1) a bar chart showing the City's 2008 inventory, state/county reductions, local reductions, and unmitigated emissions in 2020, along with the 2020 emissions goal identified by the City; 2) a bar chart showing the 2020 BAU emissions by sector and the 2020 emissions with full implementation of the Plan; and 3) pie charts showing reductions by controlling entity and by sector.
3. **Emissions and Reductions Table**—This table presents the same information as shown in the graphics, including the City's 2008 inventory, 2020 BAU forecast, and reductions by sector.
4. **Reduction Measures Table**—This table presents all reduction measures considered by the City for this plan, along with GHG reductions and simple descriptions of each measure.

The City has selected a goal to reduce their community GHG emissions by 15% below 2008 baseline levels by the year 2020. The City has selected this goal based on what the City considers feasible given the local conditions.

The City has selected these measures independently of other cities' selections within the San Bernardino County Regional GHG Reduction Plan. Selections include both the measure itself and the participation rate associated with each measure. For example, the City chose Solar Installation for Existing Housing (Energy-7) and also chose the specific percentage of homes that are assumed to be retrofitted with solar roofs by the year 2020. The measure selections were based on the City's best judgment about what is feasible for Yucaipa, and depend on the specific emissions source profile (i.e. inventory) and the anticipated growth within the city.

3.2 City of Yucaipa

3.2.1 City Summary

The City of Yucaipa is located in the foothills of the San Bernardino Mountains, at the far eastern end of the San Bernardino Valley. Yucaipa is located 10 miles east of San Bernardino, and just southeast of Redlands along the I-10 freeway before it ascends over the San Gorgonio Pass. Yucaipa's altitude of 2,600 feet provides for a more moderate climate than other Valley cities. The city has access to state parks in the San Bernardino Mountains. Yucaipa contains some of the oldest dwellings in the county, including the Yucaipa Rancheria and Yucaipa Adobe.

Yucaipa covers approximately 28 square miles and is largely residential, with only 665 of 17,763 acres devoted to commercial and industrial uses and more than 1,000 acres devoted to rural uses within the city limits, according to the City's general plan. Because commercial and industrial activity in the city is limited, residents typically commute to other areas of San Bernardino and Riverside counties for work. These land uses are reflected in the city's GHG profile, with primary emissions sources in the on-road transportation, residential building energy use, and commercial energy use sectors.

The population of Yucaipa in 2010 was 51,367 (51,217 in 2008) and is expected to increase to 62,822 by 2020, an increase of 22% over 2008, with the adoption of the 2015 General Plan update. Yucaipa's demographic composition in 2010 was 79.5% White, 1.6% Black, 0.9% American Indian and Alaska Native, 2.8% Asian, 0.1% Native Hawaiian and Other Pacific Islander, 10.9% from other races, and 4.1% from two or more races. Persons of Hispanic or Latino origin were 27.1%. The majority of the population in Yucaipa is White (80% compared to the state average of 58%), but nearly 27% of residents are of Hispanic or Latino origin. The city also has a high homeownership rate of 78% (U.S. Census Bureau 2012). Employment is expected to increase by a comparable amount before 2020.

Table 3-1 presents socioeconomic data for Yucaipa, including population, housing (single-family and multifamily), and employment (agricultural, industrial, retail, and nonretail) (Southern California Association of Governments 2012).

Table 3-1. Socioeconomic Data for Yucaipa

Category	2008	2020
Population	51,217	62,822
Housing	18,176	21,822
Single-Family	*11,987*	*14,493*
Multifamily	*6,189*	*7,319*
Employment	9,761	13,640
Agricultural	*107*	*188*
Industrial	*1,837*	*3,008*
Retail	*2,078*	*2,631*
Non-Retail	*5,739*	*7,813*

3.2.2 Emission Reductions

The City of Yucaipa selected a goal to reduce its community GHG emissions to a level that is 15% below its 2008 GHG emissions level by 2020. The City will meet and exceed this goal subject to reduction measures that are technologically feasible and cost-effective. The City will meet this goal through a combination of state (~81%) and local (~19%) efforts. The Pavley vehicle standards, the state's low carbon fuel standard, the RPS, and other state measures will reduce GHG emissions in Yucaipa's on-road and building energy sectors in 2020. An additional reduction of 17,126 $MTCO_2e$ will be achieved primarily through the following local measures, in order of importance: Implement SB X7-7 (Water-4); GHG Performance Standard for New Development (PS-1); and Solar Installations for Existing Housing (Energy-7). Yucaipa's Plan, including both state and local measures has the greatest impacts on GHG emissions in the on-road transportation, building energy, and water conveyance sectors.

The bars in Figure 3-1 show Yucaipa's 2008 GHG emissions total, 2020 BAU emissions forecast total, and the total emissions remaining after meeting the city's emissions reduction target (i.e., 15% below the 2008 emissions level). The contribution of state/county and local reductions are overlaid on the 2020 BAU emissions forecast total ("2020 Plan"), representing the total emissions reductions achieved in 2020. As stated above, state/county reductions account for the majority (~81%) of the total reductions needed to achieve the 2020 target. It should be noted that the CAP has analyzed its BAU forecasts from the population projections from the proposed 2015 General Plan update. Therefore, the CAP provides a more aggressive BAU reduction to recognize the new planning projections to provide consistency with the anticipated adoption of the General Plan.

Figure 3-2 presents emissions by sector, for both the 2020 BAU and the 2020 reduction or "Plan" scenarios. The largest emissions contributions are in the on-road transportation, building energy, and off-road equipment emissions sectors.

Table 3-2 summarizes the 2008 inventory, 2020 BAU forecast, and GHG reduction ("Plan") results by sector. It shows the percent reduction in each sector's emissions in 2020 and demonstrates that Yucaipa exceeds its emissions reduction goal. Emissions sectors with the greatest percent reduction include the on-road transportation, building energy, and water conveyance sectors.

Figure 3-3 presents emission reductions by sector and by control (i.e., state/county control versus local or city control). As stated previously, the majority of emissions reductions are due to state/county measures. Of the state/county measures, the majority of reductions are in the building energy and on-road transportation sectors. Of the local measures, the majority of reductions are in the building energy sector due to the implementation of SB X7-7 (Water-4).

Figure 3-1. Emissions Reduction Profile for Yucaipa

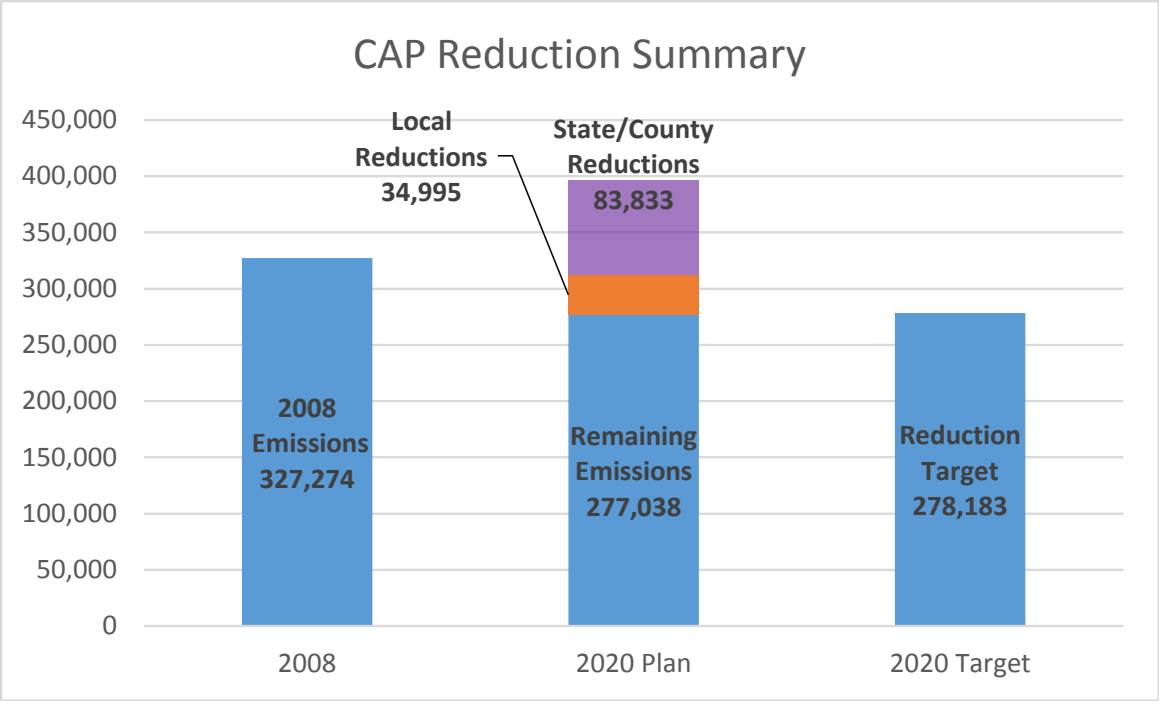


Figure 3-2. Emissions by Sector for Yucaipa

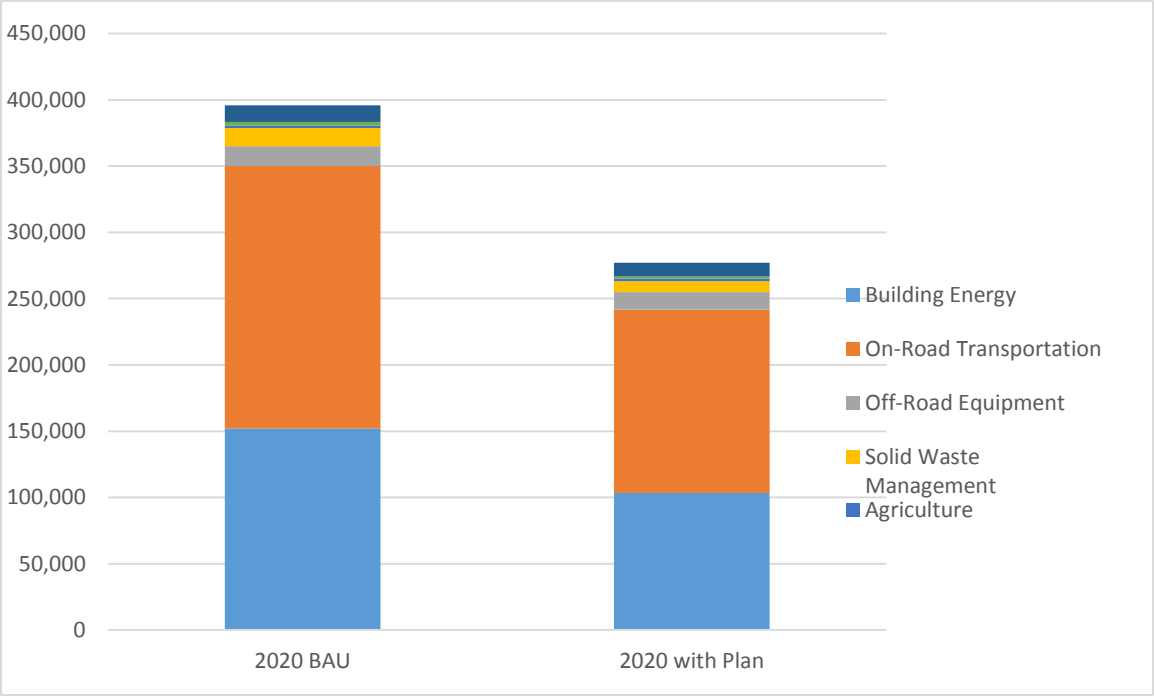
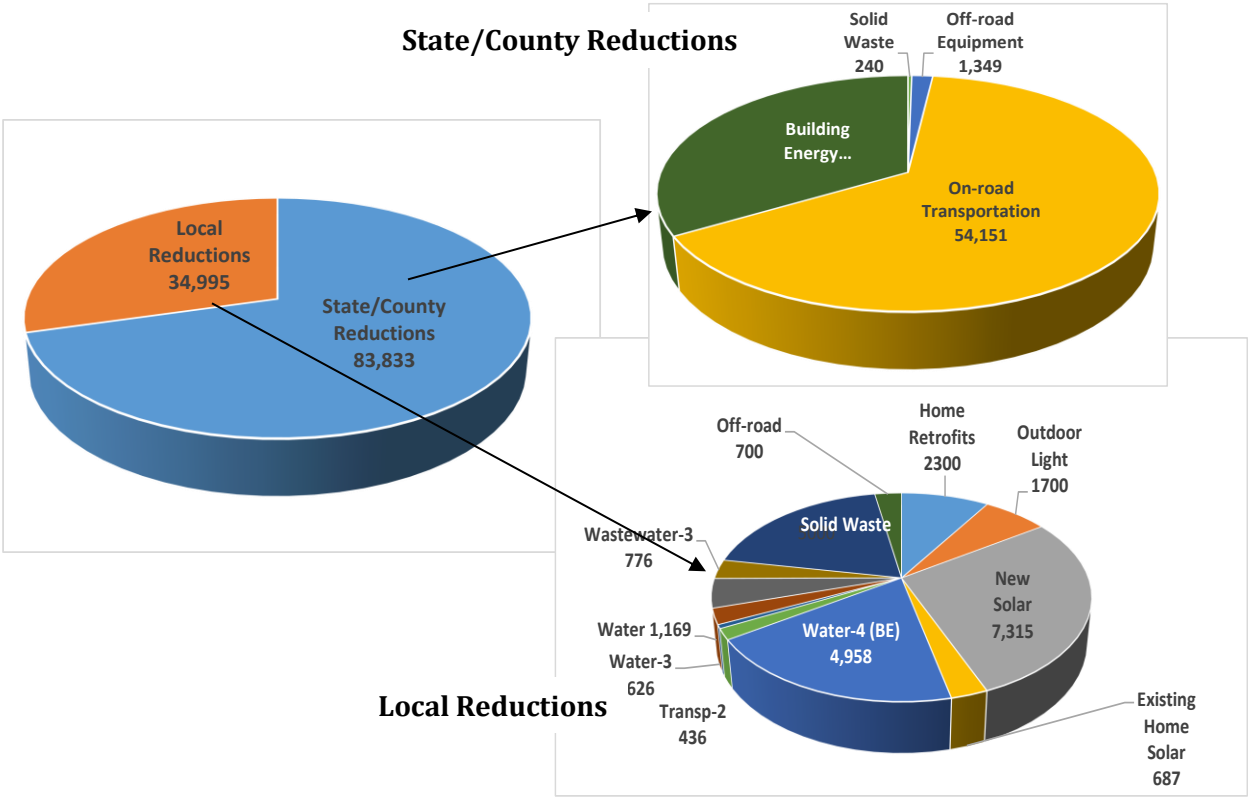


Table 3-2. Emission Reductions by Sector for Yucaipa

Sector	2008	2020 BAU	Reductions	2020 Emissions with Plan	% Reduction
Building Energy	122,591	152,149	45,053	107,096	29.61%
On-Road Transportation	168,613	197,859	54,587	143,272	27.59%
Off-Road Equipment	12,035	15,096	1,349	13,747	8.93%
Solid Waste Management	11,875	13,638	5,240	8,398	38.42%
Agriculture	3,967	2,022	0	2,022	0.0%
Wastewater Treatment	2,071	2,557	926	1,631	36.21%
Water Conveyance	6,122	12,545	1,795	10,750	14.31%
GHG Performance Standard*	-	-	9,878	-9,878	-
Total Emissions	327,274	**395,866**	**118,828**	**277,038**	**30.02%**
Reduction Goal	-	-	*117,683*	*278,183*	29.73%
Goal Met?	-	-	*Yes*	*Yes*	*Yes*
Reductions Beyond Goal	-	-	*1,245*	-	-
Per-Capita Emissions	6.4	6.3	-	4.8	-
Per-Job Emissions	33.5	29.0	-	22.2	-
Excluded Emissions: Stationary Sources	*23,188*	*32,910*	-	-	-

Notes:
Values may not sum due to rounding.
* The GHG Performance Standard for New Development is not a sector of the inventory, but it contributes toward the City's reduction goal by promoting reductions in multiple sectors. Please see Chapter 4 for a complete description of this measure.

Figure 3-3. Emission Reductions by Control and by Sector for Yucaipa



3.2.3 Reduction Measures

Table 3-3 presents each reduction measure evaluated for Yucaipa. For each measure, the short title and estimated GHG reductions in 2020 are listed. Measures are organized by state/county control and local control and listed by sector.

Table 3-3. GHG Reduction Measures and Estimated 2020 Reductions for Yucaipa

Measure Number	Measure Description	Reductions
State/County Measures		
State-1	Renewable Portfolio Standard	17,356
State-2	Title 24 (Energy Efficiency Standards)	5,777
State-3	AB 1109	4,574
State-4	Solar Water Heating	181
State-5	Industrial Boiler Efficiency	205
State-6	Pavley plus LCFS	49,765
State-7	AB 32 Transportation Reduction Strategies	4,386
State-8	LCFS: Off-Road	1,349
State-9	AB 32 Methane Capture	0
County-1	San Bernardino County GHG Plan Landfill Controls	240
Local Measures		
Building Energy		
Energy-1	Existing Residential Energy Efficiency Retrofits	2,300
Energy-2	Outdoor Lighting Efficiency	1,700
Energy-7	Solar Installation for Existing Housing	1,073
Energy-8	Solar Installation for Existing Commercial / Industrial	102
Water-4 (BE)	Implement SB X7-7	4,958
On-Road Transportation	Smart Bus Technologies	436
Off-Road Equipment	25% of Construction equipment is electric	700
Wastewater Treatment		
Wastewater- (WC)	Wastewater Equipment Upgrades	776
Water-4 (WT)	Implement SB X7-7	150
Water Conveyance		
Water-3	Water-Efficient Landscaping Practices	626
Water-4	Implement SB X7-7	1,169
Wastewater-3 (WC)	Recycled Water	776
Solid Waste		
Waste-1	75% Waste Diversion Rate	5,000
GHG Performance Standard for New Development		
PS-1	GHG Performance Standard for New Development	9,878
Total Reductions		118,828

Notes: Values may not sum due to rounding.

The Low Carbon Fuel Standard (LCFS) reduces emissions in both the on-road transportation and off-road equipment sectors.

Measures in italics result in GHG reductions in multiple sectors. For example, Water-1 reduces the amount of water consumed in the city, which reduces emissions for conveying that water (water conveyance sector), the energy needed to heat that water (building energy sector), and the energy required to treat the associated wastewater (wastewater treatment sector). The abbreviations are: BE = Building Energy; WT = Wastewater Treatment; WC = Water Conveyance

Chapter 4
Reduction Measures

4.1 Introduction

This section contains a detailed description of all reduction measures discussed in the CAP. Measures are organized below into state, county, and local categories. For local measures, the following sectors are included: building energy; on-road and off-road transportation; wastewater; water conveyance; solid waste; and performance standards. An overview of each sector, including a summary of each sector's results, its relative importance (compared to other sectors), and major opportunities for reductions, is also provided.

For each measure, the following information is provided.

Measure Description: A description of the measure.

Entity Responsible for Implementation: The entity that would be implementing the measure.

Measure Implementation Details: More information on how and when the measure would be implemented, including actions, programs and funding sources.

Level of Commitment: The assumed level of commitment for each measure.

Co-Benefits: Possible co-benefits of each measure are included.

The full methods for the reduction measure calculations are included in Appendix B to the CAP.

4.2 State Measures

Actions undertaken by the state would contribute to GHG reductions in Yucaipa. For example, the state requires electric utility companies to increase their procurement of renewable resources by 2020. Renewable resources, such as wind and solar power, produce the same amount of energy as coal and other traditional sources, but do not emit any GHGs. By generating a greater amount of energy through renewable resources, electricity provided to Yucaipa would be cleaner and less GHG intensive than if the state hadn't required the renewable standard. Even though state measures do not always require local government action, emissions reductions achieved by this and other state measures would help lower GHG emissions in Yucaipa. This CAP includes ten statewide initiatives that would contribute to GHG reductions in Yucaipa. The majority of these programs would improve building energy efficiency and renewable energy generation. Specifically, Title 24 energy efficiency standards for new residential and nonresidential buildings would require building shells and components be designed to conserve energy and water. Similarly, energy efficiency strategies required by AB 1109 would reduce electricity consumption. Finally, the state's RPS would increase the amount of electricity generated by renewable resources.

Over the past several decades, California has become a leader in establishing initiatives to reduce fuel consumption and on-road vehicle emissions and this continues in combination with federal efforts on the CAFE standards. CARB has also adopted the LCFS, which requires a 10% reduction in the carbon intensity of California's transportation fuels by 2020 and outlined several efficiency measures in the AB 32 Scoping Plan. Together, these measures would reduce light- and heavy-duty vehicle emissions.

A complete list of state programs included in the Plan, as well as anticipated GHG reductions, is presented in this chapter. Appendix B provides more description of each state measure.

4.2.1 State-1: Senate Bill 1078 (2002)/Senate Bill 107 (2006) and Senate Bill 2 (2011) Renewable Portfolio Standard

Measure Description: Obligates IOUs, ESPs, and CCAs to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010 and sets forth a longer-range target of procuring 33% of retail sales by 2020.

Entity Responsible for Implementation: IOUs, ESPs, and CCAs are responsible for implementing this measure.

Measure Implementation Details: The responsible entities will procure incremental amounts of retail sales each year from renewable sources. By 2020, 33% of retail sales will be procured from renewable sources.

Co-Benefits: Reduced air pollution, waste reduction, energy diversity and security, reduced price volatility, economic development, and public health improvements.

4.2.2 State-2: Title 24 Standards for Non-Residential and Residential Buildings (Energy Efficiency Standards and CALGreen)

Measure Description: Requires that building shells and building components be designed to conserve energy and water. Mandatory and voluntary measures became effective on January 1, 2011, and the guidelines will be periodically updated. Local governments are responsible for adoption and enforcement of the standards. The latest energy efficiency update of standards took effect in July 2014 and the CEC intends to update them approximately every 3 years in future years.

Entity Responsible for Implementation: Local governments are responsible for implementation and enforcement of the standards.

Measure Implementation Details: This measure would be implemented gradually as new homes are built.

Co-Benefits: Reduced energy use, reduced air pollution, resource conservation, increased property value, public health improvements, and increased quality of life.

4.2.3 State-3: AB 1109 (Huffman) Lighting Efficiency and Toxics Reduction Act

Measure Description: Structured to reduce statewide electricity consumption in the following ways: 1) At least 50% reduction from 2007 levels for indoor residential lighting, and 2) At least 25% reduction from 2007 levels for indoor commercial and outdoor lighting, by 2018.

Entity Responsible for Implementation: The State of California is responsible for implementing this measure.

Measure Implementation Details: By 2018, reductions of 50% and 25%, compared to 2007 levels would be achieved.

Co-Benefits: Reduced energy use, reduced air pollution, increased property values, and increased quality of life.

4.2.4 State-4: AB 1470 (Huffman) Solar Water Heating

Measure Description: Creates a $25 million per year, 10-year incentive program to encourage the installation of solar water heating systems that offset natural gas use in homes and businesses throughout the state.

Entity Responsible for Implementation: The State of California is responsible for implementing this measure.

Measure Implementation Details: This measure would be implemented gradually as residents replace their heaters with solar water heating systems.

Co-Benefits: Reduced energy use, reduced air pollution, increased property values.

4.2.5 State-5: Industrial Boiler Efficiency

Measure Description: This measure evaluated by CARB would require one or more of the following: annual tuning of all boilers, the installation of an oxygen trim system, and/or a noncondensing economizer to maximize boiler efficiency. A facility could also replace an existing boiler with a new one that is equipped with these systems.

Entity Responsible for Implementation: The State of California is responsible for implementing this measure.

Measure Implementation Details: This measure would be implemented gradually as industrial facilities replace their boilers.

Co-Benefits: Reduced energy use and reduced air pollution.

4.2.6 State-6a: AB 1493 (Pavley I and II) Greenhouse Reductions from New Passenger Vehicles

Measure Description: AB 1493, (Pavley I) requires CARB to adopt vehicle standards that will lower GHG emissions from new light-duty autos in 2009. Additional strengthening of the Pavley standards (Pavley II or Advanced Clean Cars measure) has been proposed for vehicle model years 2017–2025. Together, the two standards are expected to increase average fuel economy to roughly 43 miles per gallon by 2020 and reduce GHG emissions from the transportation sector in California by approximately 14%.

Entity Responsible for Implementation: The State of California, EPA and NHTSA, and vehicle manufacturers are responsible for implementing the Pavley standards.

Measure Implementation Details: The 2011—2016 standards would be implemented through 2016 and the 2017—2025 standards would be implemented through 2020. Implementation would be gradual through 2016 and 2020 as older vehicles are replaced with more fuel efficient vehicles.

Co-Benefits: Reduced energy use, reduced air pollution, public health improvements, and energy security.

4.2.7 State-6b (On-Road) and State-8 (Off-Road): Executive Order S-1-07 Low Carbon Fuel Standard

Measure Description: Mandates the following: (1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020, and (2) that a LCFS for transportation fuels be established in California.

Entity Responsible for Implementation: The State of California and vehicle fuel manufacturers are responsible for implementing this measure.

Measure Implementation Details: The standard would be fully implemented by 2020. Implementation would occur as fuel is improved statewide.

Co-Benefits: Reduced air pollution, public health improvements, energy security, reduced price volatility, and economic development.

4.2.8 State-7: Assembly Bill 32 (AB 32) Transportation Reduction Strategies

Measure Description: The AB 32 Scoping Plan includes vehicle efficiency measures (in addition to Pavley and LCFS) that focus on maintenance practices. The following AB 32 reduction strategies and/or programs are recommended.

- Tire Pressure Program (assures vehicle tire pressure is maintained to manufacturer specifications).
- Low Rolling Resistance Tires (creates an energy efficiency standard for automobile tires to reduce rolling resistance).
- Low Friction Engine Oils (mandates the use of engine oils that meet certain low friction specifications).
- Cool Paints and Reflective Glazing (reduces the engine load for cooling the passenger compartment with air conditioning through the use of solar reflective paints and window glazing).
- Goods Movement Efficiency (targets system-wide efficiency improvements in goods movement to achieve GHG reductions from reduced diesel combustion).
- Heavy-Duty Vehicle GHG Emission Reduction (requires installation of best available technology and/or CARB approved technology to reduce aerodynamic drag and rolling resistance).
- Medium-and Heavy-Duty Vehicle Hybridization (adopts a regulation and/or incentive program that reduces the GHG emissions of new vehicles sold in California by replacing them with hybrids).

Entity Responsible for Implementation: The State of California is responsible for implementing this measure.

Measure Implementation Details: Implementation would occur gradually through 2020 as the statewide strategies and programs are put into effect.

Co-Benefits: Reduced energy use, reduced air pollution, public health improvements, and energy security.

4.2.9 State-9: AB 32 Methane Capture

Measure Description: The Landfill Methane Rule requires gas collection and control systems on landfills with greater than 450,000 tons of waste-in-place. The measure also establishes statewide performance standards to maximize methane capture efficiencies.

Entity Responsible for Implementation: Landfill owners and operators are responsible for complying with the landfill regulation.

Measure Implementation Details: This measure would be implemented gradually by 2020 as landfill operators comply.

Co-Benefits: Reduced air pollution, resource conservation, and increased quality of life.

4.3 County Measures

The San Bernardino County plans to install methane capture systems at a number of county-owned and operated landfills. Since these landfills serve Yucaipa, the City would see emission reductions from their solid waste management sector, as fewer fugitive methane emissions from the decomposition of City-generated waste would be released into the atmosphere.

4.3.1 County-1: San Bernardino County GHG Reduction Plan Landfill Controls

Measure Description: San Bernardino County, through their adopted GHG Reduction Plan, would install landfill gas controls on the following County-owned and operated landfills.

- 95% capture at Mid-Valley landfill
- 85% capture at Milliken and Colton landfills
- 75% capture at Barstow and Landers landfills

Since these landfills serve several of the cities of San Bernardino County including Yucaipa, the City would realize GHG reductions from the county's installation of landfill gas controls.

Entity Responsible for Implementation: The County of San Bernardino is responsible for implementing this measure.

Measure Implementation Details: San Bernardino County would need to upgrade and install equipment as necessary to increase and utilize the captured methane gas. The installation of equipment is a one-time event, and implementation would be complete once the equipment begins operating.

Level of Commitment: San Bernardino County would install methane capture technology and associated monitoring systems on the landfills listed above.

Co-Benefits: Reduced energy use and reduced air pollution.

4.4 Building Energy

Building energy use from residential, commercial, and industrial buildings is a large component of the regional GHG inventory, accounting for 40% of the total regional emissions in 2008 and 2020. Building energy consumption includes electricity and natural gas usage. Electricity use in buildings results in indirect emissions from the power plants that produce electricity outside of city boundaries. Natural gas consumption by furnaces and other appliances in buildings results in direct emissions where the natural gas is combusted.

The building energy sector is the second largest contributor of GHG emissions to the City's GHG inventory. Consequently, building energy-related reduction measures can yield substantial reductions.

The City's selected reduction measures to address GHG emissions from building energy use by promoting solar energy measures to change the carbon content of electricity.

Improving energy performance is therefore vital to this CAP. Solar energy retrofits have upfront costs, but can result in savings over the long term. In this sector, private residents, businesses, and the municipal governments would incur costs to install solar roofs but would also realize the resulting energy cost savings. Costs to the city governments would mainly be associated with staff time for development of the incentive programs, as well as costs of retrofits to existing municipal buildings and upfront costs for building new city facilities.

The building energy measures would also result in other benefits for both small and large businesses, as well as households in Yucaipa. The generation of renewable energy from clean technologies (e.g., wind, solar) would contribute to reductions of regional criteria pollutants. Less combustion of natural gas may also produce local air quality and public health benefits. Overall, increase in renewable energy generation would enhance the ability of homeowners and business to withstand unexpected surges in future energy costs. Energy retrofits would also improve home values and likely contribute to economic growth by providing new jobs within the community.

4.4.1 Renewable Energy

Energy-7: Solar Installations for Existing Housing

Measure Description: Establish a goal for solar installations on existing single-family homes to be achieved before 2020 (California Air Pollution Control Officers Association 2009, 2010). The goal for this measure is for 5% of existing single-family homes to install solar.

These goals could be supported through nonfinancial incentives or streamlined permitting through the City. Primary funding would likely be through state- or utility-level programs or through private funding such as a PPA. The City may also act as a resource for connecting project proponents with funding opportunities.

Entity Responsible for Implementation: The City in coordination with various private companies, are responsible for implementing this measure.

Measure Implementation Details: To implement this measure, the City can work with private companies to provide funding for solar energy projects. Implementation of this measure would be gradual through 2020 as new commercial and industrial developments are constructed and equipped with solar installations.

Level of Commitment: Yucaipa has set a 5% percentage goal of existing single-family homes to install solar.

Co-Benefits: Reduced air pollution, waste reduction, energy diversity and security, reduced price volatility, economic development, public health improvements, and increased property values.

Energy-8: Solar Installations for Existing Commercial/Industrial Buildings

Measure Description: Establish a goal for solar installations on existing commercial/industrial buildings to be achieved before 2020 (California Air Pollution Control Officers Association 2009, 2010). The goal for this measure is for 5% of existing buildings to install solar installations.

The selected goal could be achieved in part through private funding from SunRun, SolarCity, or other solar lease PPAs. Additionally, nonfinancial incentives and streamlined permitting at the local level can support this goal. The City may also act as resources for connecting property owners with funding opportunities. This measure could complement voluntary CALGreen measures related to solar photovoltaic systems.

Entity Responsible for Implementation: The City, in coordination with external funding programs and/or private companies, are responsible for implementing this measure.

Measure Implementation Details: To implement this measure, the City can work with building owners, state funding programs, and private companies to provide funding for solar energy projects. Implementation of this measure would be gradual through 2020 as solar is installed on existing buildings.

Level of Commitment: The City's established goal is for 5% of existing commercial and industrial buildings (private and/or public buildings) to install solar to provide a minimum of 15% of the building's onsite energy needs.

Co-Benefits: Reduced air pollution, waste reduction, energy diversity and security, reduced price volatility, economic development, public health improvements, and increased property values.

4.5 On-Road Transportation

On-road transportation emissions include emissions from light- and medium-duty vehicles and heavy-duty trucks associated with land use activity in Yucaipa. Emissions originate from the combustion of fossil fuels (such as diesel, gasoline, compressed natural gas, etc.) to power the vehicles. These emissions are direct emissions and accounted for approximately 52% of the City's emissions in 2008.

The total VMT by residents and employees in Yucaipa is expected to increase by the year 2020 under business as usual conditions as new housing units are developed and new jobs are created. The transportation represents the largest source of GHG emissions in Yucaipa's future community GHG inventory. As a result, transportation related reduction measures need to be a part of reducing the City's overall GHG emissions in 2020.

On-road state and local transportation measures can achieve significant benefits for both individual residents and the region as a whole. Reductions in VMT and traffic congestion would reduce smog-forming emissions, toxic air contaminants, and diesel particulate matter (California Air Resources Board 2008). Community well-being and quality of life may also be improved as individuals spend less time commuting, waiting for the bus, and/or sitting in heavy congestion.

On Road-2: "Smart Bus" Technologies (Regional)

Measure Description: Collaborate with Omnitrans to implement "Smart Bus" technology, global positioning system (GPS), and electronic displays at all transit stops by 2020 to provide customers with "real-time" arrival and departure time information[2] (California Air Pollution Control Officers Association 2009).

Smart Bus Technologies include Automatic Vehicle Location (AVL) systems and real-time passenger information at bus stations. Omnitrans plans to implement these technologies system-wide on all bus routes serving San Bernardino Valley (Omnitrans service area) to enable information sharing, enhance rider services, and attract potential riders. The AVL system has already been implemented. The Bus Arrival Prediction Information System (BAPIS) would be installed in two phases. In Phase I, real-time rider information would be available via text messaging, Quick Response (QR), website, Interactive Voice Response (IVR), and mobile phone devices. Completed implementation is slated for December 2012. In Phase II, Omnitrans will install electronic signs at all major transit hubs and provide General Transit Feed Specification (GTFS) data to the general public to build apps for mobile devices like smartphones and tablet computers. Phase II completion is slated for December 2013.

GHG emissions are expected to decrease because the AVL technologies could lead to more fuel-efficient bus operations for Omnitrans and the BAPIS technologies could potentially attract more transit riders who may switch modes from automobiles. Omnitrans' Demand Response Services, OmniLink and Access, do not operate on a fixed schedule or route and are not included in this analysis.

Entity Responsible for Implementation: Omnitrans is primarily responsible for this measure. Yucaipa would coordinate with Omnitrans as appropriate.

Measure Implementation Details: To implement this measure, Yucaipa would coordinate with Omnitrans in the region to utilize "Smart Bus" and similar technology. Implementation of this measure would most likely be achieved in increments as the technology is expanded throughout the region.

Level of Commitment: Omnitrans plans to implement these technologies system-wide on all bus routes serving San Bernardino Valley. Therefore, no local action is required from the City.

Co-Benefits: Reduced air pollution, public health improvements, and increased quality of life.

4.6 Wastewater Treatment and Discharge

Total emissions from wastewater treatment account for approximately 1% of the City's emissions in 2008. The City of Yucaipa has an individual WWTP. GHG emissions result from electricity and/or natural gas used to power the facility. Additional emissions of CH_4 and N_2O result from the treatment and breakdown of waste in the facility.

Reduction measures in the wastewater treatment and discharge sector typically provide modest GHG reductions relative to other sectors. Some of the water measures, like Water-4 (discussed in the next section) produce reductions in the wastewater sector.

[2] These systems not only allow riders to know exactly when the next vehicle will be arriving, but also enable the system operator to track, schedule, and repair vehicles in service. Providing better information to passengers about scheduled arrivals can result in dramatic increases in passengers' perceptions of the service, even if the actual service provided is the same in terms of frequency and on-time arrivals.

4.6.1 Wastewater-3: Recycled Water

Measure Description: Establish a goal that a certain percentage of all water used for non-potable purposed (such as landscaping irrigation, dust control, or fire suppression) be recycled (and treated) wastewater. Consider requiring all new parks, schools, and other public facilities to use 100% recycled water for non-potable outdoor uses as a first step, as feasible depending on existing and planned recycled water infrastructure. Develop public education materials that support and encourage the use of recycled water. Adopt a municipal goal of 100% use of recycled water for non-potable purposes (California Air Pollution Control Officers Association 2010). Implementation will likely require coordination with WWTPs and recycled water providers. This measure would also include development of an inventory of non-potable uses of water in the City for potential to substitute recycled water.

Entity Responsible for Implementation: To implement this measure, the City would coordinate with regional water providers and the WWTPs, as appropriate.

Measure Implementation Details: This measure would most likely be implemented in incremental steps as the City utilizes recycled water for its municipal purposes. Recycled water would also be gradually employed through 2020 as new parks and schools are constructed and as recycled water distribution systems expand.

Level of Commitment: The City's selected goal is that 50% of all water used for non-potable sources (such as landscaping irrigation, dust control, or fire suppression) to be recycled (and treated) wastewater.

Co-Benefits: Reduced energy use, reduced air pollution, and resource conservation.

4.7 Water Conveyance

Water conveyance emissions accounted for approximately 2% of City emissions in 2008. However, water consumption includes the following indirect emissions by activity: electricity consumption for water supply and conveyance, water treatment, water distribution, and wastewater treatment. Water is not only an important resource with limited supplies, but the treatment, distribution, and conveyance of water requires considerable amounts of electricity. The generation of this electricity consumes fossil fuels and releases GHGs. Reducing water demand and conserving water can therefore save energy and avoid future emissions.

Yucaipa has identified the following strategies to enhance community-wide water and resource conservation. These strategies would collectively reduce water consumption, which would likewise contribute to reductions in building energy use. For example, efficient faucets that use less water would require less electricity and natural gas for hot water heating. Additionally, energy required to transport, distribute, and treat water would be reduced. The consumption of less electricity and natural gas would ultimately translate to reductions in regional and local criteria pollutants, which may improve community health and well-being. Water measures that encourage building retrofits also have an additional benefits of enhancing building value and resale.

It is important to note that the water conservation measures would achieve reductions in the building energy sector that can be greater than their reductions in the water conveyance sector. However, the emissions savings are reported as part of the water sector because they are a direct result of implementation of water conservation measures.

4.7.1 Water-3: Encourage Water-Efficient Landscaping Practices

Measure Description: Encourage water-efficient landscaping practices. Adopt a landscaping water conservation ordinance that exceeds the requirements in the Model Landscape Ordinance (AB 1881). The conservation plan could include provisions for any of the following.

- Further reducing the ET Adjustment factor listed in the Model Ordinance.
- Limiting turf grass areas.
- Providing approved plant lists.
- Implement a public education and outreach campaign to promote water conservation. The program should highlight specific water-wasting activities to discourage, such as the watering of nonvegetated surfaces and using water to clean sidewalks and driveways, as well as educate the community about the importance of water conserving techniques. Water efficiency training and certification for irrigation designers, installers, and property managers should also be offered.
- Encourage alternatives to lawns and turf uses, except for parks, playing fields, children's play areas, and other specialized uses.
- Promote underground irrigation techniques.
- Encourage extensive use of mulch in landscape areas to improve the water-holding capacity of the soil by reducing evaporation and soil compaction.
- Require drought-tolerate landscape plantings for all municipal buildings.
- Establish landscape maintenance districts along streets for water conservation purposes.
- Promote installation of dual plumbing in all new development, allowing gray water to be used for landscape irrigation.

Entity Responsible for Implementation: The City is responsible for implementing this measure in concert with water retailers.

Measure Implementation Details: The City can adopt water conservation plans that surpass the requirements of the Model Landscape Ordinance. Implementation would be gradual through 2020 as residents adopt new water conservation behaviors, and as new developments utilize less water-demanding plants, alternatives to lawns, and gray water infrastructure.

Level of Commitment: The City would adopt a landscaping water conservation plan that exceeds the requirements in the Model Landscape Ordinance (AB 1881) to achieve outdoor water use reductions for a certain percentage of residential and nonresidential buildings.

Co-Benefits: Reduced energy use, reduced air pollution, and resource conservation.

4.7.2 Water-4: Senate Bill X7-7 The Water Conservation Act of 2009

Measure Description: SB X7-7 was enacted in November 2009 and requires urban water agencies throughout California to increase conservation to achieve a statewide goal of a 20% reduction in urban per capita use by December 31, 2020 (referred to as the "20X2020 goal"). Each urban water retailer in the

county has established a 2020 per-capita urban water use target to meet this goal. Implementation of SB X7-7 will not only reduce GHG emissions through water conservation but also reduce the amount of wastewater entering WWTPs.

Entity Responsible for Implementation: The Yucaipa Valley Water District is the primary urban water retailer in the City, and is responsible for implementing this measure in cooperation with the City of Yucaipa. The City's Landscape Architect would also review all landscape plans submitted to ensure that landscape plans are designed to reduce water usage.

Measure Implementation Details: The Yucaipa Valley Water District will implement water conservation measures according to their 2010 Urban Water Management Plans. The City will need to work with the District as necessary to reduce per-capita water use by 2020. Implementation would be gradual through 2020 as new buildings are constructed with water-efficient fixtures and other conservation measures are put into place.

Level of Commitment: Yucaipa Valley Water District would have to meet the SB X7-7 goal to reduce per-capita water use by 2020.

Co-Benefits: Reduced energy use, reduced air pollution, resource conservation, and increased property values.

4.8 GHG Performance Standard for New Development

4.8.1 PS-1: GHG Performance Standard for New Development

Measure Description: The City proposed to adopt a GHG Performance Standard for New Development (PS) that would provide a streamlined and flexible program for new residential and nonresidential projects to reduce their emissions. The PS would be a reduction standard for new private developments as part of the discretionary approval process under CEQA. Under the PS, new projects would be required to quantify project-generated GHG emissions and adopt feasible reduction measures to reduce project emissions to a level that is a certain percent below BAU project emissions. The PS does not require project applicants to implement a pre-determined set of measures. Rather, project applicants are allowed to choose the most appropriate measures for achieving the percent reduction goal, while taking into consideration cost, environmental or economic benefits, schedule, and other project requirements.

SCAQMD does not have an established CEQA significance threshold for new nonindustrial development at this time. However, other air districts, such as the San Joaquin Air Pollution Control District, use a PS reduction goal of 29 percent as their recommended CEQA significance threshold and based on the calculations of reductions necessary at the state level to meet AB 32 at the time of the Scoping Plan (29% below forecasted 2020 levels = 1990 levels based on data available at that time).

Based on that District's approach, the City has also selected a 29 percent reduction goal for this measure.

Entity Responsible for Implementation: The City is responsible for implementing this measure.

Measure Implementation Details: Implementation of the performance standard would reduce GHG emissions attributable to new discretionary development projects at least 29 percent by 2020. Measurable reductions of GHG emissions would be achieved through the City's review and discretionary approval of

residential, commercial, and industrial development projects. It is expected that project proponents would often include energy-efficiency and alternative energy strategies to help reduce their project's GHG emissions because these are often the most cost-effective approach to reducing GHG emissions, but are free to propose any valid measures that would achieve the overall reduction goal.

In order to calculate the reductions from this measure, state measures and local mandatory measures were quantified for new development for the City. These measures achieve a certain portion of the PS goal. The PS contributes the remaining percent reduction required to achieve the PS goal in new developments. The reduction amounts for each individual project from state or other local measures would vary; however, state and local mandatory measures are still expected to result in the largest share of the burden in meeting the PS reduction target.

Level of Commitment: The City would adopt the GHG Performance Standard for New Development, requiring a 29 percent reduction in new development emissions within the City.

Co-Benefits: Co-benefits would depend on the exact measures selected by individual project proponents, but would be the same as the corresponding strategies described for the other measures (e.g., if a project proponent were to select energy efficiency measures as part of meeting project reductions, the benefits would be similar in character to those described for energy-efficiency retrofits).

Chapter 5
Implementation of the CAP and Regional Coordination

5.0 Implementation of the Climate Action Plan

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

Successful implementation of the CAP will require the following components. These are described in more detail below

- Administration and/or staffing
- Financing and budgeting
- Timelines for measure implementation
- Community outreach and education
- Monitoring, reporting, and adaptive management
- Regional coordination

The steps above are not specific to any one Partnership City but are basic steps that any City might take or that other California communities have taken to implement a GHG reduction plan. These are suggested, not required, and are intended to guide a City in its implementation planning.

5.1 Administration and Staffing

The City has designated the Director of Development Services as the CAP Implementation Coordinator (CIC) to oversee the successful implementation and tracking of all selected GHG reduction strategies. The CIC will primarily be responsible for coordinating with contacts across departments to gather data, report on progress, track completed projects, and ensure that scheduling and funding of upcoming projects is discussed at key City meetings.

In addition, the CIC could have the following responsibilities.

- Secure long-term financing for GHG reduction measures (i.e., grant application primary contact).
- Coordinate CAP implementation related meetings.
- Serve as the external communication hub to local and regional climate action organizations including SANBAG.
- Conduct public outreach to inform the community of the City's reduction planning efforts.
- Investigate methods to utilize existing resources and harness community support to better streamline implementation of the local climate action plan.

- Monitor implementation of reduction measures and success of the CAP using the monitoring tools provided by SANBAG
- Develop a protocol for monitoring the effectiveness of emissions reduction programs.
- Establish guidelines for reporting and documenting emissions reduction progress.
- Submit annual reports to the City council.
- Develop a protocol for utilizing the real-time information collected through the verification process to modify and revise existing reduction programs.
- Track state and federal legislation and its applicability to the City.

In general, the goal in implementing the CAP is not to create new administrative tasks or new staff positions necessarily, but rather to leverage existing programs and staff to the maximum extent feasible. Cities should seek to fold GHG planning and long term reduction into their existing procedures, institutional organization, reporting and long-term planning; a process that will be unique to each City.

5.2 Financing and Budgeting

5.2.1 Funding Mechanisms

Implementation of the local GHG reduction measures will require the City and other public agencies, local businesses, developers/builders, and existing commercial building owners and residential homeowners and individuals to incur increased costs for the capital improvements and other investments, and increased operations and maintenance costs. However, in some cases operating costs are anticipated to decrease, resulting in offsetting savings. This section presents a summary of funding and financing options (Table 5-1) available at the writing of this document. Some funding sources are not necessarily directed towards a City, but to a larger regional agency such as SANBAG, a JPA, or a waste services provider serving multiple jurisdictions. The City should continually monitor private and public funding sources for new grant and rebate opportunities and to better understand how larger agencies are accessing funds that can be used for GHG reductions in their area. Leveraging financing sources is one of the most important roles a local government can play in helping the community to implement many of the GHG reduction measures.

Table 5-1. Potential Funding Sources to Support GHG Reduction Measures

State and Federal Funds	
Federal Tax Credits for Energy Efficiency	• Tax credits for energy efficiency can be promoted to residents.
Energy Efficient Mortgages (EEM)	• An EEM is a mortgage that credits a home's energy efficiency in the mortgage itself. • Residents can finance energy saving measures as part of a single mortgage. • To verify a home's energy efficiency, an EEM typically requires a home energy rating of the house by a home energy rater before financing is approved. • EEMs are typically used to purchase a new home that is already energy efficient, such as an ENERGY STAR® qualified home.
California Department of Resources Recycling and Recovery (CalRecycle)	• CalRecycle grant programs allow jurisdictions to assist public and private entities in management of waste streams. • Incorporated cities and counties in California are eligible for funds. • Program funds are intended to: o Reduce, reuse, and recycle all waste. o Encourage development of recycled-content products and markets. o Protect public health and safety and foster environmental sustainability.
California Air Resources Board (CARB)	• CARB offers several grants, incentives, and credits programs to reduce on-road and off-road transportation emissions. Residents, businesses, and fleet operators can receive funds or incentives depending on the program. • The following programs can be utilized to fund local measures: o Air Quality Improvement Program (AB 118) o Carl Moyer Program – Voucher Incentive Program o Goods Movement Emission Reduction Program (Prop 1B Incentives) o Loan Incentives Program o Lower-Emission School Bus Program/School Bus Retrofit and Replacement Account (Prop 1B and EPA Incentives)
Existing Capital Improvement Program	• State and federal funds would most likely continue to local governments, builders, and homeowners in the following forms. o Grants o Transportation and transit funding o Tax credit and rebate programs • The Capital Improvement Program can be utilized for measures relating to traffic or transit.
State Funding for Infrastructure	• The state's Infill Infrastructure Grant Program may potentially be used to help fund measures that promote infill housing development. • Grants can be used for gap funding for infrastructure improvements necessary for specific residential or mixed-use infill development projects.

Transportation-Related Federal and State Funding	• For funding measures related to transit, bicycle, or pedestrian improvements, the following funding sources may be utilized.	
	Safe, Accountable, Flexible, Efficient Transportation Equity Act—Legacy for Users (SAFETEA-LU).	FTA Small Starts
	Surface Transportation Program Fund, Section 1108 (STP)	FTA Section 5311(f)
	Congestion Mitigation and Air Quality Improvement Program, Section 1110 (CMAQ)	California's Bicycle Transportation Account (BTA)
	Transportation Enhancement Activities (TEA)	Environmental Enhancement and Mitigation (EEM) Program
	National Recreational Trails Program	Safe Routes to School (SR2S)
	National Highway System Fund (NHS)	Office of Traffic Safety (OTS)
	National Highway Safety Act, Section 402	Transportation Development Act (TDA) Article III
	Transit Enhancement Activity, Section 3003	Transportation Funds for Clean Air (TFCA, formerly AB 434)
	Section 3 Mass Transit Capital Grants	Flexible Congestion Relief (FCR) Program
	Bridge Repair & Replacement Program (BRRP)	State Highway Operations and Protection Program (SHOPP)
	Federal Transit Administration (FTA) 5309	
Other Local/Regional Funding Sources	• SCAQMD has several grant programs related to air quality improvement, some of which may apply to various reduction measures. • Bus Stop Sponsorships—Advertisement sponsorship of bus stops has been utilized as a revenue source. • Transit Fare Increases—Transit fares could be increased to help fund capital improvements, though increases also have the potential to decrease ridership in the short term. • Parcel Tax—An election consistent with Proposition 218 could serve to increase the existing level of taxation and provide additional funding for transit-related capital improvements. However, in the current economic climate, this may not be a likely financing source unless economic conditions improve and community support for such a taxation approach is favorable.	
Utility Rebates	• SoCal Edison is one of the three utilities participating in the Go Solar initiative. • A variety of rebates are available for existing and new homes. • Photovoltaics, thermal technologies, and solar hot water projects are eligible. • Single-family homes, commercial development, and affordable housing are eligible. • Budget for new solar hot water systems for 2010–2017: $250 million.	

Energy Upgrade California	• Program is intended for home energy upgrades. • Funded by the American Recovery and Reinvestment Act, California utility ratepayers, and private contributions. • Utilities administer the program, offering homeowners the choice of one of two upgrade packages—basic or advanced. • Homeowners are connected to home energy professionals. • Rebates, incentives, and financing are available. • Homeowners can receive up to $4,000 back on an upgrade through the local utility.
Private Funding	
	• Private equity can be used to finance energy improvements, with returns realized as future cost savings. • Rent increases can fund retrofits in commercial buildings. • Net energy cost savings can fund retrofits in households. • Power Purchase Agreements (PPA) involve a private company that purchases, installs, and maintains a renewable energy technology through a contract that typically lasts 15 years. After 15 years, the company would uninstall the technology or sign a new contract. • Power produced from a PPA is sold to customers. SANBAG recently approved a contract for solar power site assessments, bringing together a number of cities and agencies to aggregate their solar sites. • On-Bill Financing (OBF) can be promoted to businesses for energy-efficiency retrofits. Funding from OBF is a no-interest loan that is paid back through the monthly utility bill. Lighting, refrigeration, HVAC, and LED streetlights are all eligible projects.
Other Funding Mechanisms for Implementation	
	• Increased operating costs can be supported by grants from the Strategic Growth Council (SGC) or the State Department of Conservation (DOC) to fund sustainable community planning, natural resource conservation, and development, adoption, and implementation of Sustainable Community planning elements, including climate action plans and general plan amendments.
Future Funding Options: Funding Mechanisms for Capital and/or Implementation Costs	
New Development Impact Fees	• These types of fees may have some potential to provide funding, but such fees are best implemented when the real estate market and overall regional economic conditions are strong.
General Obligation Bond	• A general obligation bond is a form of long term borrowing and could be utilized to fund municipal improvements.
AB 811 Districts Property-Assessed Clean Energy (PACE)	• AB 811 is intended to help municipalities accomplish goals outlined in AB 32. • The PACE finance program is intended to finance energy and water improvements within a home or business through a land-secured loan, and funds are repaid through property assessments. • Municipalities are authorized to designate areas where property owners can enter into contractual assessments to receive long-term, low-interest loans for energy and water efficiency improvements, and renewable energy installation on their property. • Financing is repaid through property tax bills. • AB 811 and the PACE program are currently on hold for residential properties due to potential violation of standard FHFA federally guaranteed (Fannie Mae/Freddie Mac) residential mortgage contracts. • The PACE program is not on hold for commercial properties.

- SANBAG, as the COG, has implemented the Home Energy Renovation Opportunity (HERO; a PACE program) in the region to assist residents in financing residential energy efficiency and solar retrofits. This program will be the primary funding mechanism for reduction measure Energy-7: Solar Installation for Existing Housing.
- SANBAG will structure a regional energy efficiency and water conservation improvement loan program for existing buildings (AB 181 and AB 474).

5.2.2 Additional Considerations

In addition to pursuing the funding options above and monitoring the availability of others, The City would need to take the following steps in order to best inform decisions related to the cost of GHG reductions measures.

- **Perform and Refine cost estimates.** Cost estimates for local reduction measures should be performed to identify the cost-effectiveness of each measure to inform and guide the implementation process. This analysis will likely be based on a variety of participation, per-unit, and other assumptions. As programs are developed, cost estimates should be refined and updated over time with more precise implementation-level data.
- **Integrate GHG measures into existing City budget and CIP.** Certain capital improvements may need to be added to the City's CIP and facility master plan programs, as well as those of the City utility enterprises and other public agencies that have control for project implementation. For CIPs completely under the City's control, new projects would need to be assessed for consistency with the CAP.
- **Adopt or update ordinances and/or codes.** Some local reduction measures may require new or revised ordinances (e.g., Wastewater-3: recycled water may require ordinance support for new development). Staff would need to coordinate these efforts in conjunction with planning departments, planning commissions, and City councils.
- **Pursue outside funding sources.** A range of funding from state and federal agencies has been identified. The City would need to pursue these (and other emerging) funding sources as a part of implementation efforts.
- **Implement and direct preferred City funding sources**. While City funding sources are limited, the City, when financially able, as a part of its budget process, could appropriate funding from general sources or make changes in its fee schedules, utility rates, and other sources as needed to support funding the implementation of the GHG reduction measures.
- **Create monitoring/tracking processes.** Local reduction measures will require program development, tracking, and/or monitoring. For example, Energy-7 (Promote Solar Installation for Existing Housing) would necessitate staff time to promote solar installations; the City may also want to track the number of households that participate in the program and the amount of electriCity and cost saving over time.
- **Identify economic indicators to consider future funding options.** Economic recovery may occur rapidly or slowly. Whatever the timeframe, the City would need to determine the point at which certain additional funding sources may become feasible and/or favorable. Identification and monitoring of economic indicators and trends, such as home prices, energy prices cost per

kWh on solar installations, unemployment rates, or real wage increases, can help the City decide when to further explore the potential for funding local reduction measures through different financing mechanisms.

5.3 Timelines for Measure Implementation

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

The City has developed an implementation schedule for the local reduction measures. Prioritization was based on the following factors:

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

In general consideration of these factors, the following are the key phases starting in 2015 through 2020. In addition, Table 5-2 provides a list of criteria for prioritization and Table 5-3 provides a list of measures implemented in each phase.

- **Phase 1 (2015-2016):** During Phase 1, the City will develop key ordinances, programs, policies, and procedures required to support and enforce the local mandatory GHG reduction measures such as implementation of SBX7-7. Likewise, the City would create a planning framework that would guide implementation of the voluntary measures and performance standards. Measure funding would be secured and a detailed finance plan developed. The City would conduct an inventory for 2014 (in 2015) to determine changes in emissions since 2008.
- **Phase 2 (2016–2017):** During Phase 2, the City would continue to implement measures that were begun in Phase 1. The City would evaluate the effectiveness of these measures and adapt management procedures accordingly. Likewise, the City will conduct an updated community GHG inventory to monitor emissions trends. The City would conduct an inventory for 2017 (in early 2018) to determine progress in implementing the CAP.
- **Phase 3 (2018–2020):** During Phase 3, the City would continue to implement and support measures begun in Phases 1 and 2, and encourage implementation of all remaining CAP measures (Phase 3 measures). An analysis of the effectiveness of Phase 1 and 2 measures would be conducted, as well as an updated community GHG inventory for 2019 (in early 2020). The City could also begin developing plans for post-2020 actions during this period (see further discussion below)

To encourage implementation of all reduction measures, the CIC, with consultation from the planning commission, City council, City staff and/or other key stakeholders, would develop a CAP Implementation Timeline. Measure prioritization could be based on the following factors.

- Cost/Funding—How much does the measure cost? Is funding already in place for the measure?

- Greenhouse Gas Reductions—How effective is the measure at reducing greenhouse gases?
- Other Benefits—For example, does the measure improve water quality or conserve resources? Would it create jobs or enhance community well-being?
- Consistency with Existing Programs—Does the measure complement or extend existing programs?
- Impact on the Community—What are the advantages and disadvantages of the measure to the community as a whole?
- Speed of Implementation—How quickly can the measure be implemented and when would the City begin to see benefits?
- Implementation Effort—How difficult will it be to develop and implement the program?

A qualitative appraisal of implementation effort for the City is also provided. Measures can be categorized based on the convention of low, medium, or high, with low-level measures requiring the least level of effort by the City and being the most likely to be pursued immediately (i.e., the low hanging fruit).

Table 5-2. Implementation Matrix

Implementation Effort Level	Sample Criteria
LOW	• Requires limited staff resources to develop. • Existing programs in place to support implementation. • Required internal and external coordination is limited. • Required revisions to policy or code are limited.
MEDIUM	• Requires staff resources beyond typical daily level. • Policy or code revisions necessary. • Internal and external coordination (e.g., with stakeholders, other cities or agencies, or general public) is necessary.
HIGH	• Requires extensive staff time and resources. • Requires development of completely new policies or programs and potential changes to the general plan. • Robust outreach program required to alert residents and businesses of program requirements and eligibility. • Requires regional cooperation and securing long term funding.

The Action Priority Matrix shows an example of how different GHG reduction measures can be categorized and scheduled based on implementation effort and cost.

Figure 5-1. Activity Priority Matrix

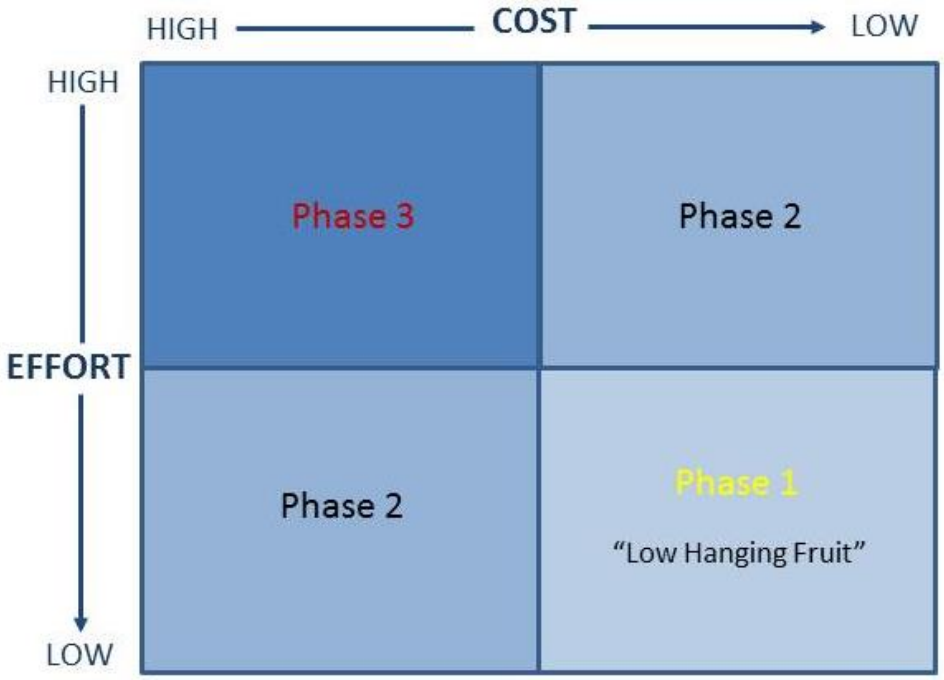


Table 5-3 translates the implementation matrix shown in Table 5-2 and Figure 5-1 and designates the phasing of the local reduction measures for the City of Yucaipa.

Table 5-3. GHG Reduction Measure Timeline and Phasing Schedule

Reduction Measure	Phase
Energy 7: Existing Residential Renewable Energy Retrofits	1, 2, 3
Energy 8: Existing Commercial Renewable Energy Retrofits	1, 2, 3
Water 4 (BE): Senate Bill X7-X Water Conservation	1, 2, 3
On-Road 2: Smart Bus Technologies	1, 2, 3
Water 3: Water Efficient Landscaping	1, 2, 3
Water 4: Senate Bill X7-X Water Conservation	1, 2, 3
Wastewater 3 (WC) Recycled Water	2, 3
PS-1 GHG Performance Standard for New Development	1, 2, 3

5.4 Community Outreach and Education

The citizens and businesses in Yucaipa are integral to the success of the CAP and to overall reductions in GHG emissions for the region. Their involvement is essential, considering that several measures depend on the voluntary commitment, creativity, and participation of the community.

The City would educate stakeholders, such as businesses, business groups, residents, developers, and property owners, about the GHG reduction measures that require their participation, encourage participation in these programs, and alert them to program requirements, incentives and/or rebate availability, depending on the measure. The CIC would schedule periodic meetings to facilitate formal community involvement in CAP implementation and adaptation over time. This could include focused meetings for a specific measure or program such as the PACE program and/or agenda items at planning commission, City Council, or other public meetings. These meetings would be targeted to particular stakeholder groups and provide information on CAP implementation progress as well as the implementation of a specific program or new policy. Alternatively, periodic written updates could be provided in City newsletters, SANBAG's newsletter, on City websites, or through other media communications with the general public such as press releases and public service announcements. Stakeholders would be provided an opportunity to comment on potential improvements or changes to the CAP. The CIC would also sponsor periodic outreach events to directly inform and solicit the input, suggestions, and participation of the community at large.

5.5 Monitoring and Reporting

Regular monitoring is important to ensure programs are functioning as they were originally intended. Early identification of effective strategies and potential issues would enable the City to make informed decisions on future priorities, funding, and scheduling. Moreover, monitoring provides concrete data to document the City's progress in reducing GHG emissions. The CIT or CIC would be responsible for developing a protocol for monitoring the effectiveness of emissions reduction programs as well as for undertaking emissions inventory updates.

- Update GHG Inventory—The City would inventory emissions for 2014, 2017, and 2019, including regular data collection in each of the primary inventory sectors (utility, regional VMT, waste, wastewater, and water), and compare to the City's baseline GHG emissions in 2008. If SANBAG Participating Cities are interested, a combined inventory effort could be conducted through SANBAG similar to the inventory preparation that was done for this Regional Plan. The CIT or CIC would consolidate information in a database or spreadsheet that can be used to evaluate the effectiveness of individual reduction measures.

- Track State Progress—The CAP will rely heavily on state-level measures. The CIT or CIC would be responsible for tracking the state's progress on implementing state-level programs. Close monitoring of the real gains being achieved by state programs would allow the City to adjust its CAP, if needed.

- Track Completion of GHG Reduction Measures—The CIT or CIC would keep track of measures implemented as scheduled in the CAP, including progress reports on each measure, funding, and savings. This will allow at least a rough attribution of gains when combined with regular GHG inventory updates.

- Regular Progress Reports—The CIT or CIC may report annually (or semi-annually or at other assigned intervals) to the City Council on CAP implementation progress. If annual reports, periodic inventories, or other information indicates that the GHG reduction measures are not as effective as originally anticipated, the CAP may need to be adjusted, amended, or supplemented. At a minimum, the City will conduct a 3-year review of CAP effectiveness as part of annual reporting in 2017, which would allow making mid-course adjustments in the CAP if needed to effect change prior to 2020.

5.6 Regional Cooperation

There are substantial opportunities to enhance the effectiveness of the CAP through regional collaboration. The City would explore the potential to leverage resources through regional cooperation. Potential opportunities and partners include the following.

- **SANBAG:** As the regional council of governments and the regional transportation agency, SANBAG is a logical hub of communication for Participating cities on the progress of their CAPs. Further, SANBAG will be the responsible implementing agency for many transportation-related measures that result in local GHG reductions. SANBAG is also administering the PACE program loans and a PPA for energy efficiency and solar energy for participating cities.
- **Air Districts:** The South Coast Air Quality Management District is the local agency responsible for developing and implementing air quality plans. The agencies also sponsor various air quality programs that may support implementation of several energy-efficiency, transportation, and renewable energy measures.
- **Energy Providers:** SCE offers numerous incentives and rebate programs to encourage energy efficiency. Resources offered by the energy providers may reduce the costs of program implementation and administration. There may also be opportunities for cooperation on community-scale alternative energy installations (e.g., wind, solar).
- **Transportation Agencies (Omnitrans):** Continued coordination with regional transportation agencies would be necessary to fully implement the transportation reduction measures that promote mixed use development. With SB 375 and its linkage to transportation funding, it would also be crucial for the City and transportation agencies to develop a shared vision of how land use and transportation can be consistent with the next RTP and the required SCS.
- **San Bernardino County:** The County operates the landfills that receive most of the local waste in the County and has committed as part of its own CAP to improve methane control for its landfills which will help reduce emissions associated with City landfilled waste. Coordination with the county to provide the necessary facilities, programs, and incentives would help ensure this goal can be achieved by 2020, as waste services are often shared across several jurisdictions, including the unincorporated portions of the county.
- **Local Water Providers:** The City can work with the both the wholesalers and retailers of water in the City to promote reductions in indoor and outdoor water use from existing developments and achieve the goals set forth by SB X7-7.

5.7 Reducing GHG Emissions after 2020

In order to assess whether implementing this Plan achieves the state's long-term climate goals, one must look beyond 2020 to see whether the emissions reduction measures included for the 2020 milestone set the region on the trajectory toward future greater reductions in the post-2020 period.

To date, there is no state or federal mandate requiring reduction of GHG emissions after 2020. AB 32 contains no post-2020 reduction target nor provides CARB with the authority to mandate compliance with a post-2020 target. SB 375, while it contains requirements for transportation planning for the MPO (SCAG in this region) to promote reductions in the passenger and light duty vehicle sector, does not contain mandatory requirements for local jurisdictions to reduce their GHG emissions overall. However, CARB and the legislature are currently (as of later 2014) contemplating new legislation to adopt post-2020 GHG reduction targets, so it is likely that during implementation of this CAP there will be post-2020 targets established in law in California.

Governor Schwarzenegger's Executive Order S-3-05 calls for an 80% reduction below 1990 greenhouse gas emission levels by 2050. However, as noted earlier in this report, an executive order is only binding on state agencies, and does not represent a legal mandate for local governments or the private sector. Nevertheless, S-03-05 contains a reduction target that is based on a rough agreement on the basis of scientific understanding of the level of reduction needed in developed countries of the world in order to avoid the more catastrophic effects of climate change that could result from unabated rise in anthropogenic GHG emission. The 2050 target in S-03-05 is equivalent to a 2050 statewide target of about 85 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) (total emissions), as compared to the 1990 level of 427 $MMTCO_2e$. However, there is currently (as of summer 2015) no approved state or federal plan as to how to achieve such ambitious reductions for 2050. The CARB 2008 AB 32 Scoping Plan did discuss a general scenario of potential reductions that would be needed by 2050 to meet these targets. Similar to the AB 32 Scoping Plan, this Regional Plan shows a potential trajectory of GHG emissions reductions due to expansion of measures after 2020. However, there is legislation in California (SB 32) being presented that, if adopted, would address the long-term requirements of S-03-05.

Assuming that emissions of 15% below 2008 levels (equal to 10.9 $MMTCO_2e$ for the region), excluding stationary sources) is roughly equivalent to 1990 levels, a 2050 regional goal to match the S-3-05 goals would be to achieve a level of emissions of 2.2 $MMTCO_2e$ in 2050, excluding stationary sources. Full implementation and expansion of the CARB's Scoping Plan to increase efforts beyond 2020 and expansion of the City-identified strategies included in this CAP could help to put the region on a path toward achieving these required long-term reductions. Figure 5-3 depicts what an emissions trajectory might look like, assuming the region follows a linear path from the 2020 reduction target to a 2050 goal matching that in S-03-05. While the specific measures needed to meet the 2050 goal are too far in the future to define in detail, one can examine the level of achievement that would be needed to keep the region on track through 2030. Table 5-4 examines a continuation and strengthening of measures already identified through 2020.

To stay on course toward the 2050 target, the region's greenhouse gas emissions need to be reduced to approximately 6.3 $MMTCO_2e$ by 2030. This translates to an average reduction of 5.25% per year between 2020 and 2030, or an additional 4.4 $MMTCO_2e$ in reductions during the period 2020 to 2030. An additional challenge comes from the fact that the population in the region (sum of participating cities considered in the Regional Plan) will continue to grow between 2020 and 2030 (a growth from approximately 1.73 million in 2020 to 1.96 million in 2030). Taking into account population growth, per-capita emissions would need to decrease at an average rate of approximately 0.5 $MTCO_2e$ per person per year during the 2020 to 2030 period. These reductions are possible. The measures needed are logical expansions of the programs recommended in the CARB Scoping Plan at the state level and the measures included in the Regional Plan at the local level (and the local measures included in Yucaipa's CAP). By building on planned state efforts during this period and ramped up efforts in the local building energy and transportation (and other) sectors on the part of the local governments, the region can be on track to reach a 2050 goal.

The state can help the cities in San Bernardino County, including Yucaipa, to keep on track through 2030 by extending state action in the following ways, as described in the Scoping Plan (California Air Resources Board 2008).

- Expand vehicle efficiency regulations to achieve a 40% fleet-wide passenger vehicle reduction by 2030 (approximately double the almost 20% expected in 2020).
- Increase California's use of renewable energy in electriCity generation (beyond the 33% planned for 2020).
- Reduce the carbon intensity of transportation fuels by 25% (a further decrease from the 10% level set for 2020).

- Increase energy efficiency and green building efforts (so that the savings achieved in the 2020 to 2030 timeframe are approximately double those accomplished in 2020).
- Using a regional or national cap-and-trade system to further limit emissions from the 85% of greenhouse gas emissions in capped sectors (Transportation Fuels and other fuel use, ElectriCity, Residential/Commercial Natural Gas, and Industry).

This Regional GHG Reduction Plan and this CAP have not assumed any benefit from a cap-and-trade system by 2020, but when implemented, such a system will result in reductions beyond those currently anticipated in the Plan for 2020, and in additional reductions for 2030. The California Cap and Trade system will particularly affect large stationary sources, which are excluded from local measures in the Regional Plan and the CAP to avoid duplication of state and federal regulatory efforts. In addition, the Cap and Trade system will also affect electricity generation and transportation fuels, which may change energy prices, which may in turn change energy use and transportation behavior beyond that assumed for the various City measures included in this Regional Plan.

It is reasonably foreseeable that as California approaches its first milestone in 2020, focus would shift to the 2050 target. A detailed plan for how the state would meet this target is expected prior to 2020 accordingly. Yucaipa and the Partnership cities will monitor developments at the national and state levels.

Beginning in Phase 3 (2018), Yucaipa will update the CAP to include post-2020 reduction targets and reduction measures to achieve the post 2020 reduction targets in compliance with EO S-3-05. The City of Yucaipa will encourage the other Partnership cities, and SANBAG to collaborate in planning for the post-2020 period. At this point, the Partnership cities would have implemented the first two phases of their local CAPs and would have a better understanding of the effectiveness and efficiency of different reduction strategies and approaches. The new post-2020 reduction plan should include a specific target for GHG reductions for at least 2030 and if supported by long-term planning at the state level, should also include preliminary planning for 2040 and 2050. The targets should be consistent with broader state and federal reduction targets and with the scientific understanding of the reductions needed by 2050. It is recommended that partnership cities, including Yucaipa adopt the post-2020 reduction plan by January 1, 2020, which would require cities to start a new inventory/assessment process by 2017 or 2018 at the latest.

The City will continue to update the CAP and provide post 2020 reduction targets to keep on track through 2030 to meet the 2050 goal by implementing the following.

- Increase energy efficiency and green building efforts (for City municipal buildings as well as private buildings in the region) so that the savings achieved in the 2020 to 2030 timeframe are far greater those accomplished in 2020.
- Continue to implement land use and transportation measures to lower VMT and shift travel modes
- Capture more methane from landfills receiving regional waste, move beyond local waste diversion goal for 2020, and utilize landfill gas further as an energy source.
- Continue to improve local water efficiency and conservation.
- Continue to support and leverage incentive and rebate and other financing programs for residential and commercial energy efficiency and renewable energy installations to shorten payback period and costs and to develop programs that encourage increased use of small-scale renewable power as it becomes more economically feasible.

The conceptual effects of these strategies regionally are presented in Table 5-4 and would represent an approximate doubling of effort for most cities from that planned at the state and City level for 2020. In

total, the measures described above would produce reductions to bring the region's GHG emissions to an estimated 8.4 $MMTCO_2e$. While the potential mix of future GHG reduction measures presented in this section is only an example, it serves to demonstrate that the current measures in the CARB Scoping Plan and the Regional Plan can not only move the region to its 2020 goal, but can also provide an expandable framework for much greater long-term greenhouse gas emissions reductions.

Figure 5-3. Required GHG Reductions in the Region to Meet the State's 2050 Target

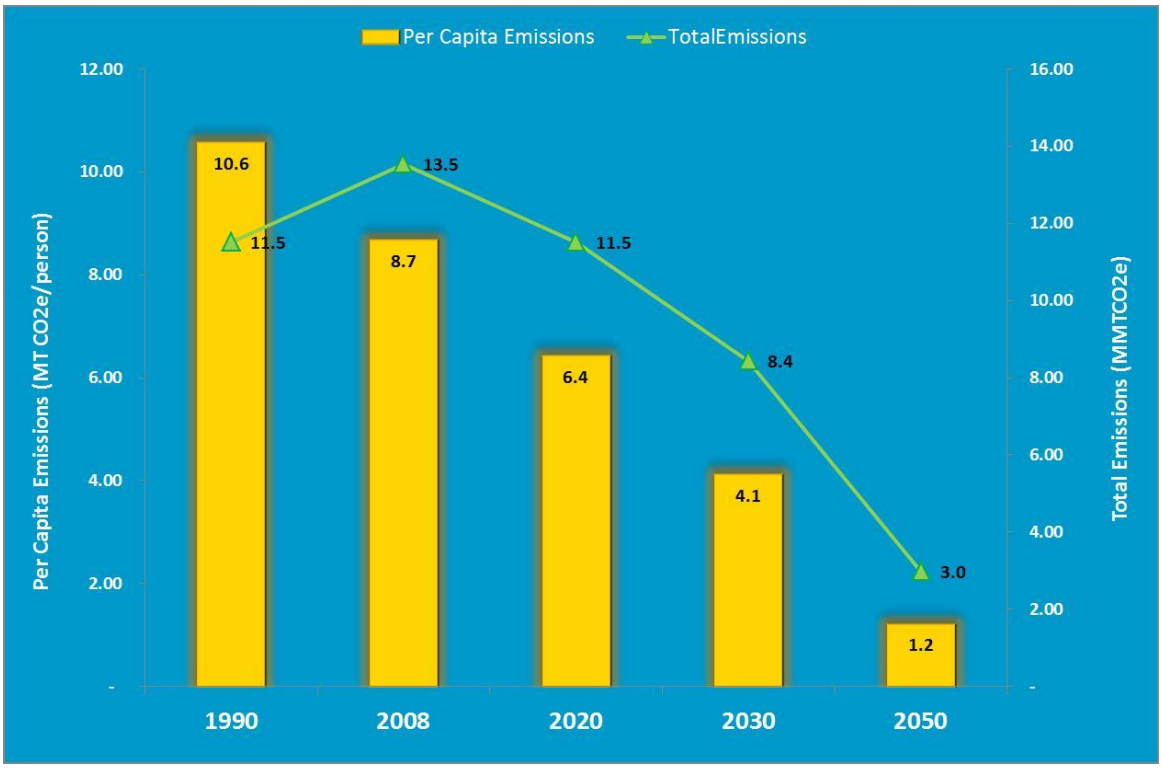


Table 5-4. Potential Regional Reduction Measures to Reach 2030 Goal

	Reductions by 2020 (This Plan)				Scenario for Reductions by 2030		
	State	Local	TOTAL	% below 2008	Total Additional Reductions 2020–2030	Effort Relative to 2008–2020	
	$MTCO_2e$	$MTCO_2e$	$MTCO_2e$	%	$MTCO_2e$	%	Notes
Building Energy (Residential, Commercial, Industrial)	1,361,486	783,954	2,145,440	39%	1,486,205	69%	CARB Scoping Plan calls for doubling of energy efficiency reductions between 2020 and 2030 (i.e., 100% effort relative to the period 2008–2020). The region would have to do 5% more in this sector to be on target. Additional GHG reductions during this period will come from a continued de-carbonization of electriCity at the public utility level, more aggressive retrofitting of existing buildings and greatly increased use of small scale renewables.
On-Road Transportation	1,839,799	54,258	1,894,057	31%	1,713,327	90%	CARB Scoping Plan calls for a doubling of GHG reductions from vehicle fleet by 2030 compared to 2020 and more than doubling reduction of carbon intensity of transportation fuels (i.e., 100% effort relative to the period 2008–2020). The region would need to do about 8% more in this sector to stay on target. SCAG assumes between 8% and 12% in GHG reductions after 2020 for 2035 for VMT reduction. This analysis assumes 8% for local reductions.
Off-Road Transportation and Equipment	78,930	37,613	116,543	15%	53,671	46%	CARB Scoping Plan calls for more than double the reduction of carbon intensity of transportation fuels (i.e., equivalent level of effort to 2008–2020 period).

	Reductions by 2020 (This Plan)				Scenario for Reductions by 2030		
	State	Local	TOTAL	% below 2008	Total Additional Reductions 2020–2030	Effort Relative to 2008–2020	
	$MTCO_2e$	$MTCO_2e$	$MTCO_2e$	%	$MTCO_2e$	%	Notes
Solid Waste Management	163,191	6,240	169,430	50%	23,733	14%	Assumed cities in the County and the County continue further efforts at methane control, waste diversion, and potential waste to energy projects to result in modest further reductions in sector (7%). Once capture technology is installed, additional reductions in this sector are somewhat limited.
Agriculture	0	79,939	79,939	16%	0	0%	No assumed change.
Wastewater Treatment	0	6,017	6,017	9%	2,115	35%	Assumed additional 3% in reduction in sector due to continued installation of fugitive emission capture technology and additional water conservation.
Water Conveyance	0	58,768	58,768	24%	12,023	20%	Assumed additional 5% in reduction in sector due to continued effort to conserve water at a similar rate as 2020-2030.
GHG Performance Standard for New Development	0	121,418	121,418	NA	0	0%	No assumed change.
TOTAL			4,591,613		3,291,074		

Chapter 6
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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	

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[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

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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.

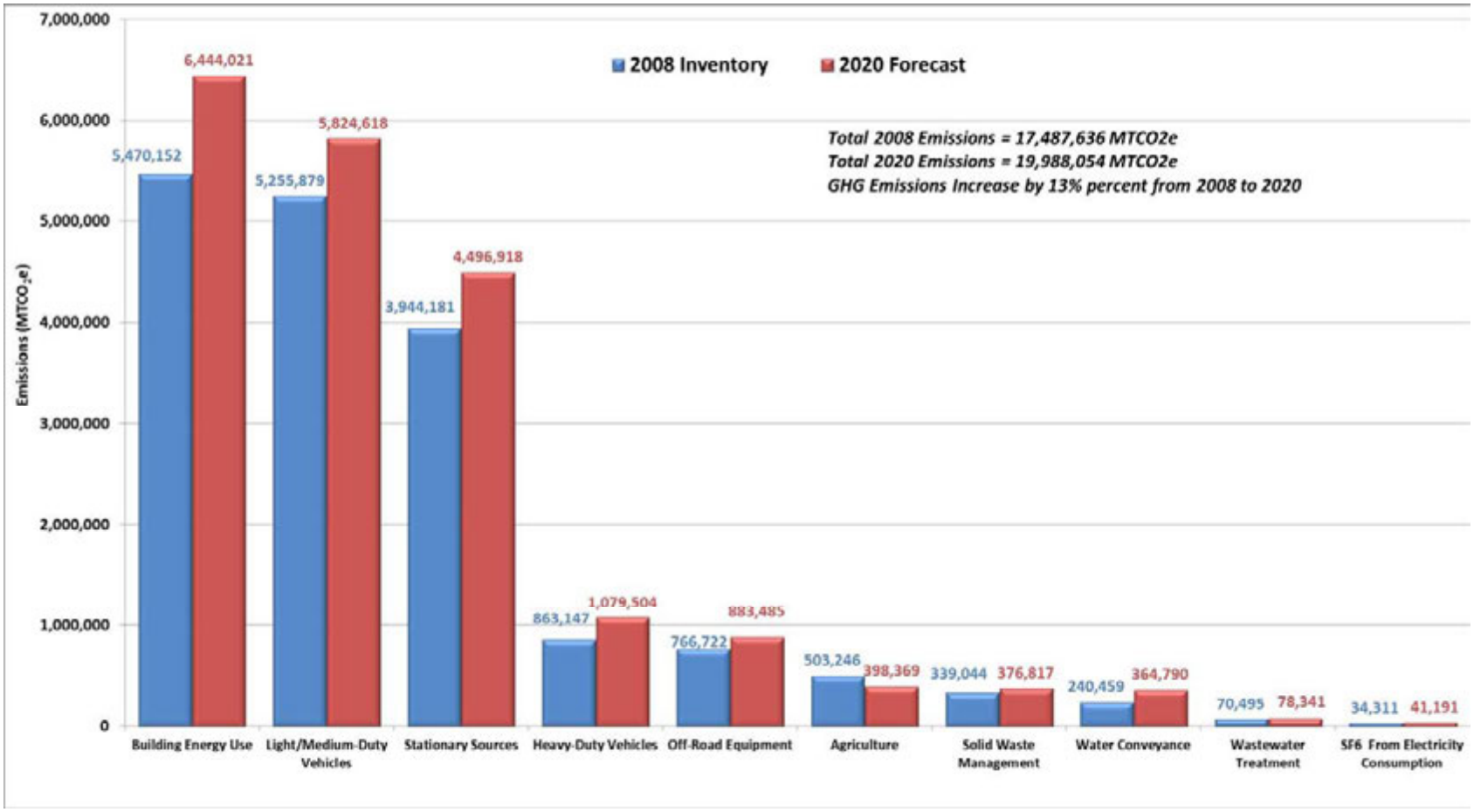
Emissions include direct emissions from a source, such as the combustion of natural gas for heating, and indirect emissions from a source, such as the GHG emissions of electricity generation that may occur outside the inventory area, but occur as a result of electricity demands within the inventory area.

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

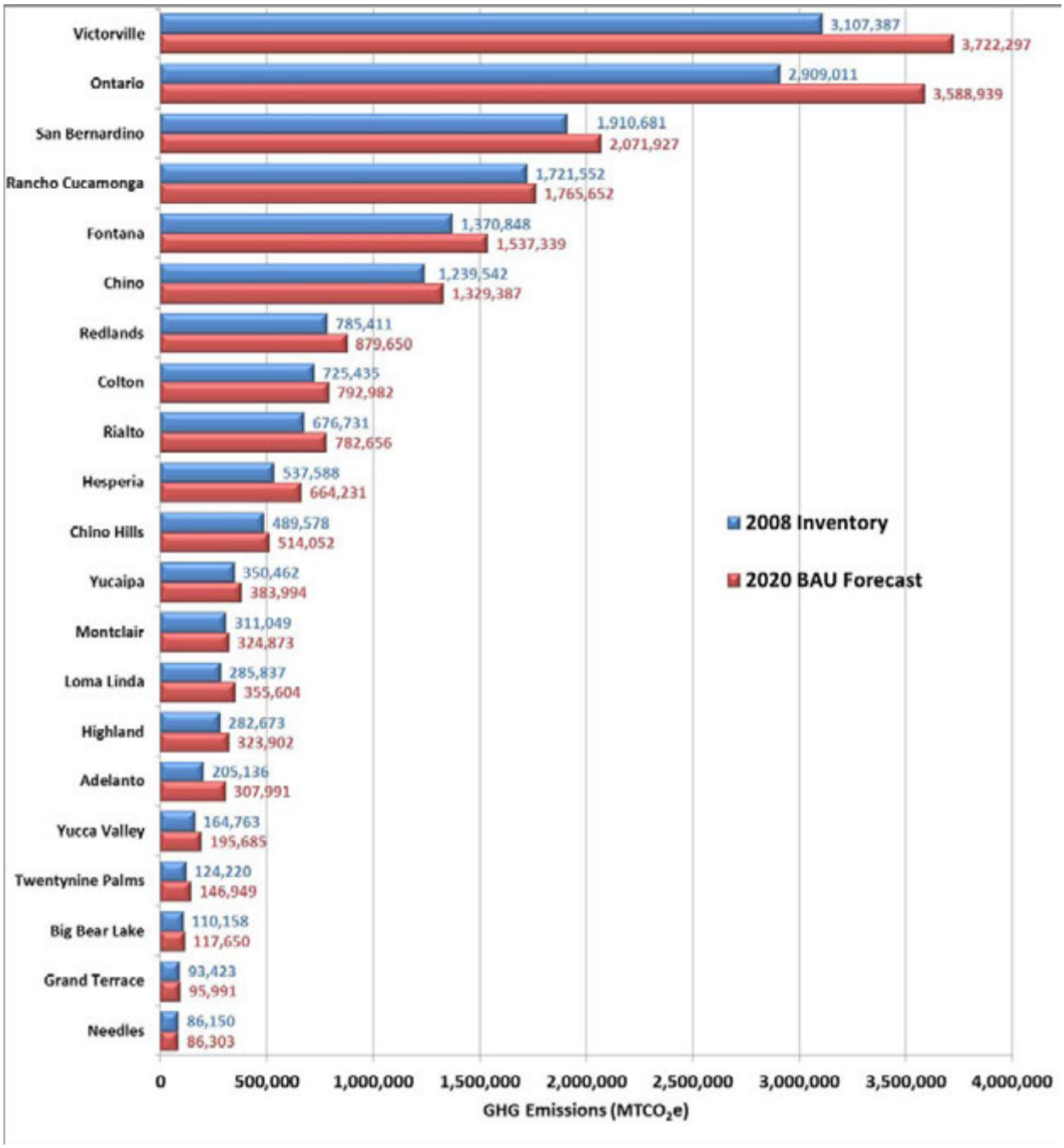
[3] Stationary sources include burning of fossil fuels on site other than natural gas. Examples include boilers and industrial equipment. These emissions are discussed in more detail in Section 4.2.1.

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

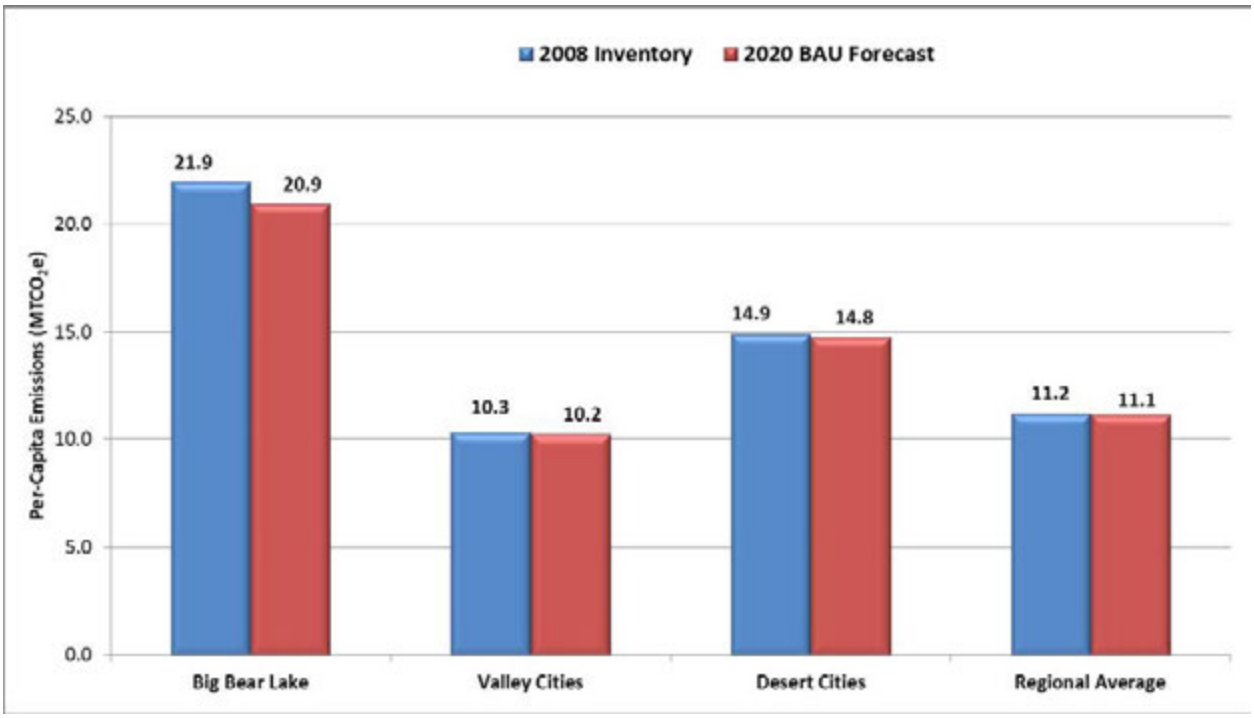


Figure 1-4. 2008 Per Capita Greenhouse Gas Emissions by City and Region

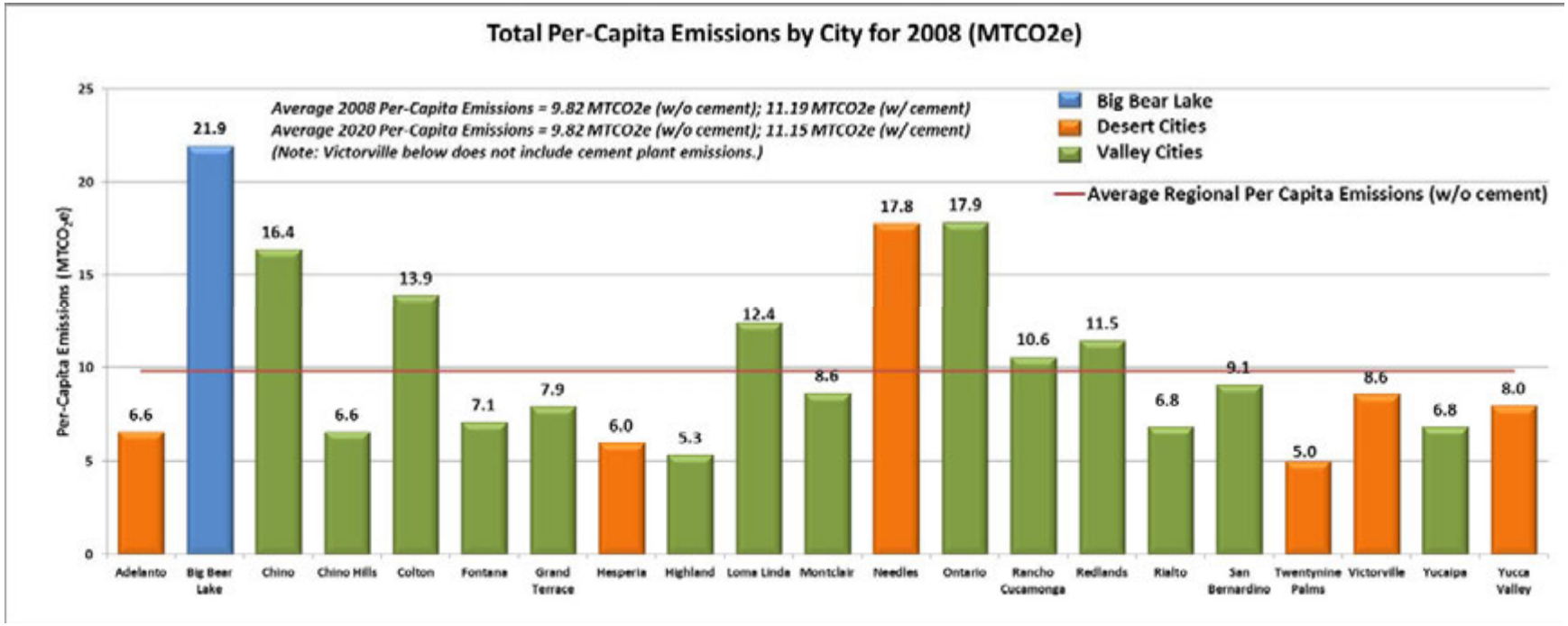
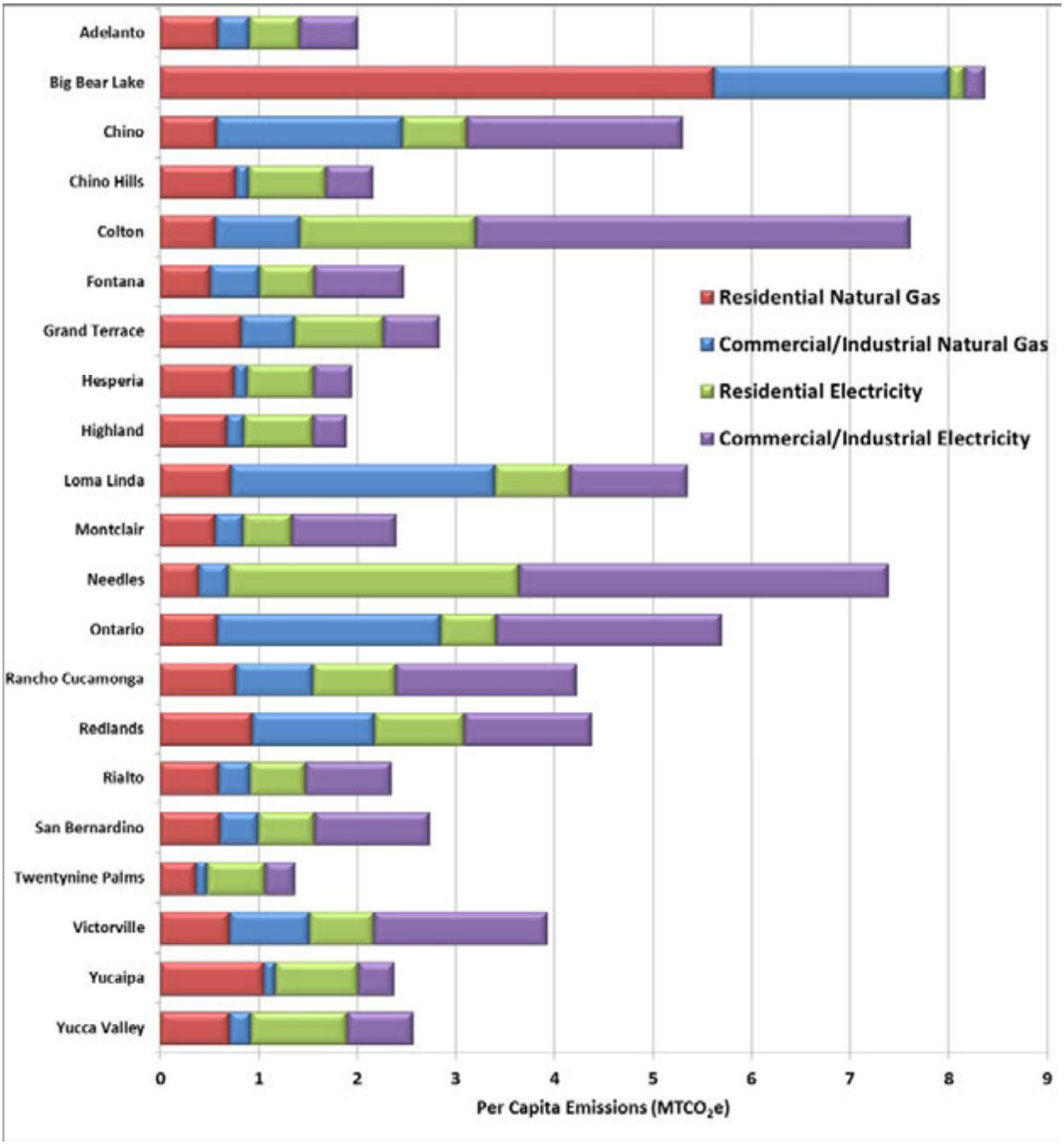


Figure 1-5. 2008 Per Capita Building Energy Emissions by City



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

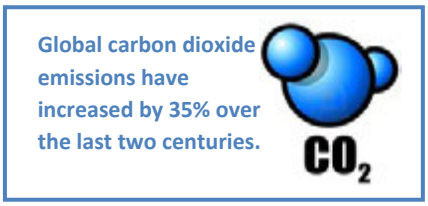
2.1 Greenhouse Gases, the Greenhouse Effect, and Climate Change

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

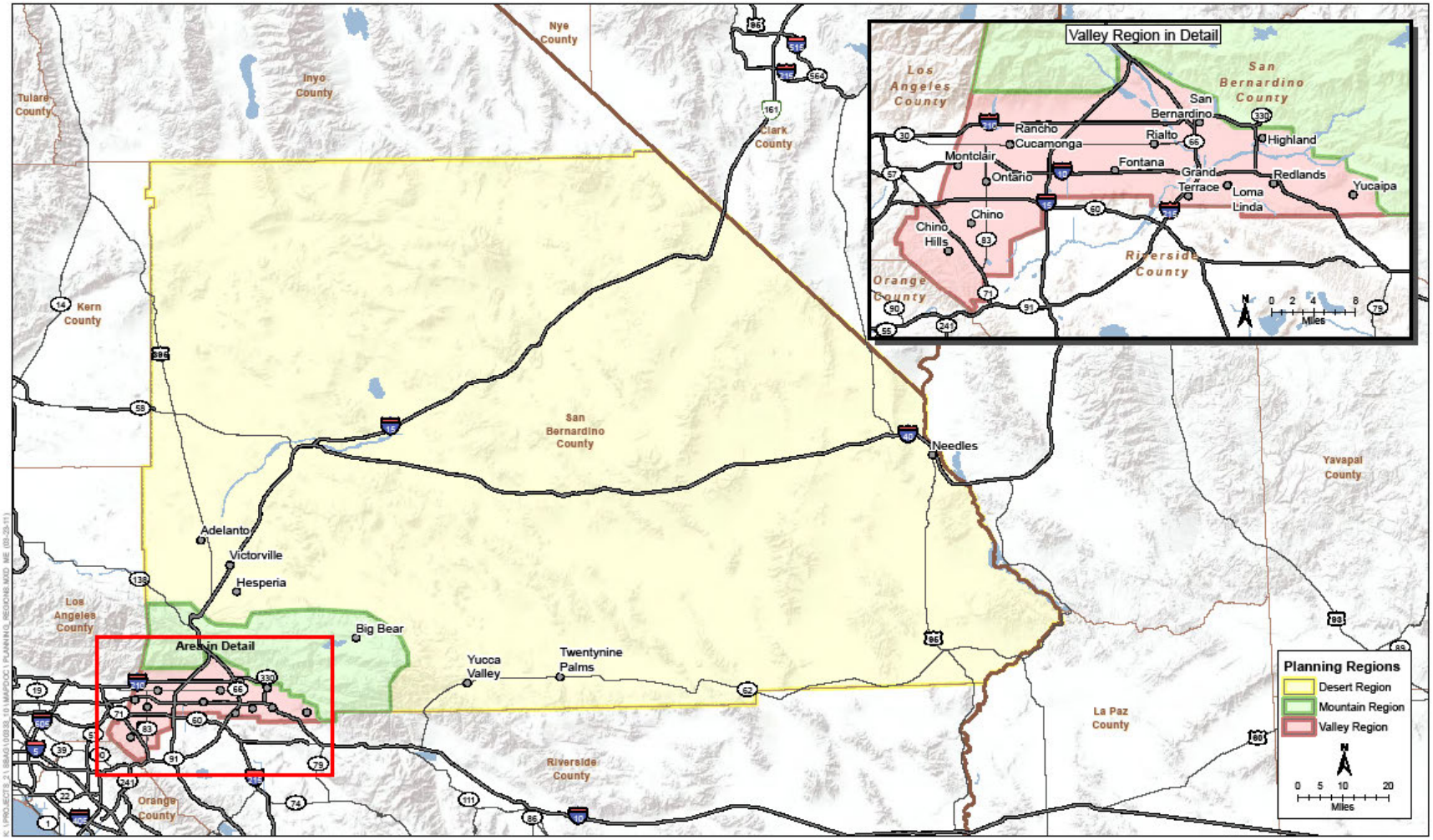


Table 2-1. San Bernardino County, Partnership Cities Population, Housing, and Employment Estimates and Forecasts

	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

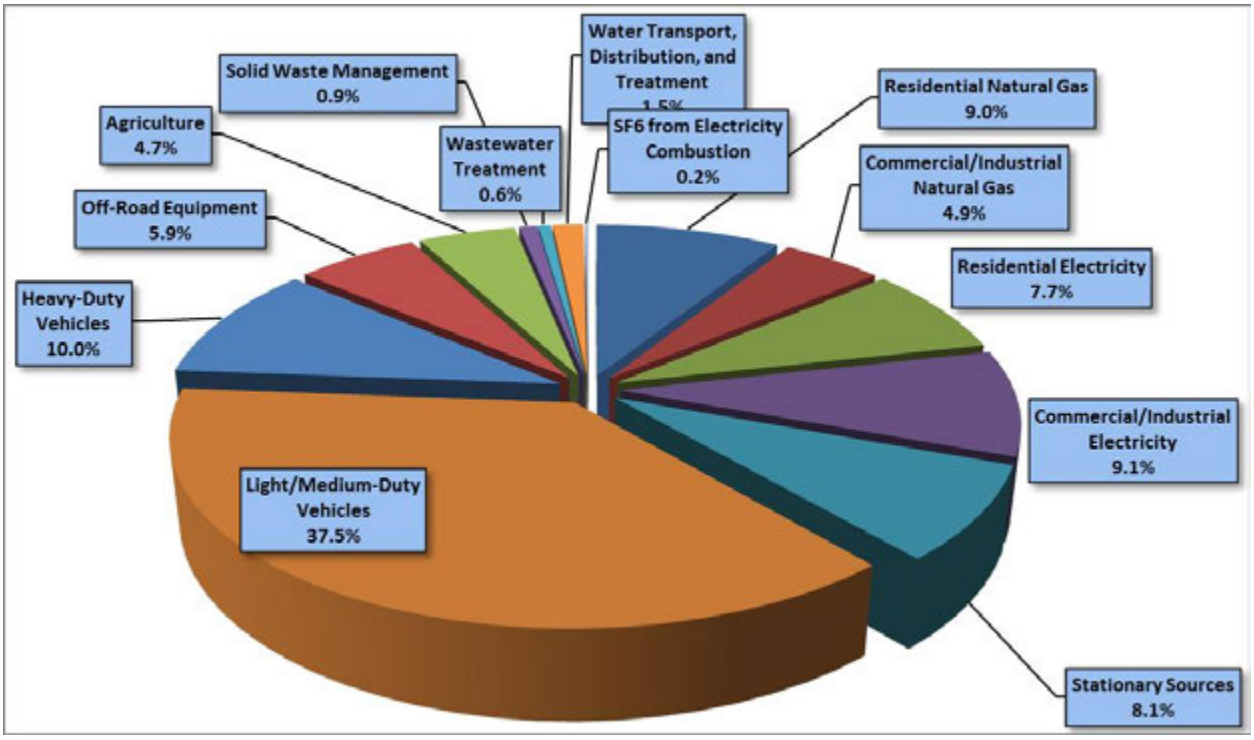
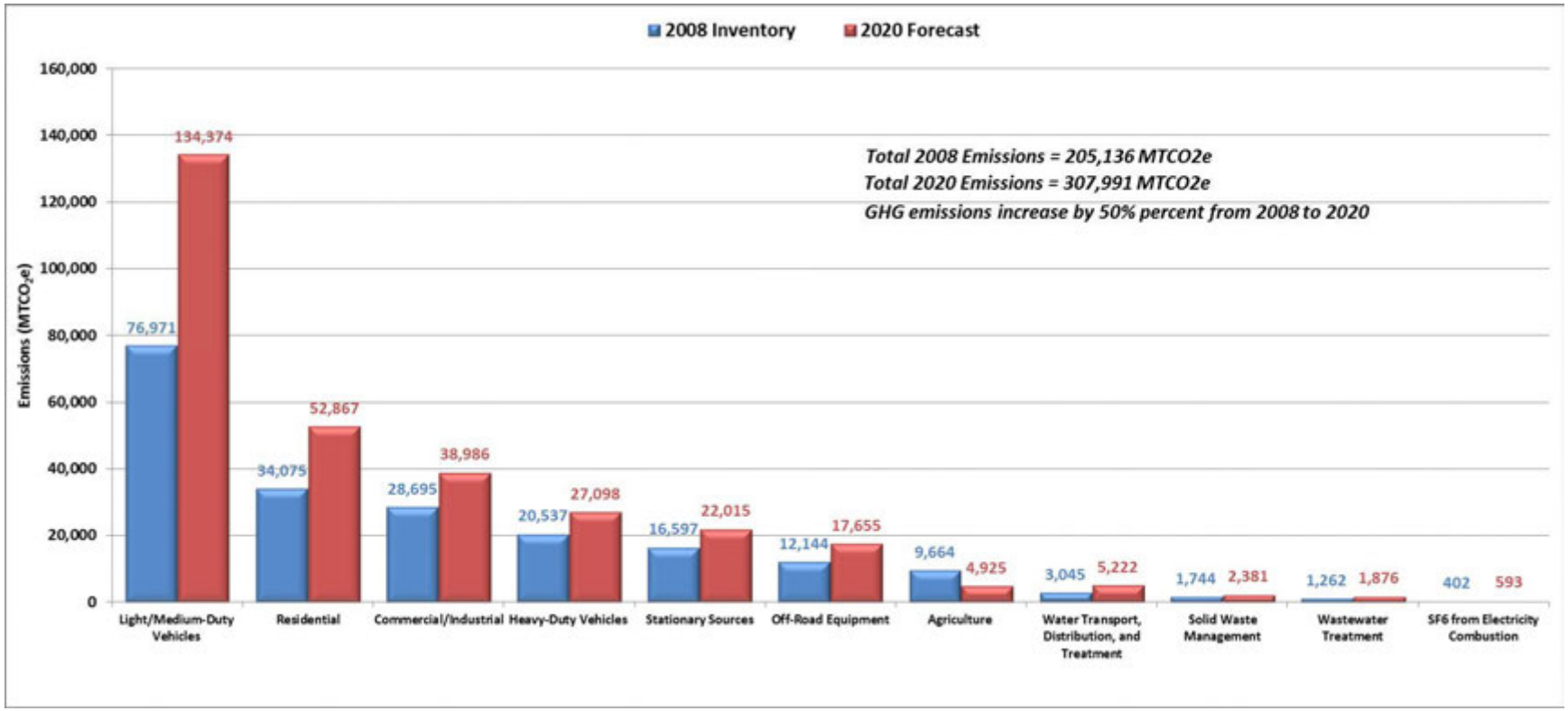


Figure 3-1b. Adelanto GHG Emissions by Sector for 2008 and 2020



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

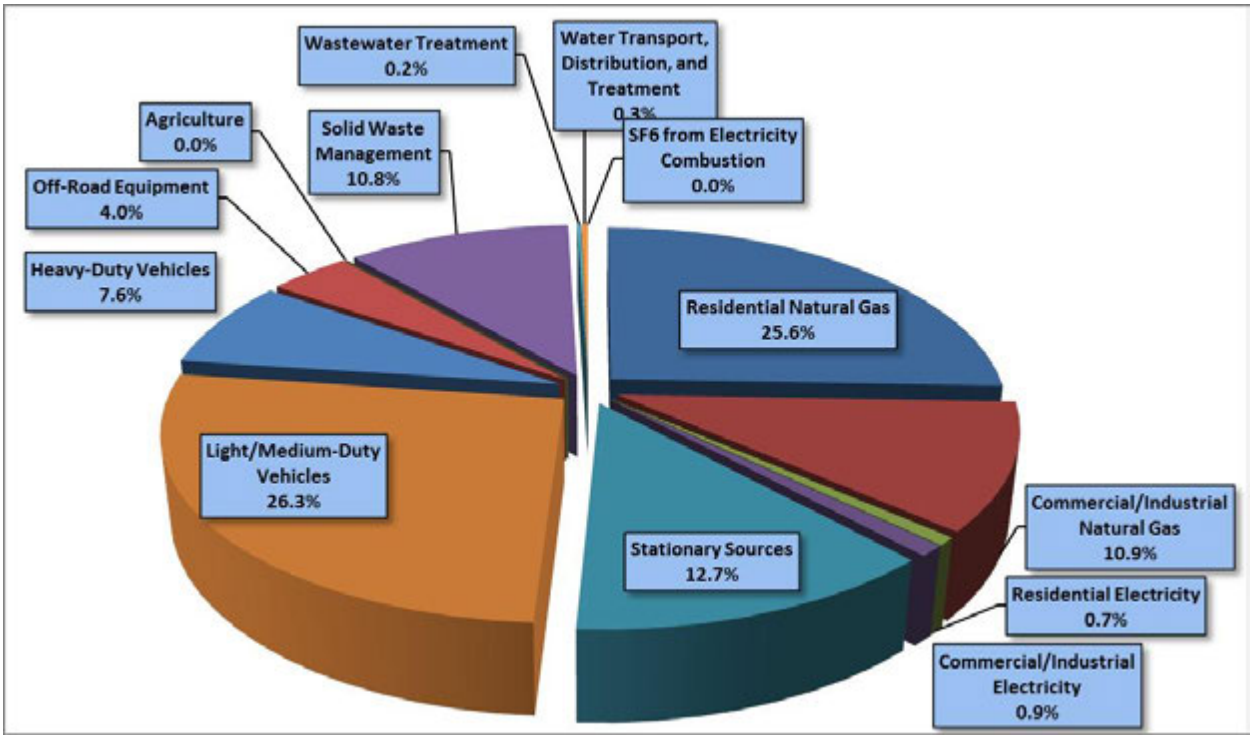
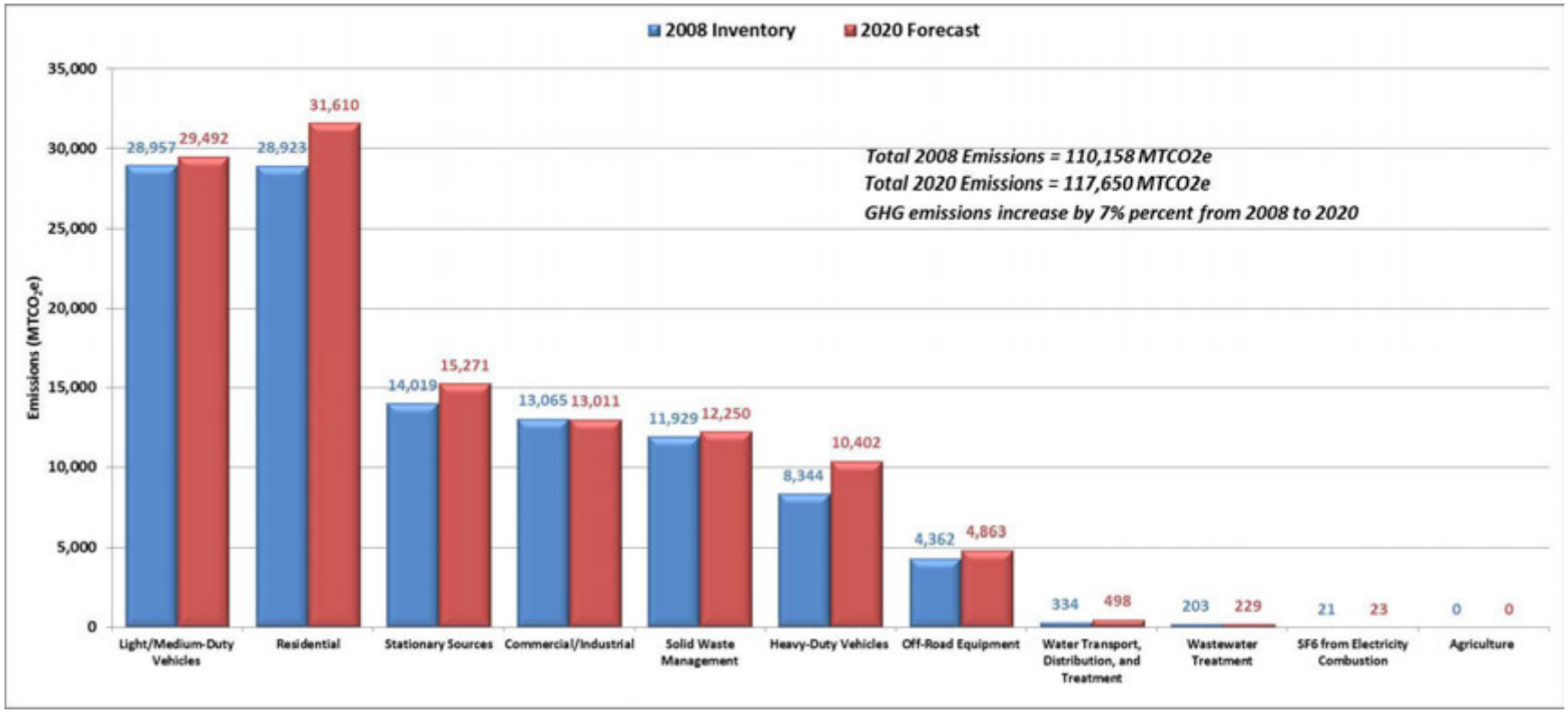


Figure 3-2b. Big Bear Lake GHG Emissions by Sector for 2008 and 2020



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

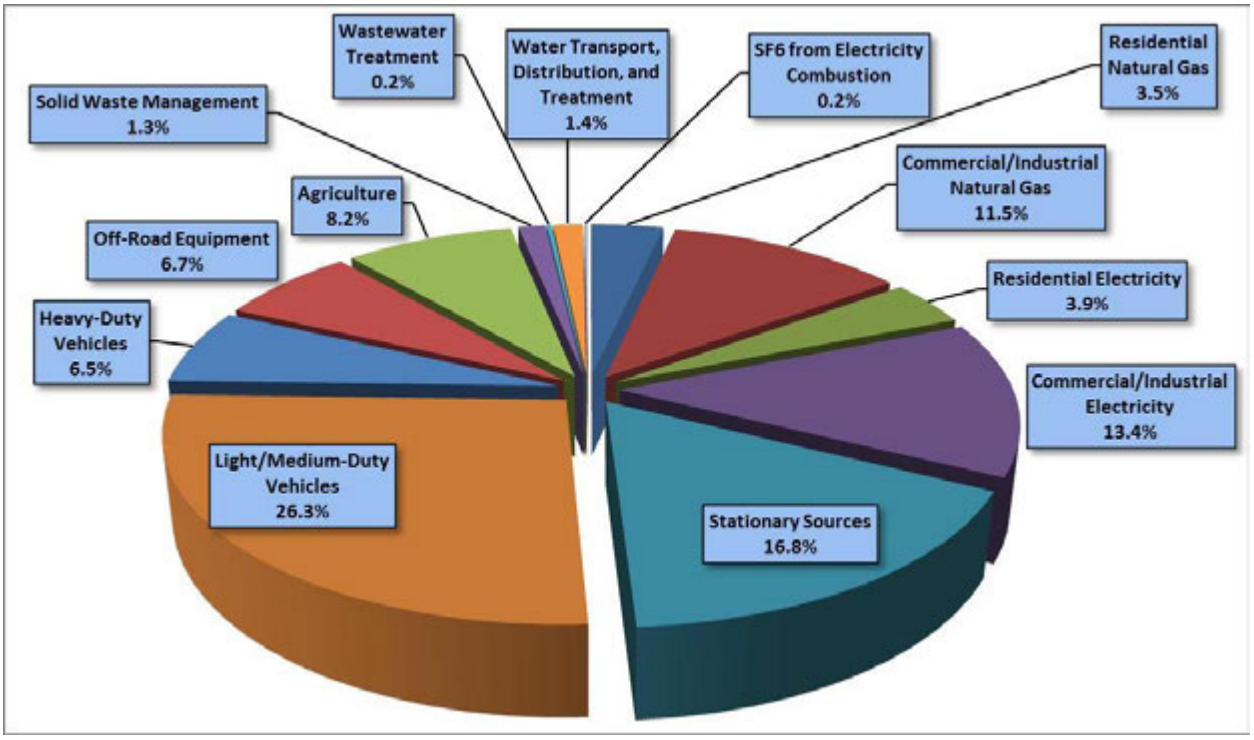
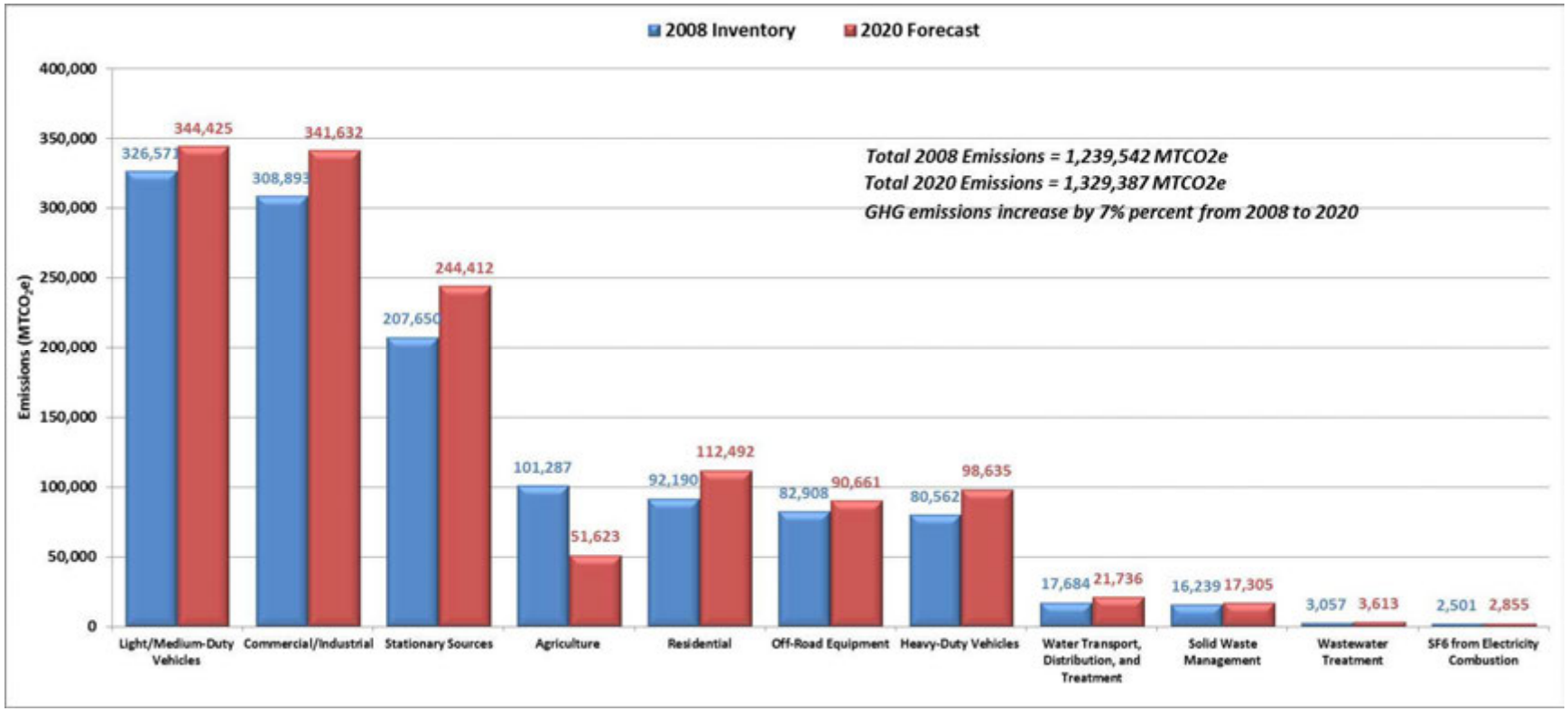


Figure 3-3b. Chino GHG Emissions by Sector for 2008 and 2020



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

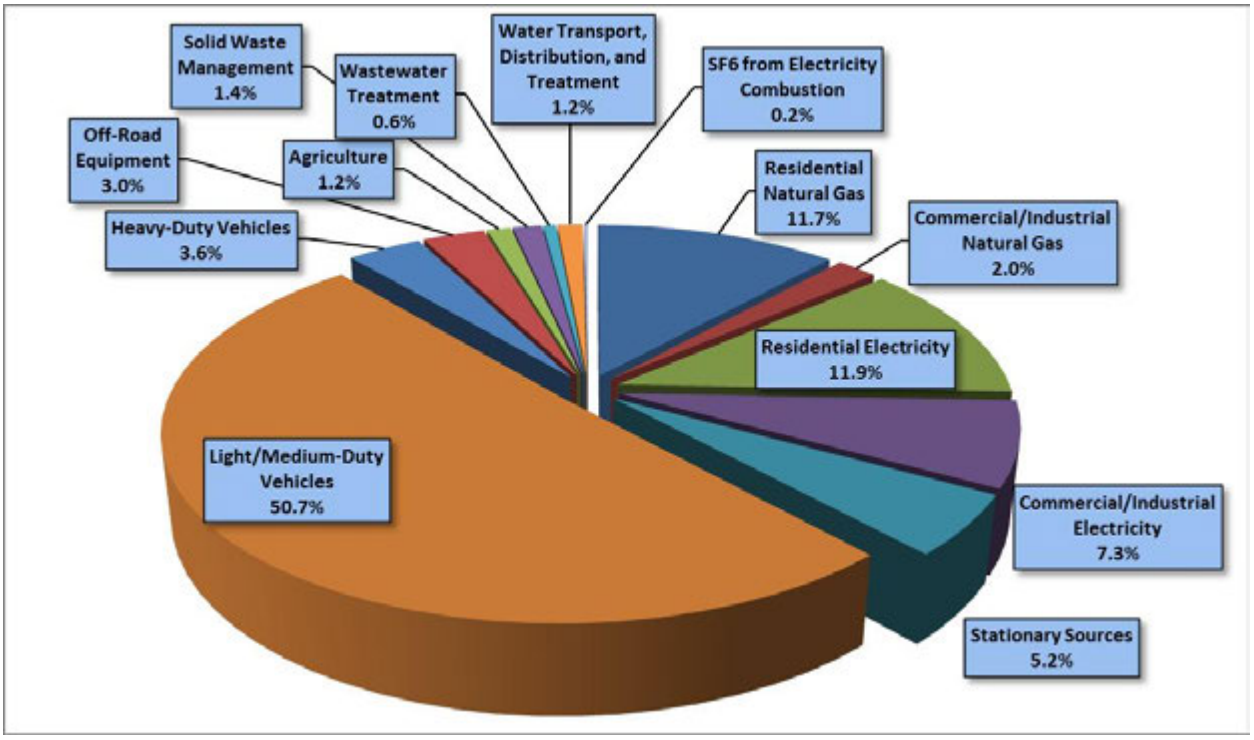
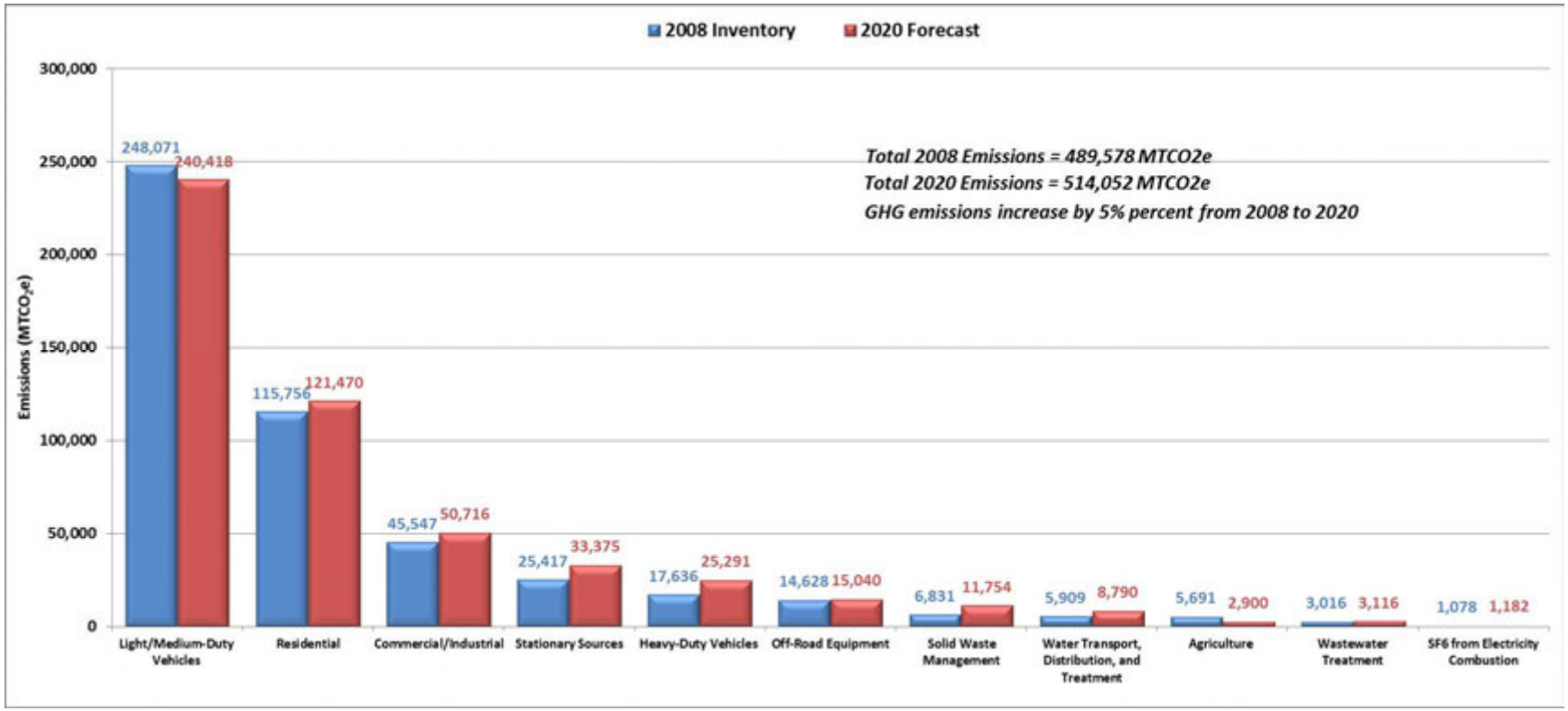


Figure 3-4b. Chino Hills GHG Emissions by Sector for 2008 and 2020



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

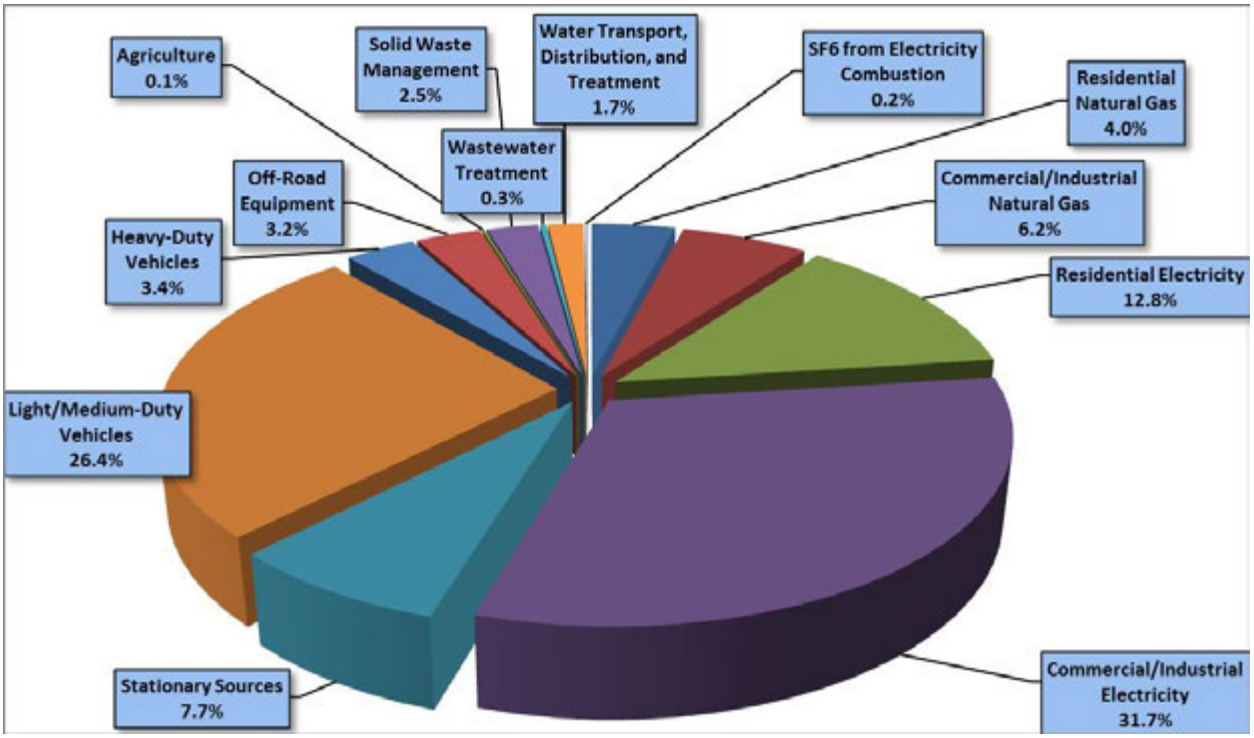
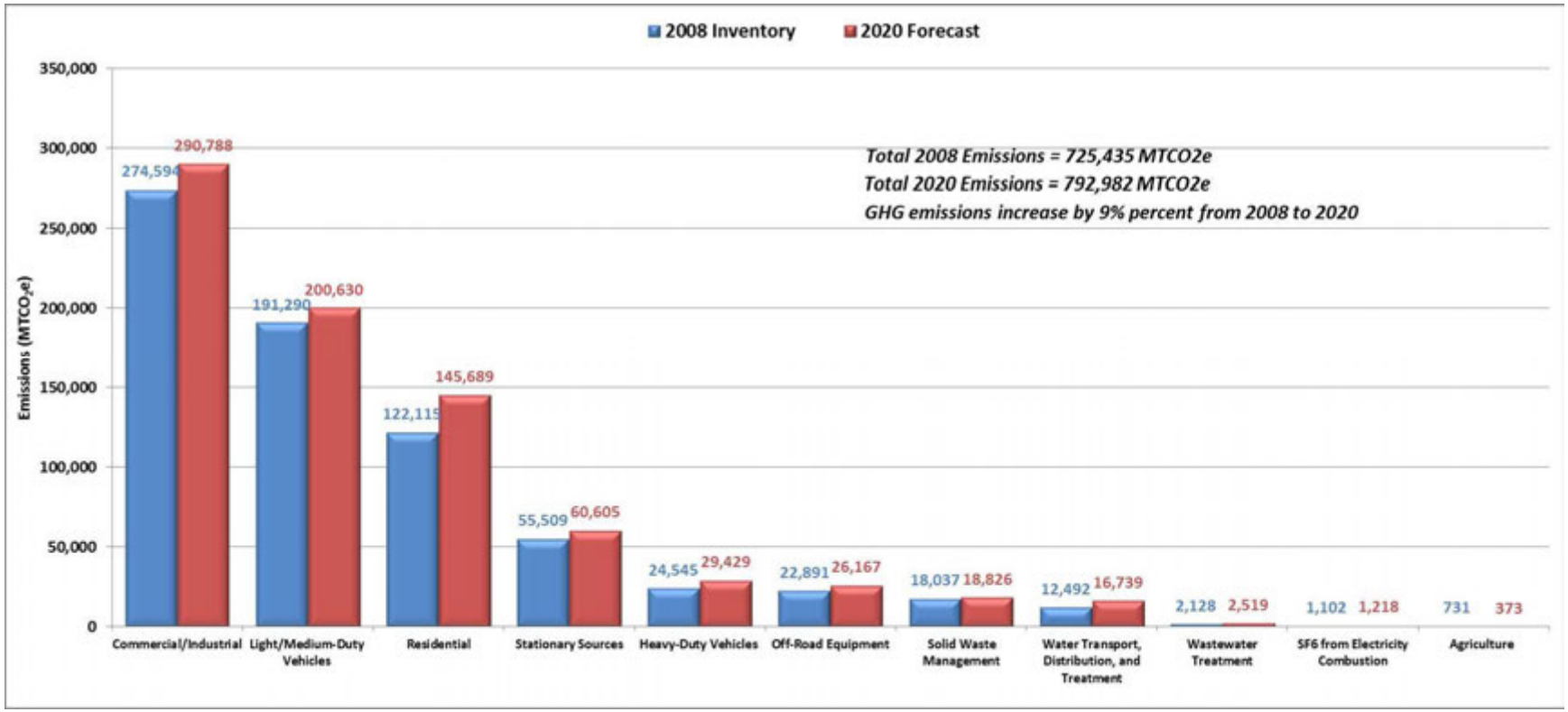


Figure 3-5b. Colton GHG Emissions by Sector for 2008 and 2020



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

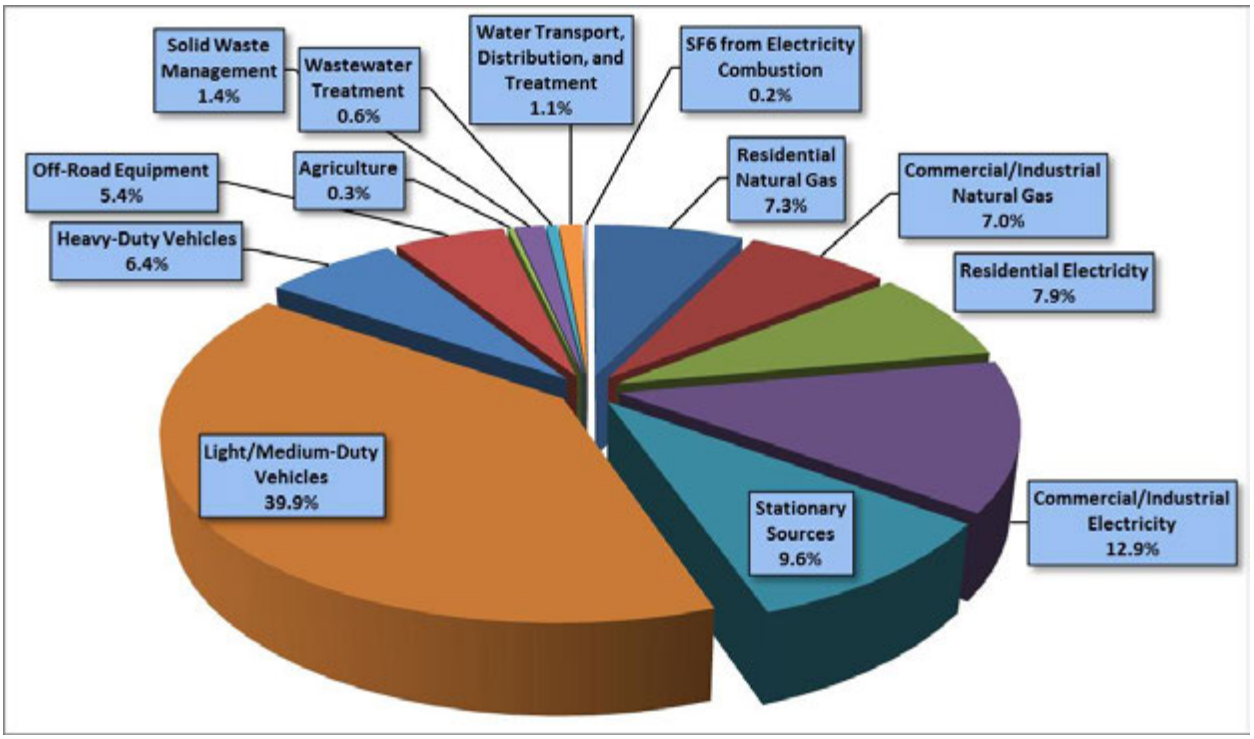
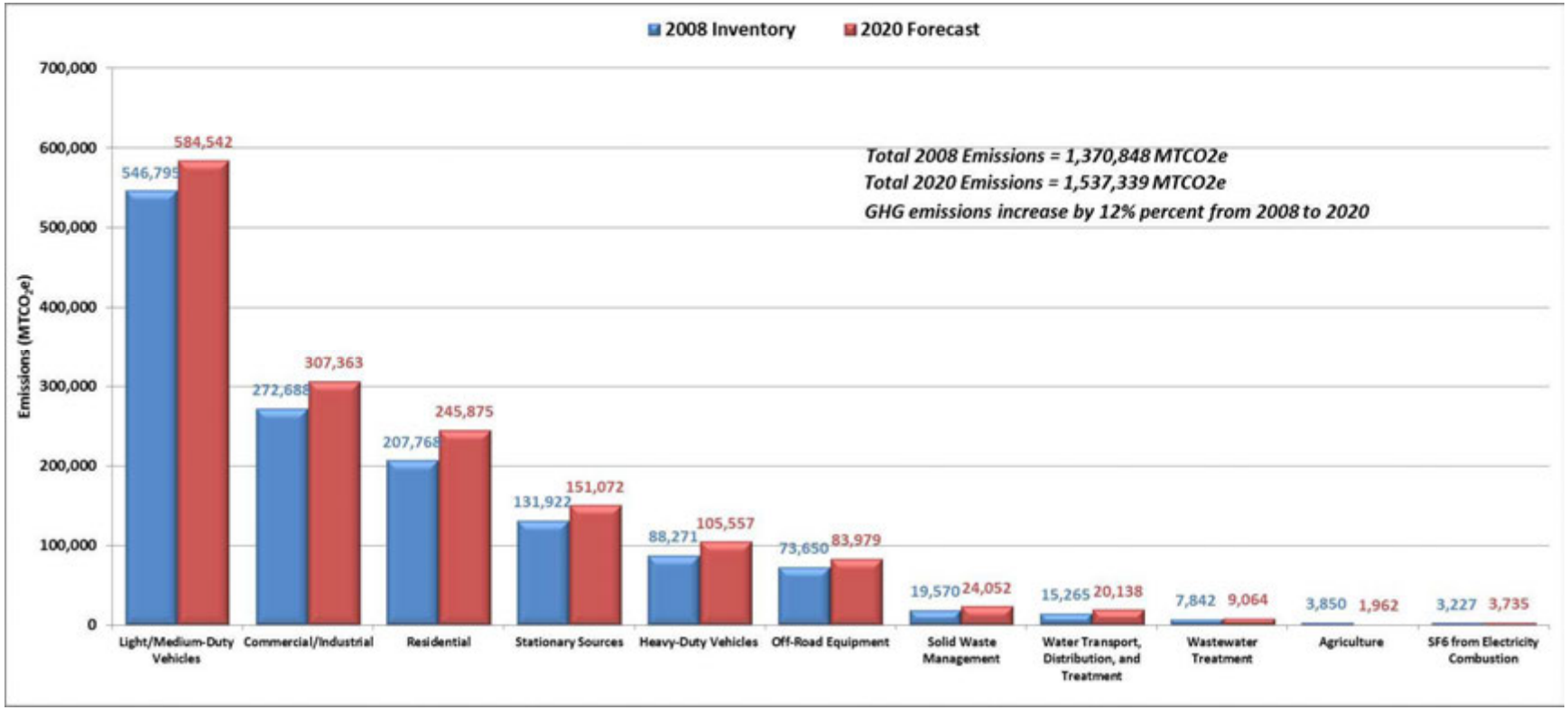


Figure 3-6b. Fontana GHG Emissions by Sector for 2008 and 2020



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

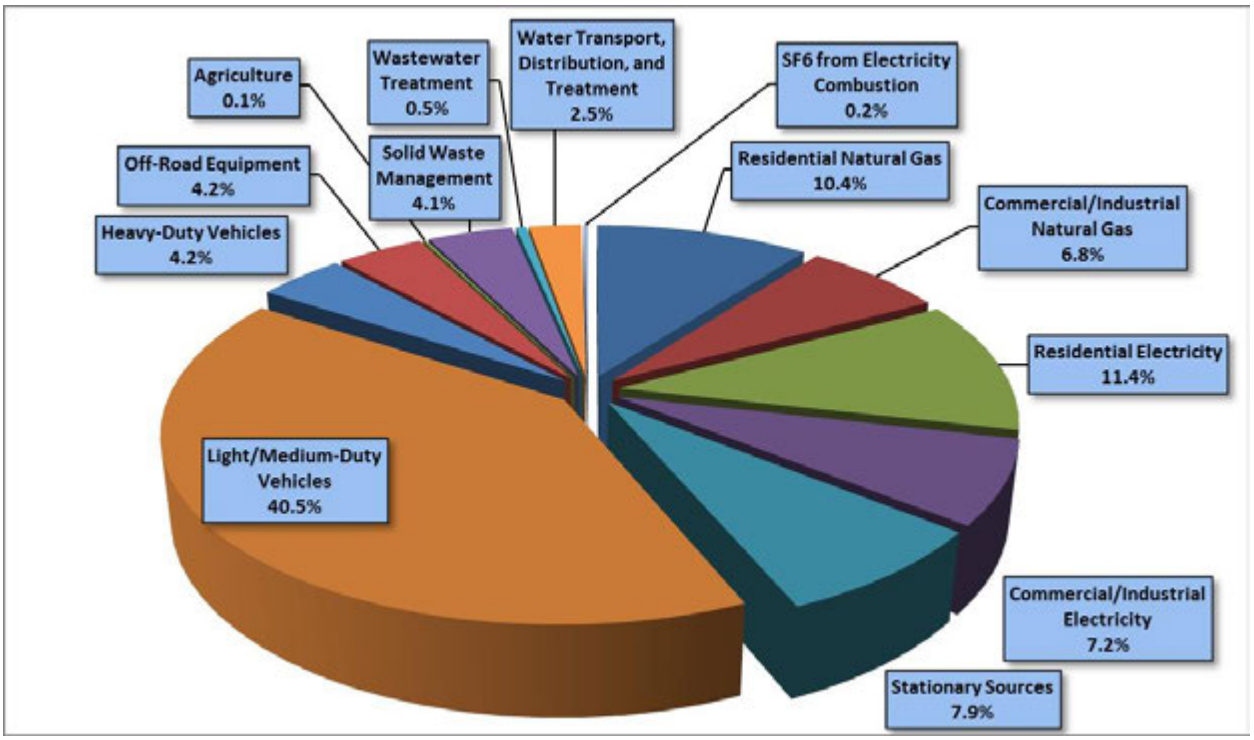
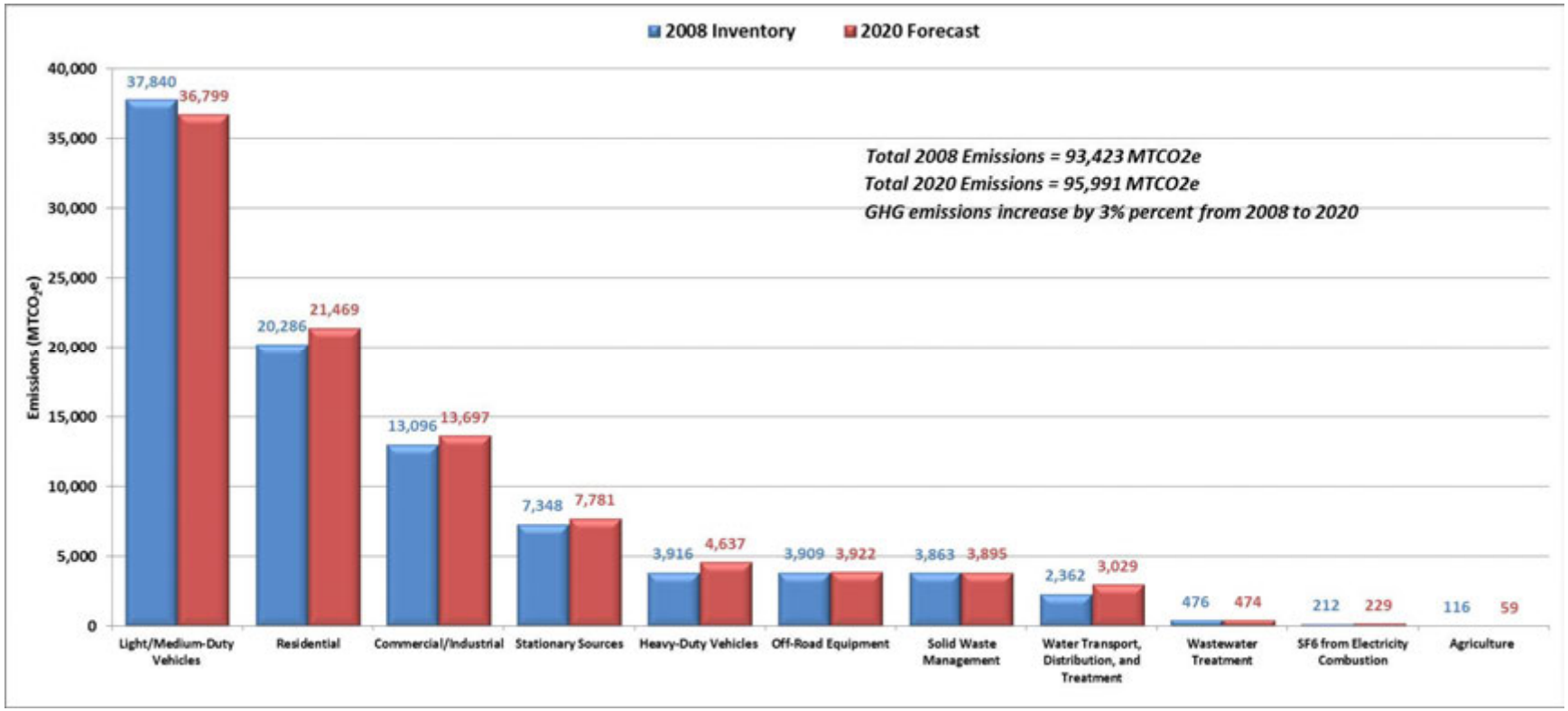


Figure 3-7b. Grand Terrace GHG Emissions by Sector for 2008 and 2020



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

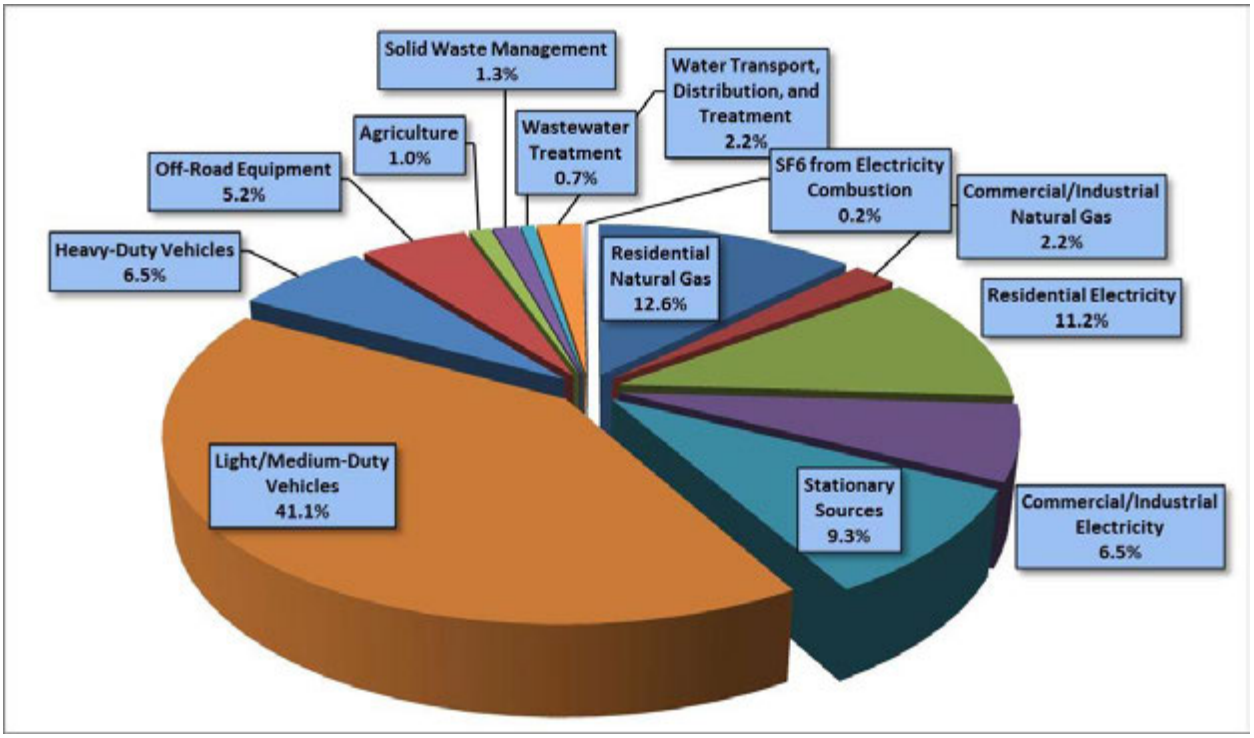
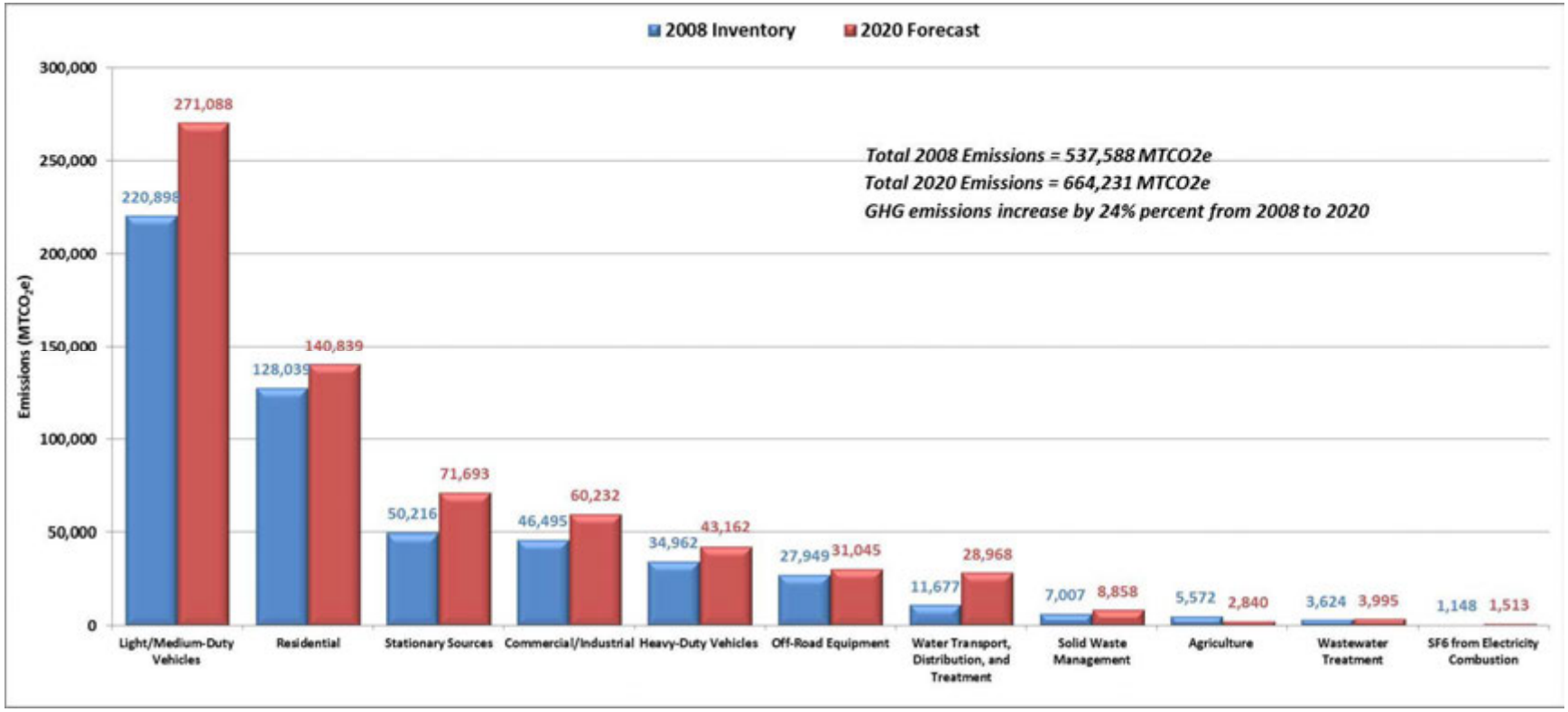


Figure 3-8b. Hesperia GHG Emissions by Sector for 2008 and 2020



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

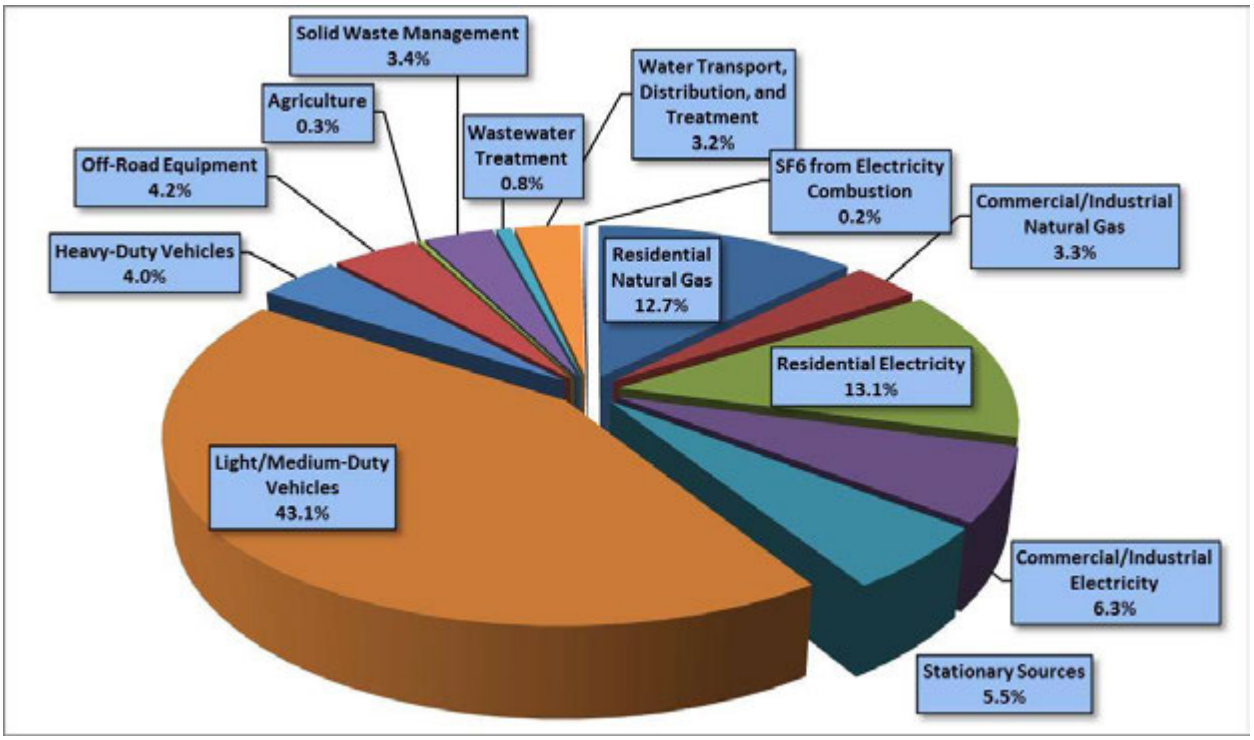
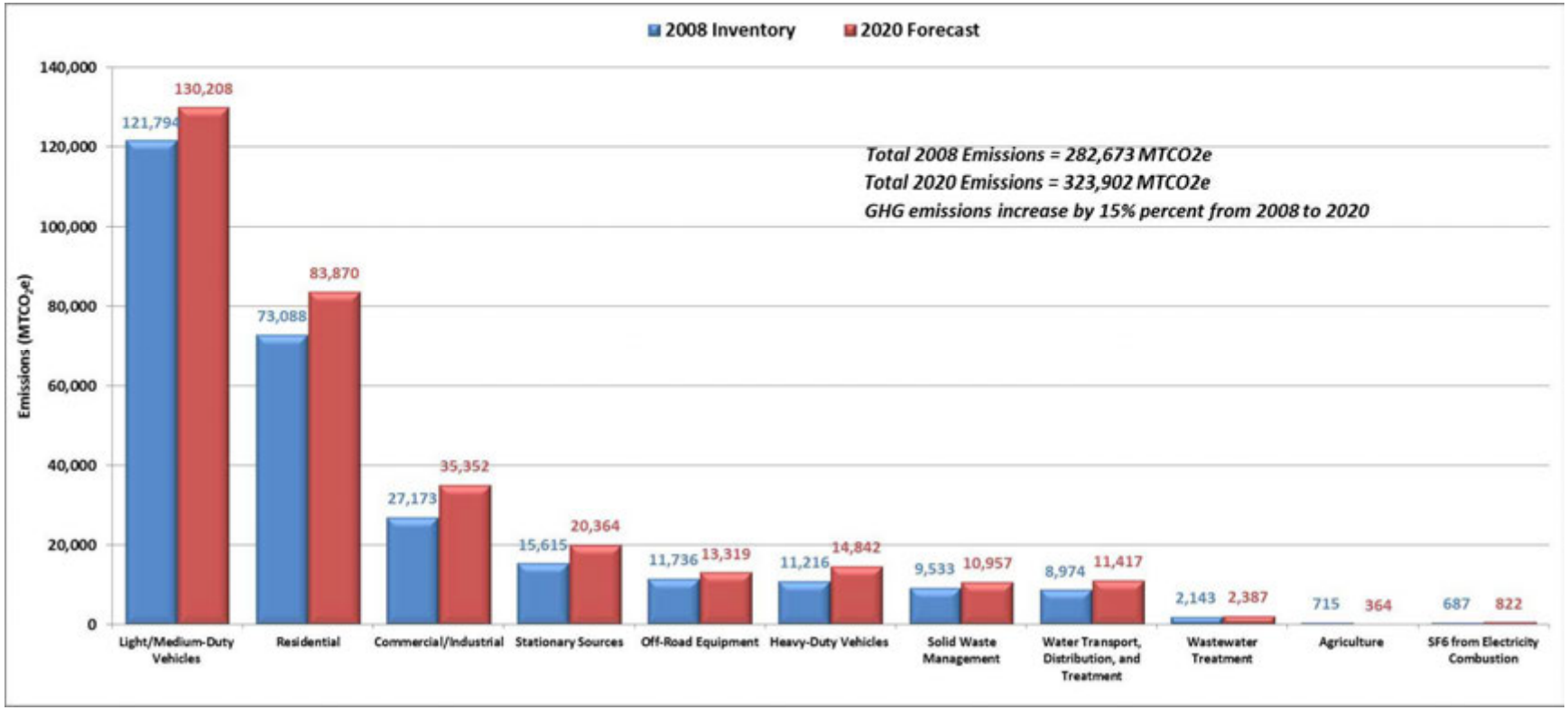


Figure 3-9b. Highland GHG Emissions by Sector for 2008 and 2020



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

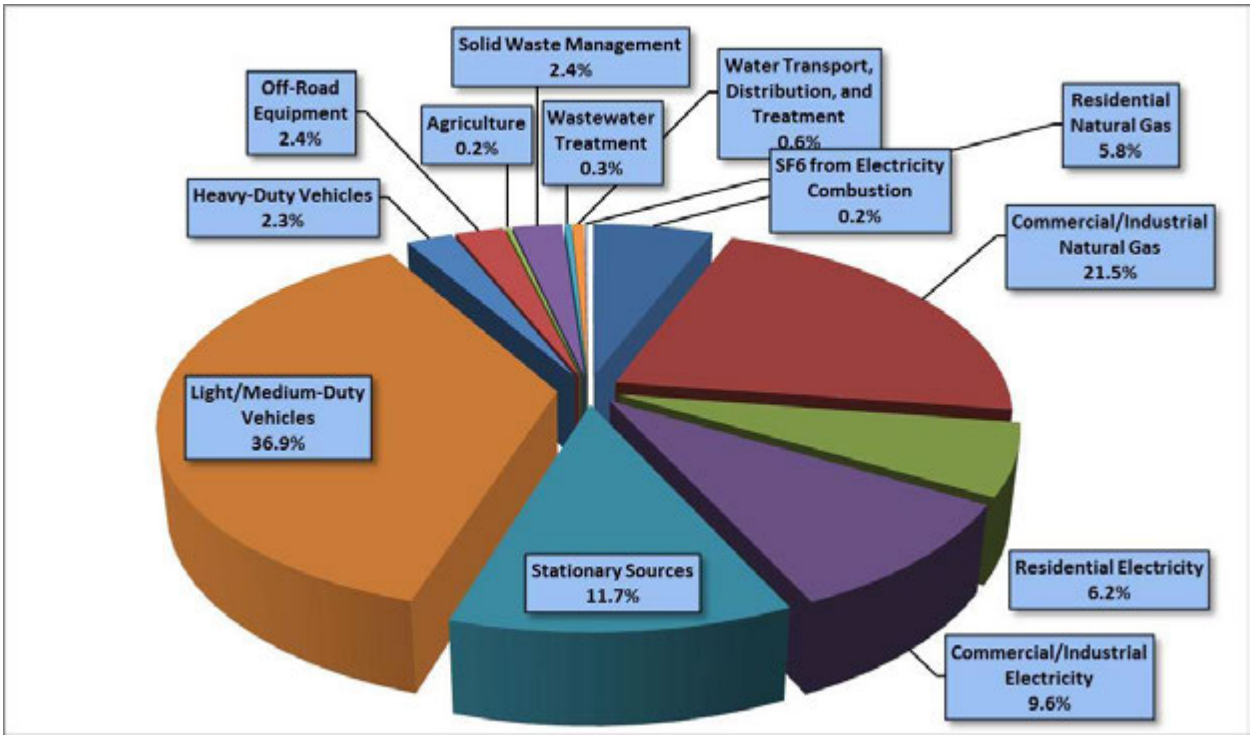
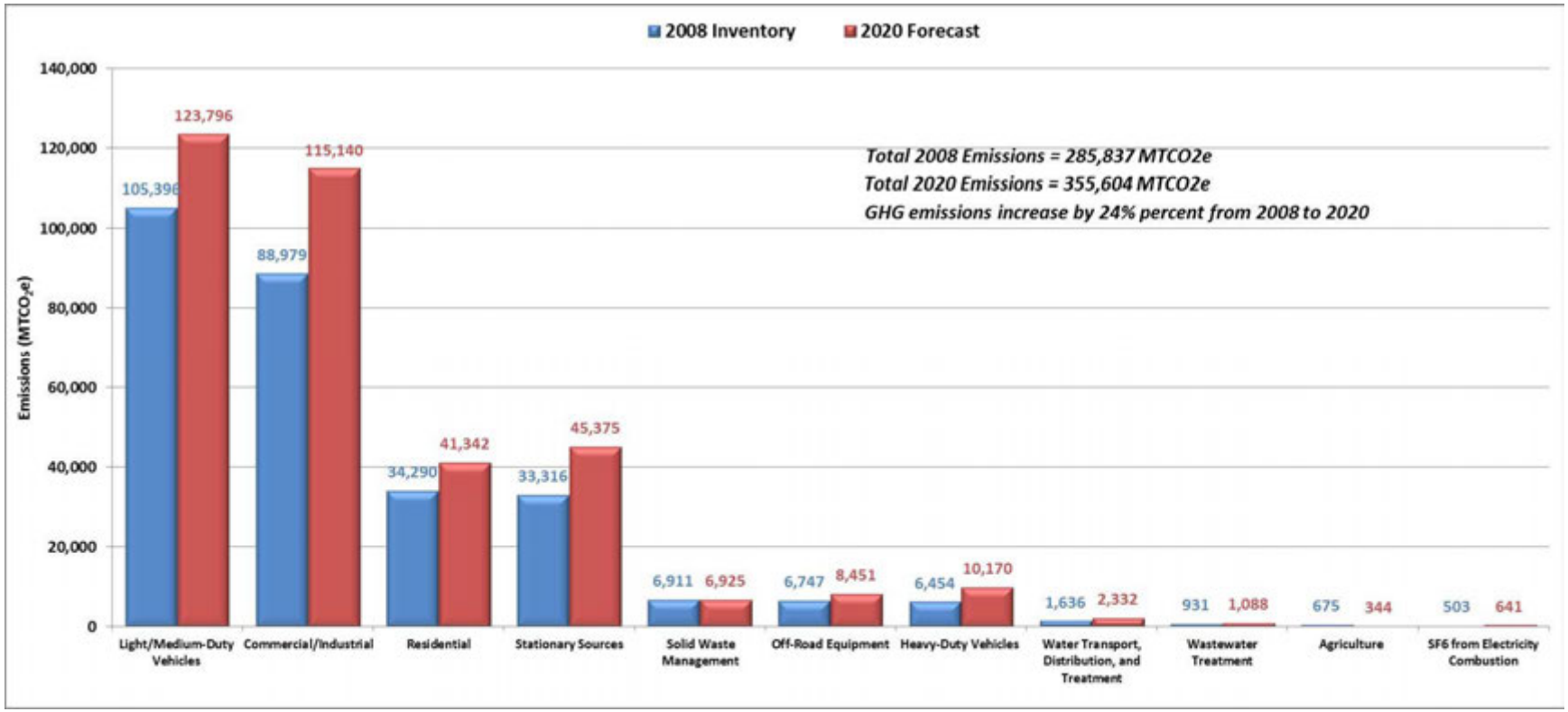


Figure 3-10b. Loma Linda GHG Emissions by Sector for 2008 and 2020



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

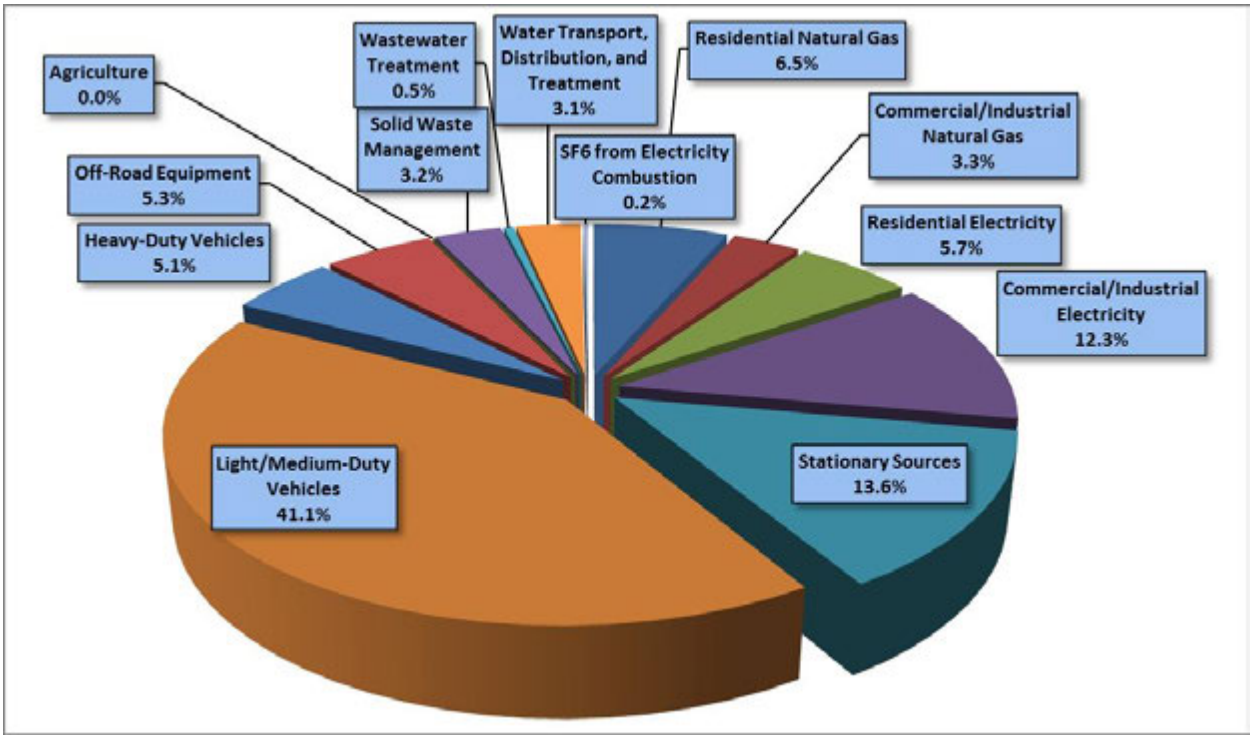
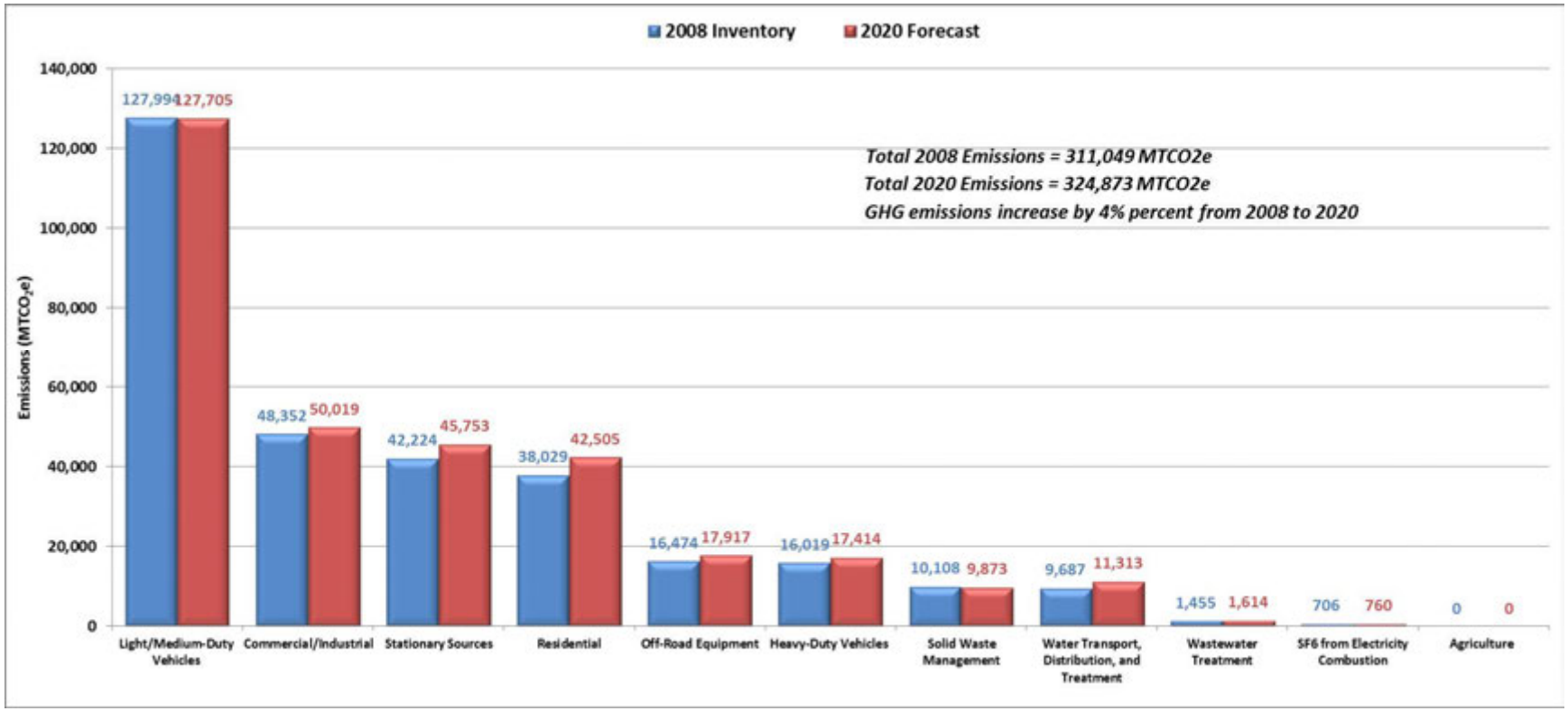


Figure 3-11b. Montclair GHG Emissions by Sector for 2008 and 2020



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

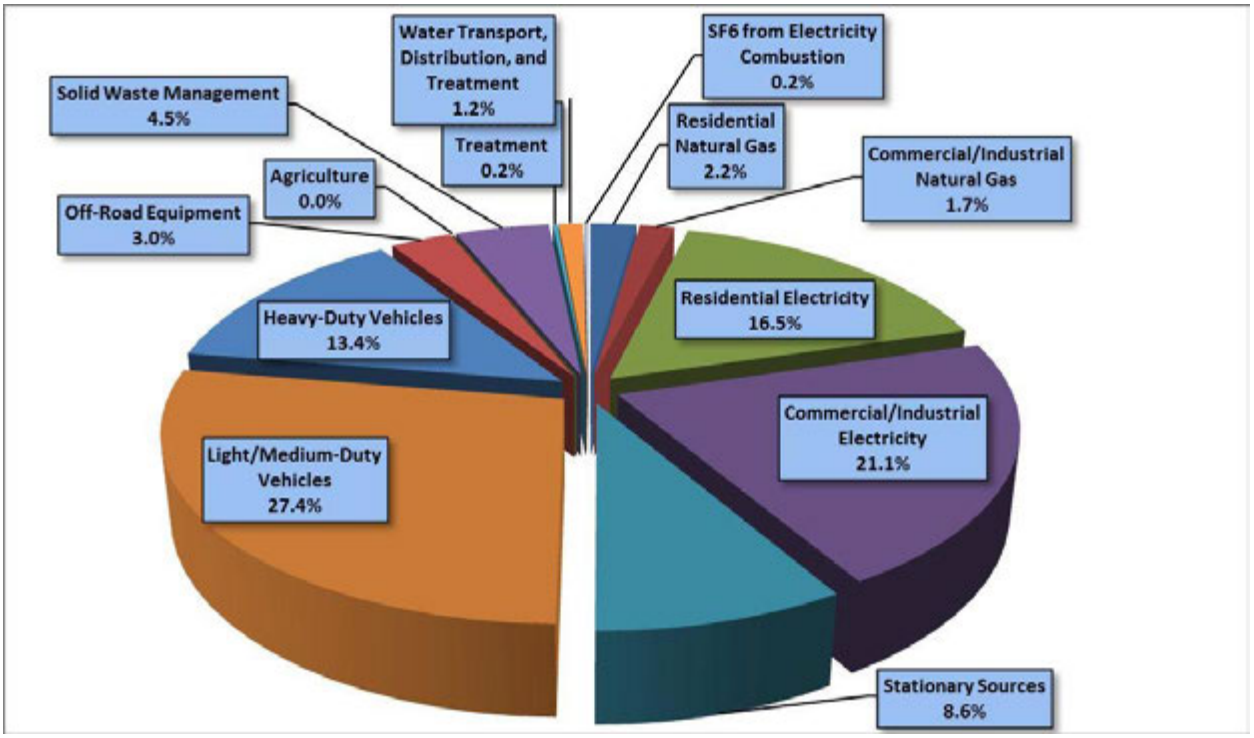
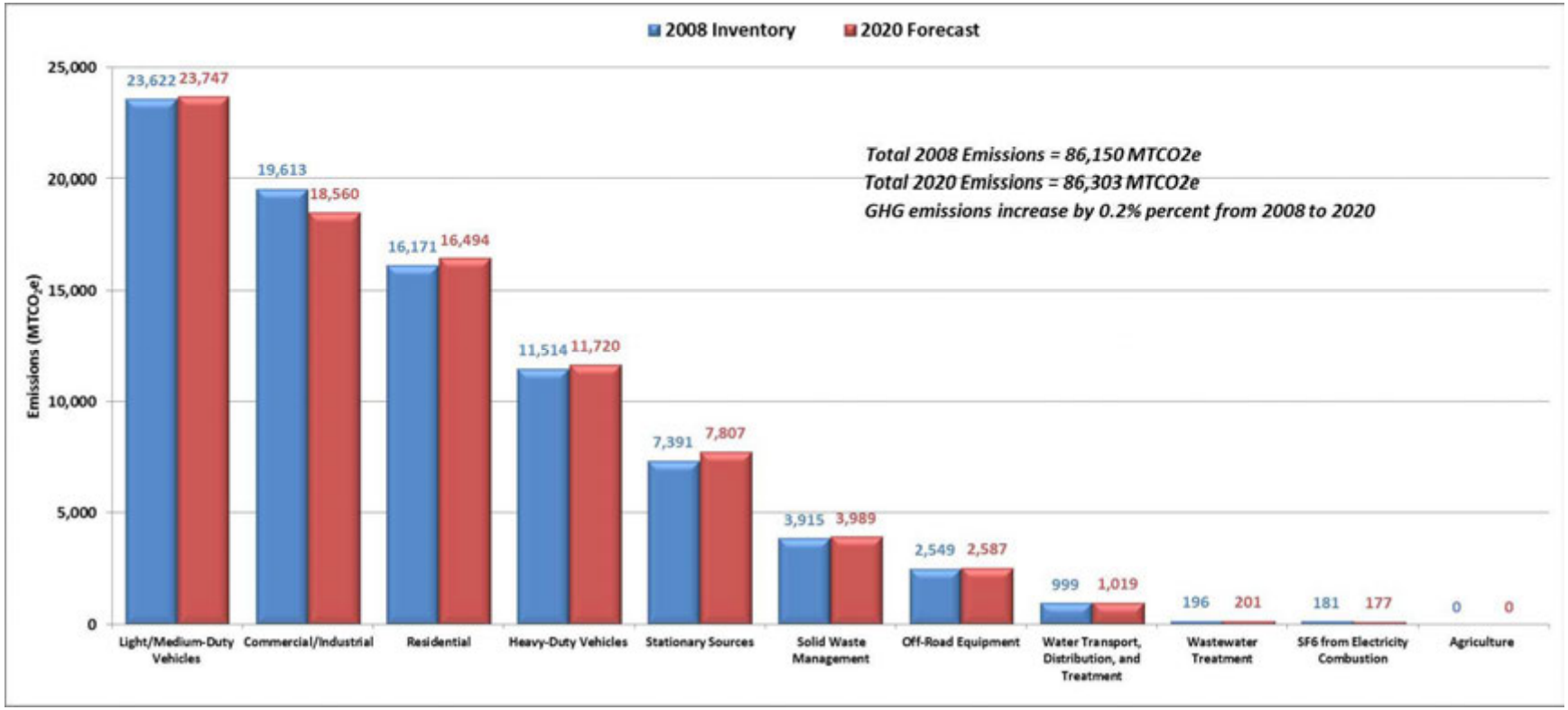


Figure 3-12b. Needles GHG Emissions by Sector for 2008 and 2020



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

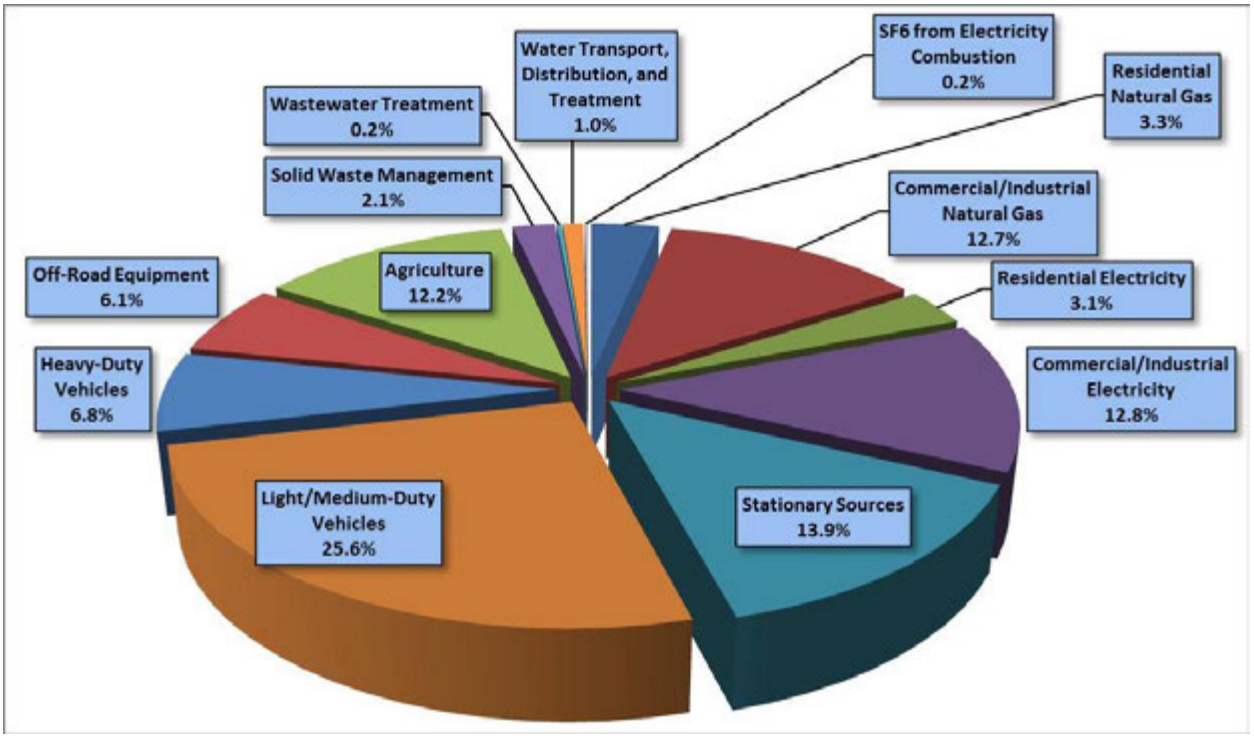
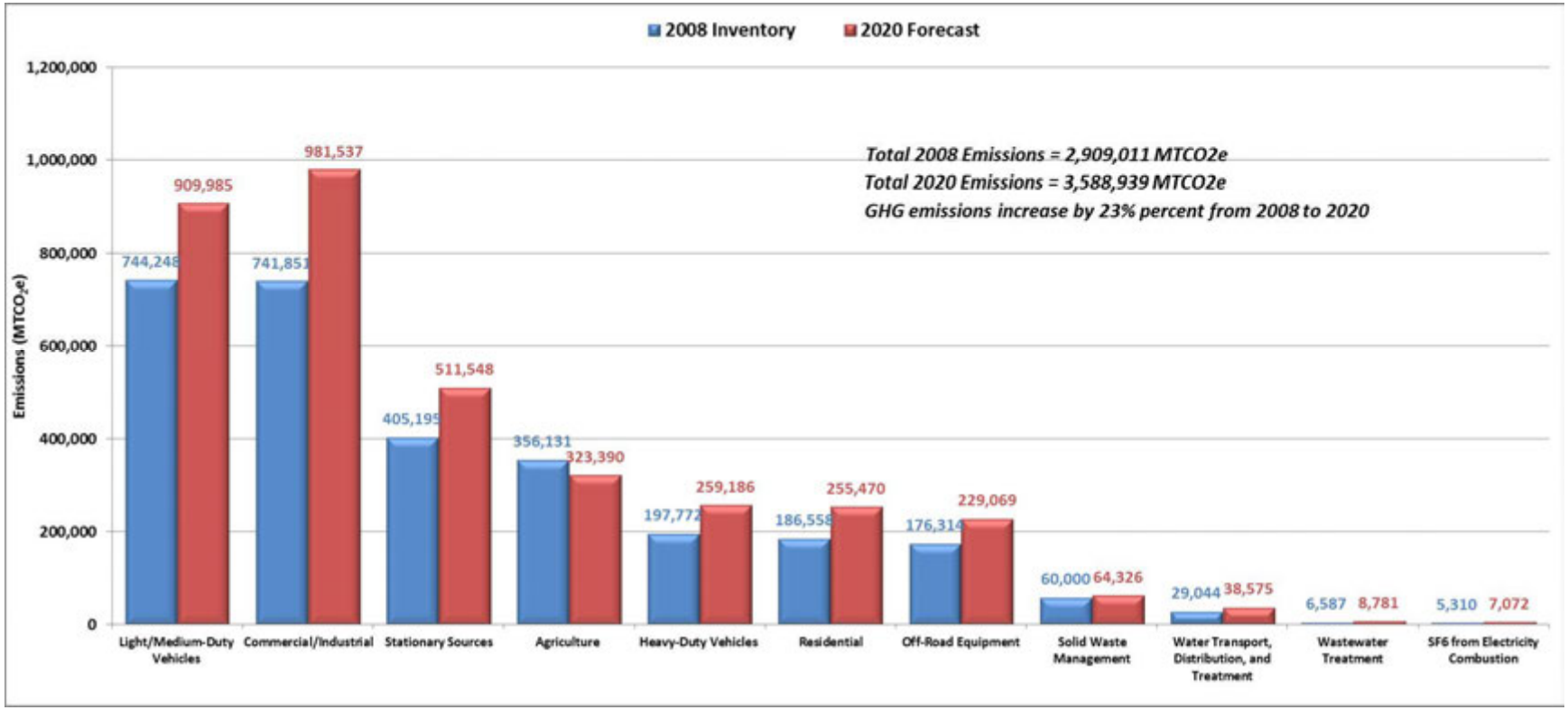


Figure 3-13b. Ontario GHG Emissions by Sector for 2008 and 2020



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

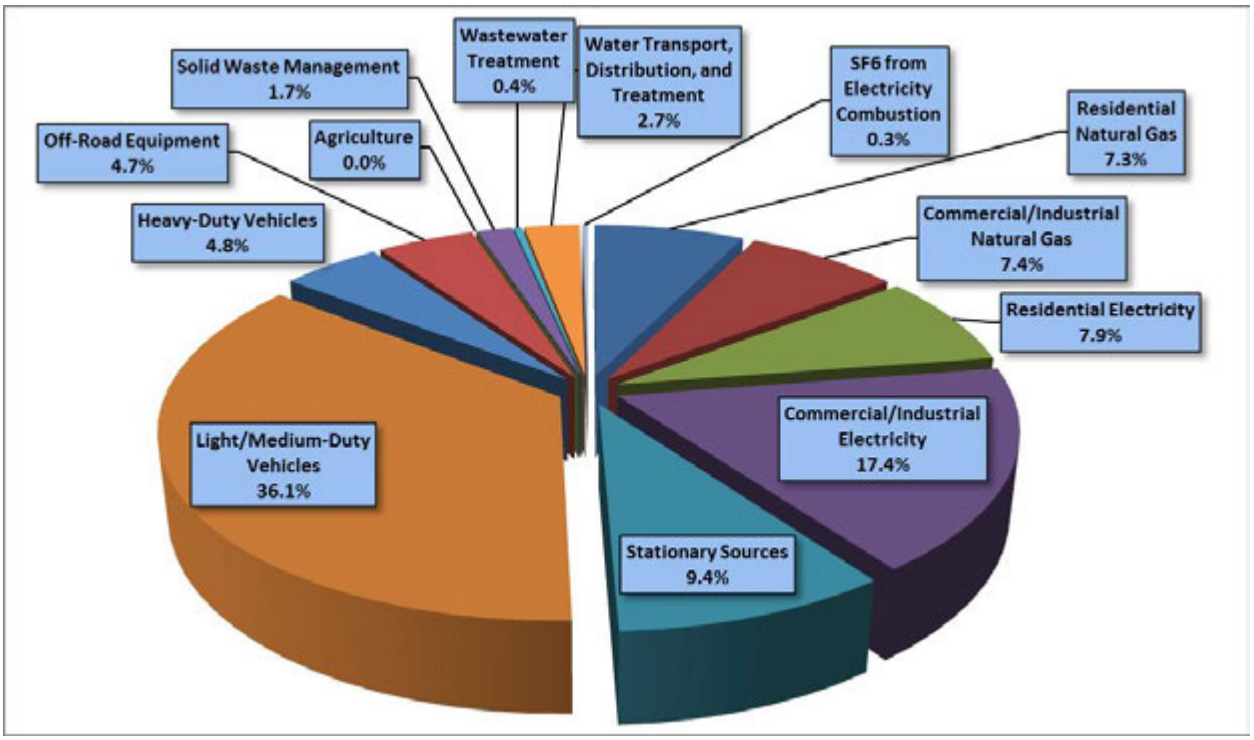
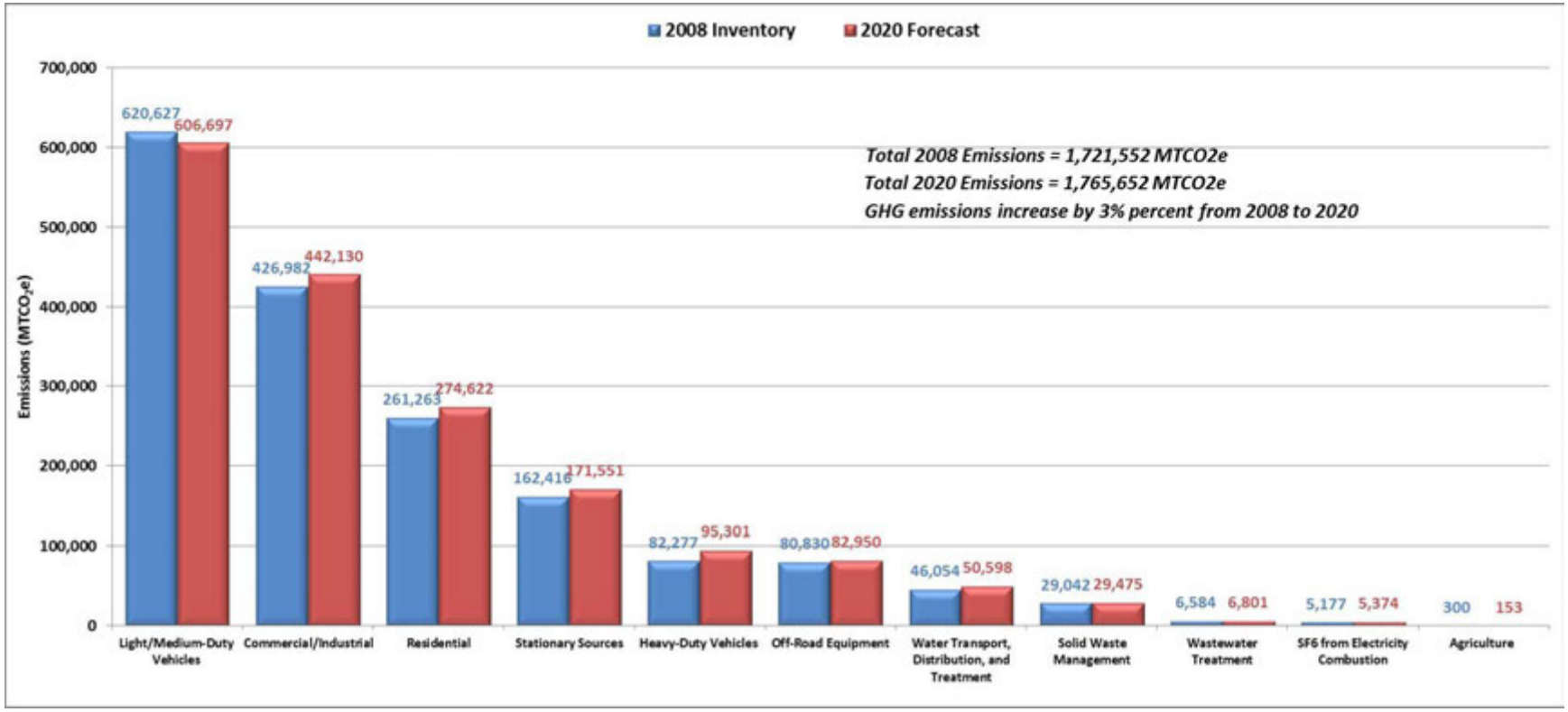


Figure 3-14b. Rancho Cucamonga GHG Emissions by Sector for 2008 and 2020



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

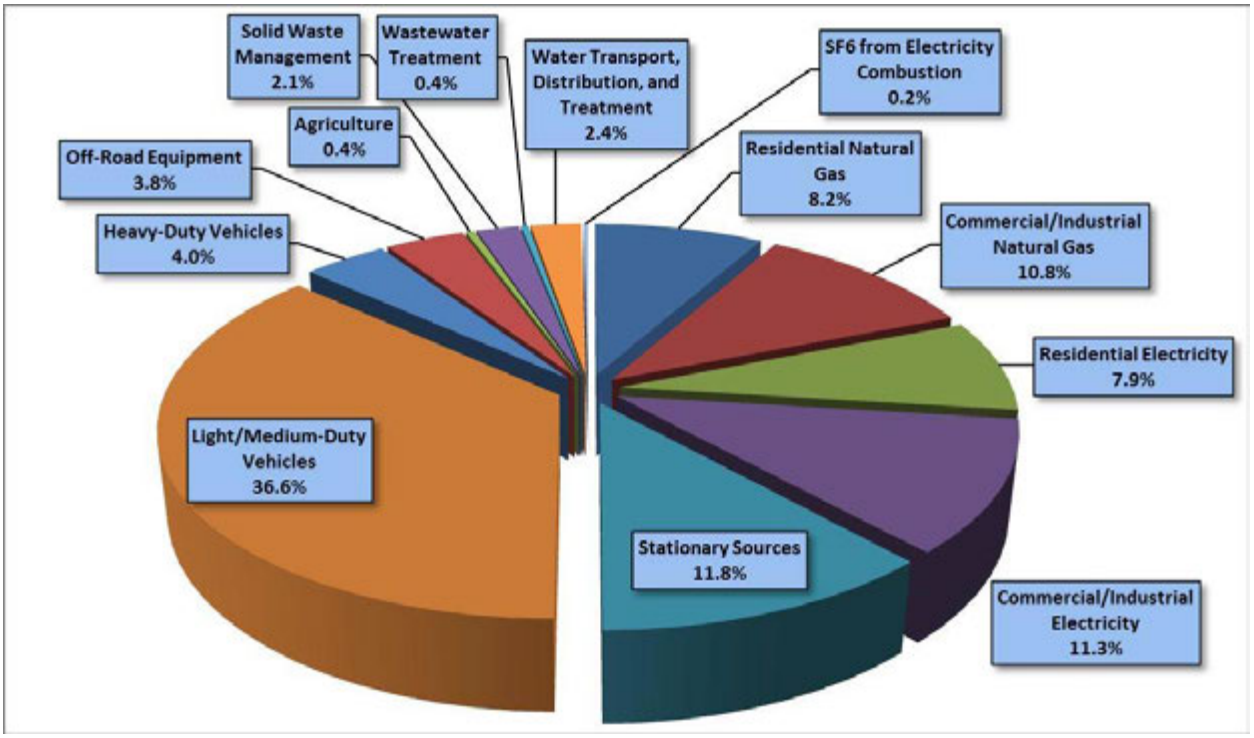
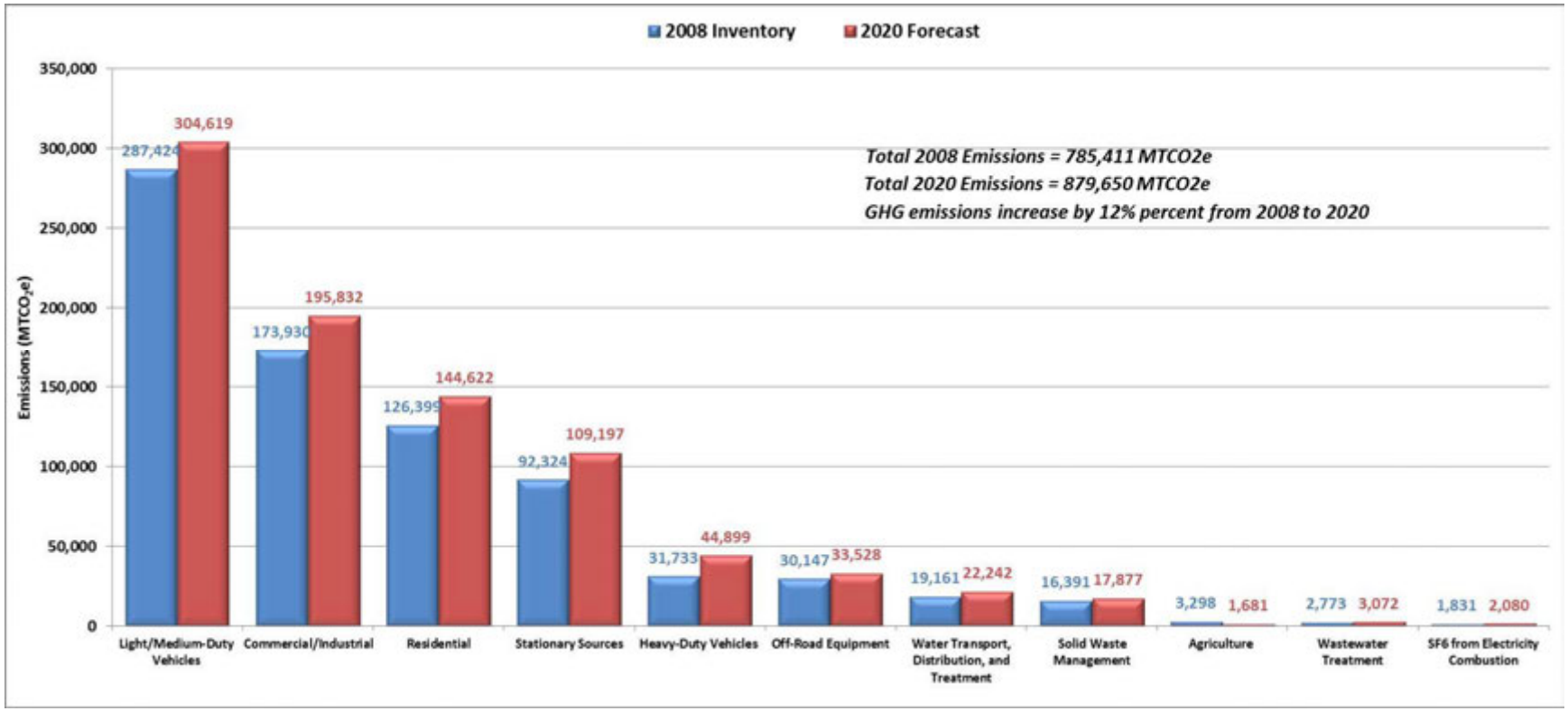


Figure 3-15b. Redlands GHG Emissions by Sector for 2008 and 2020



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

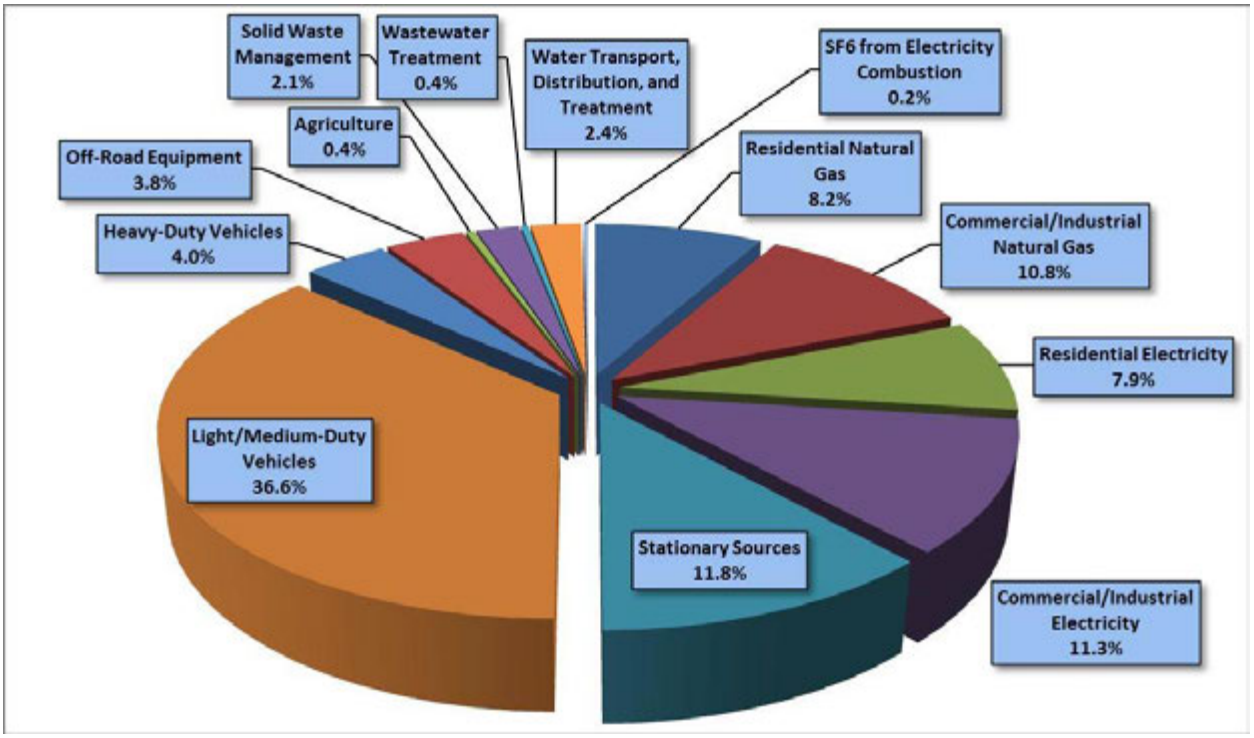
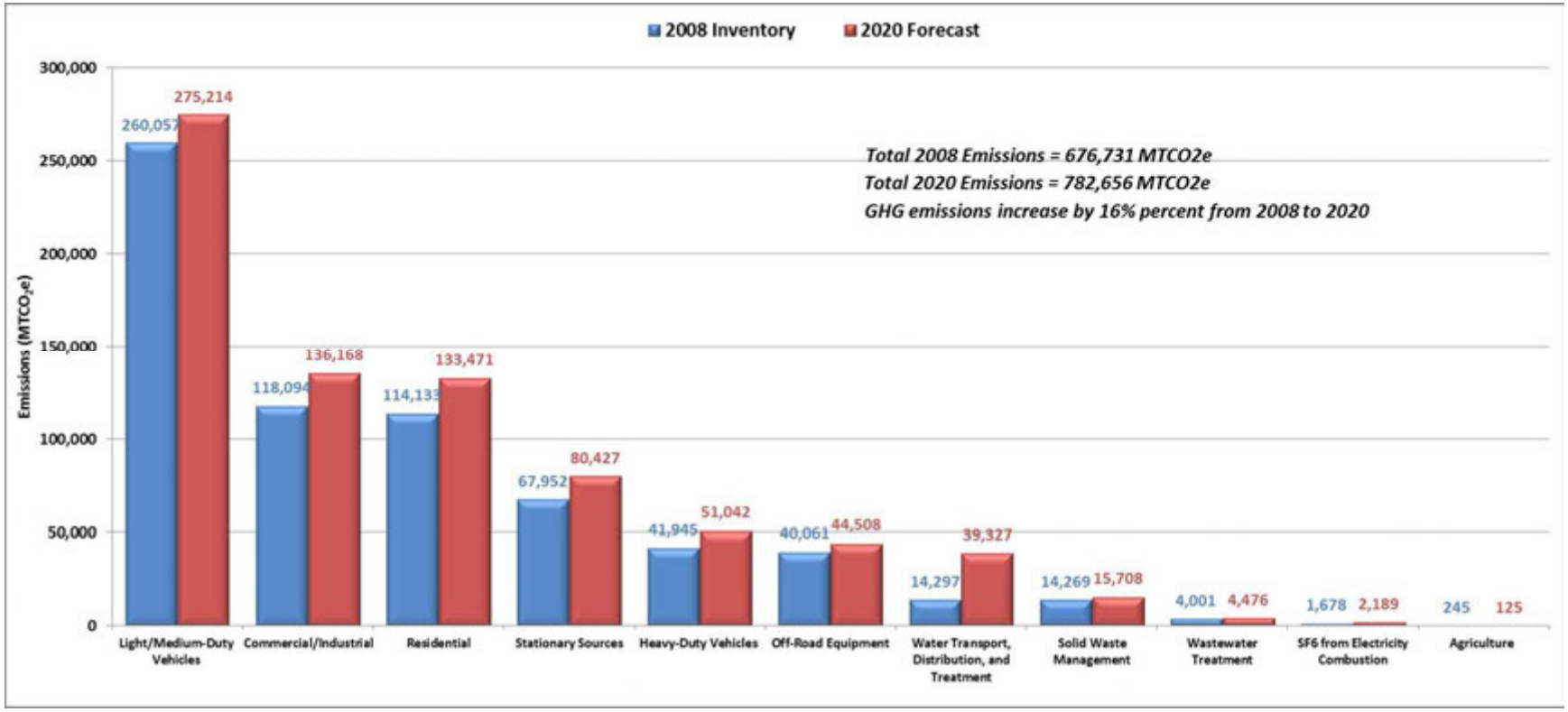


Figure 3-16b. Rialto GHG Emissions by Sector for 2008 and 2020



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

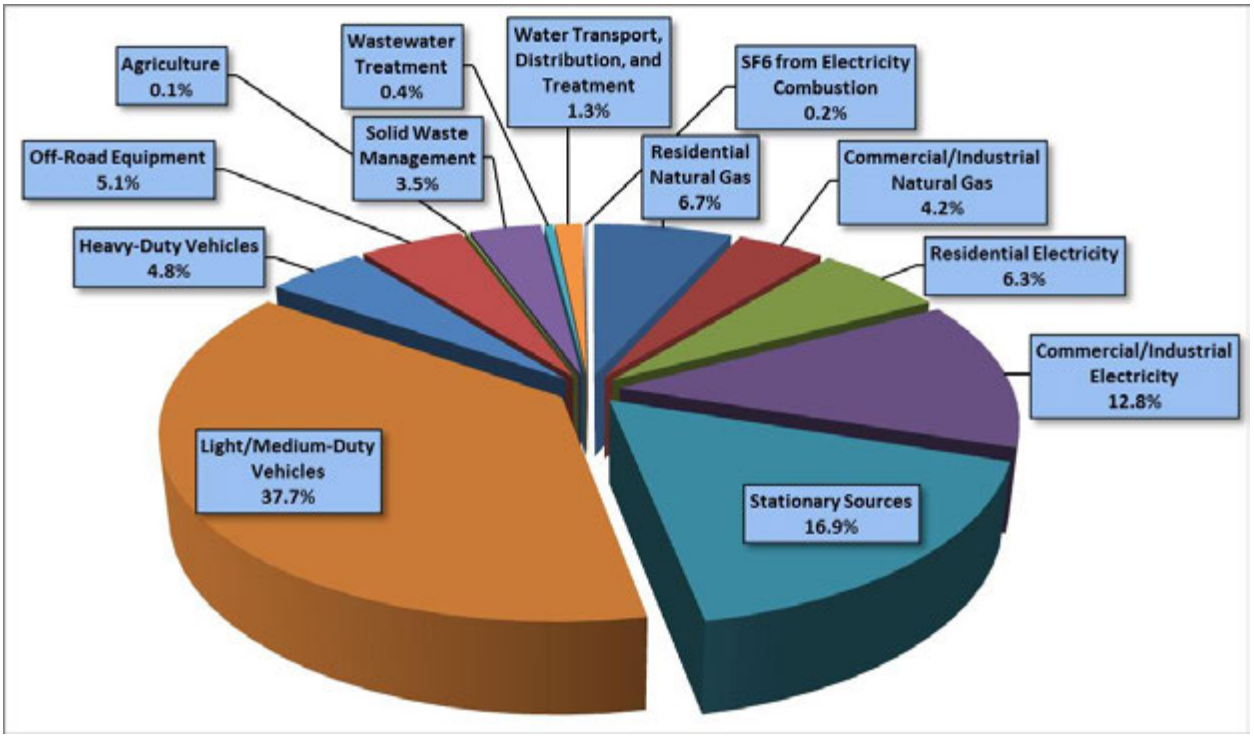
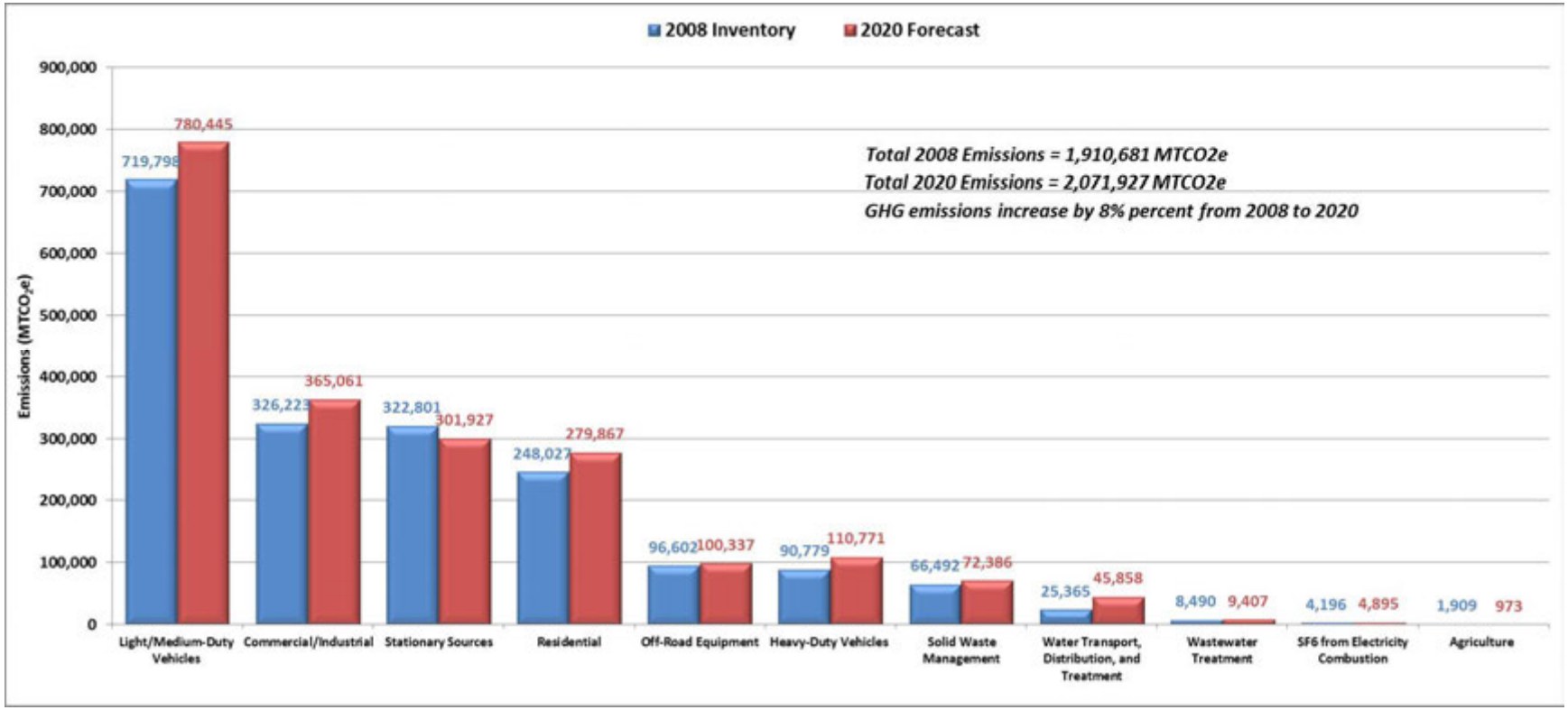


Figure 3-17b. San Bernardino GHG Emissions by Sector for 2008 and 2020



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

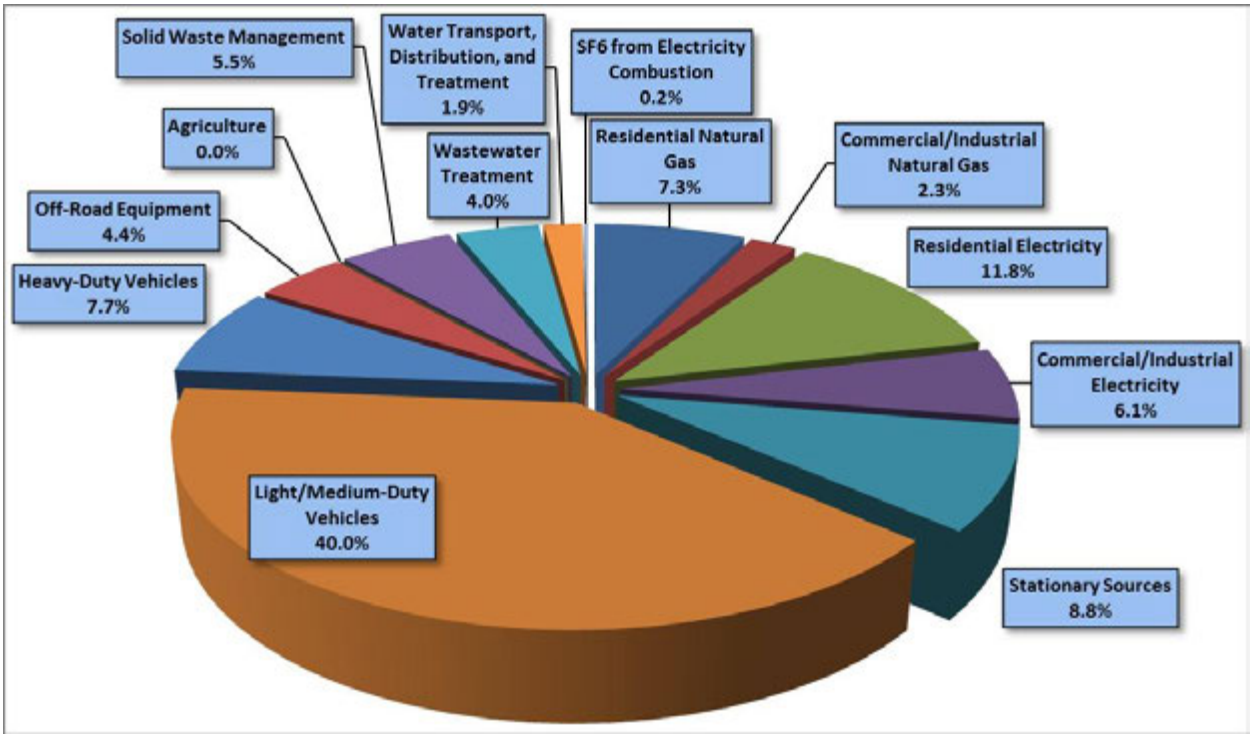
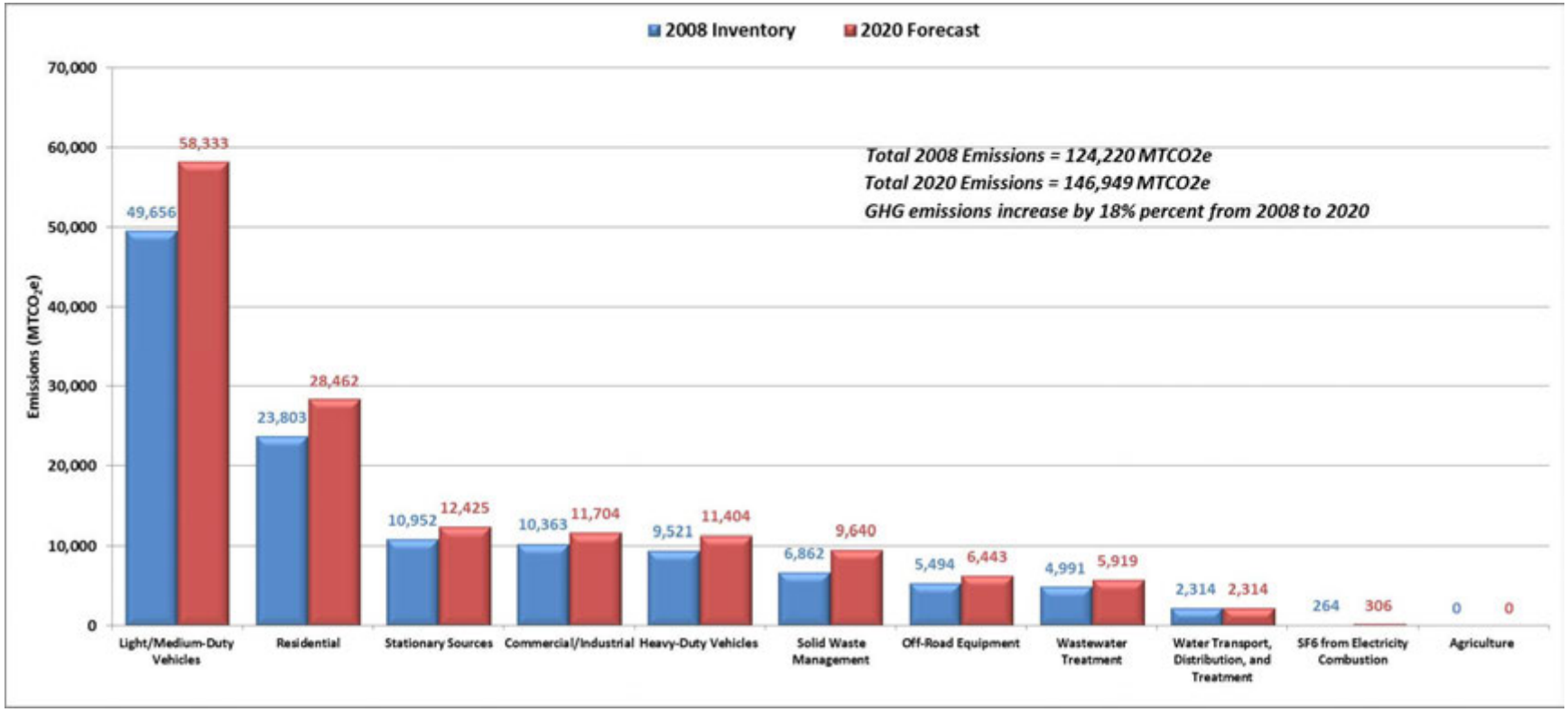


Figure 3-18b. Twentynine Palms GHG Emissions by Sector for 2008 and 2020



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

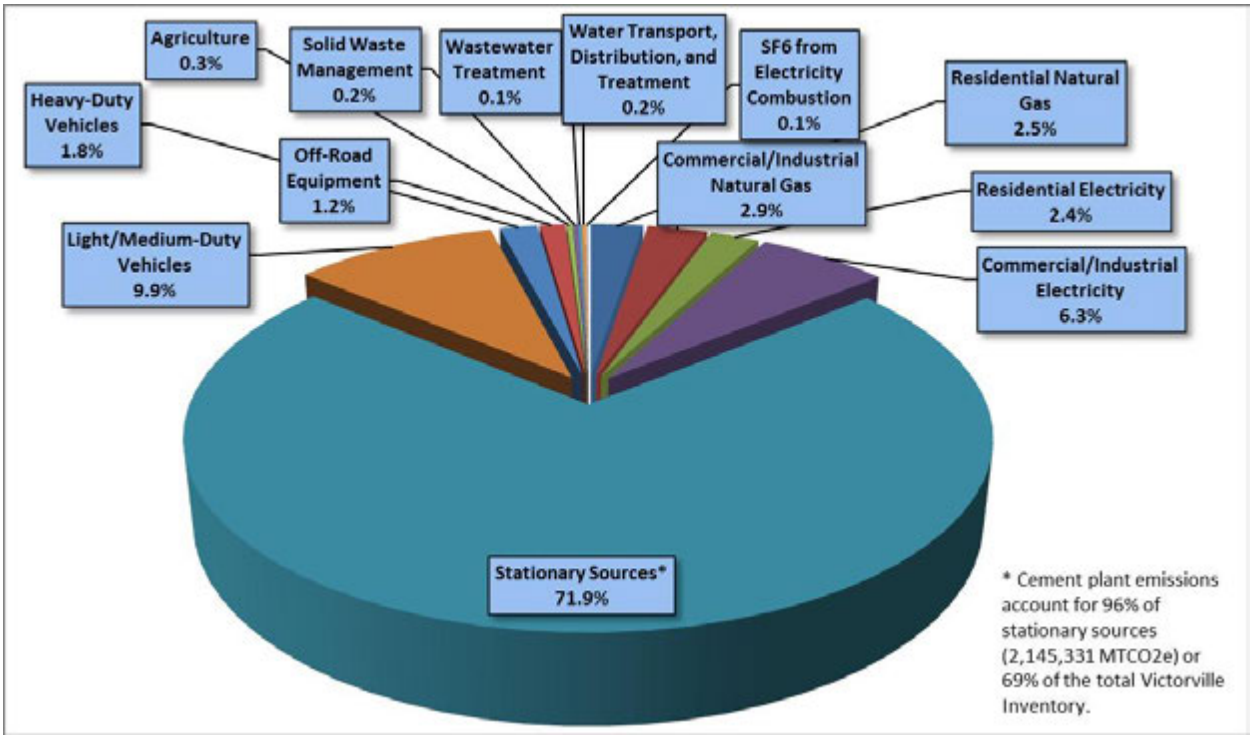


Figure 3-19b. Victorville GHG Emissions by Sector for 2008 and 2020 with Cement Plant Emissions

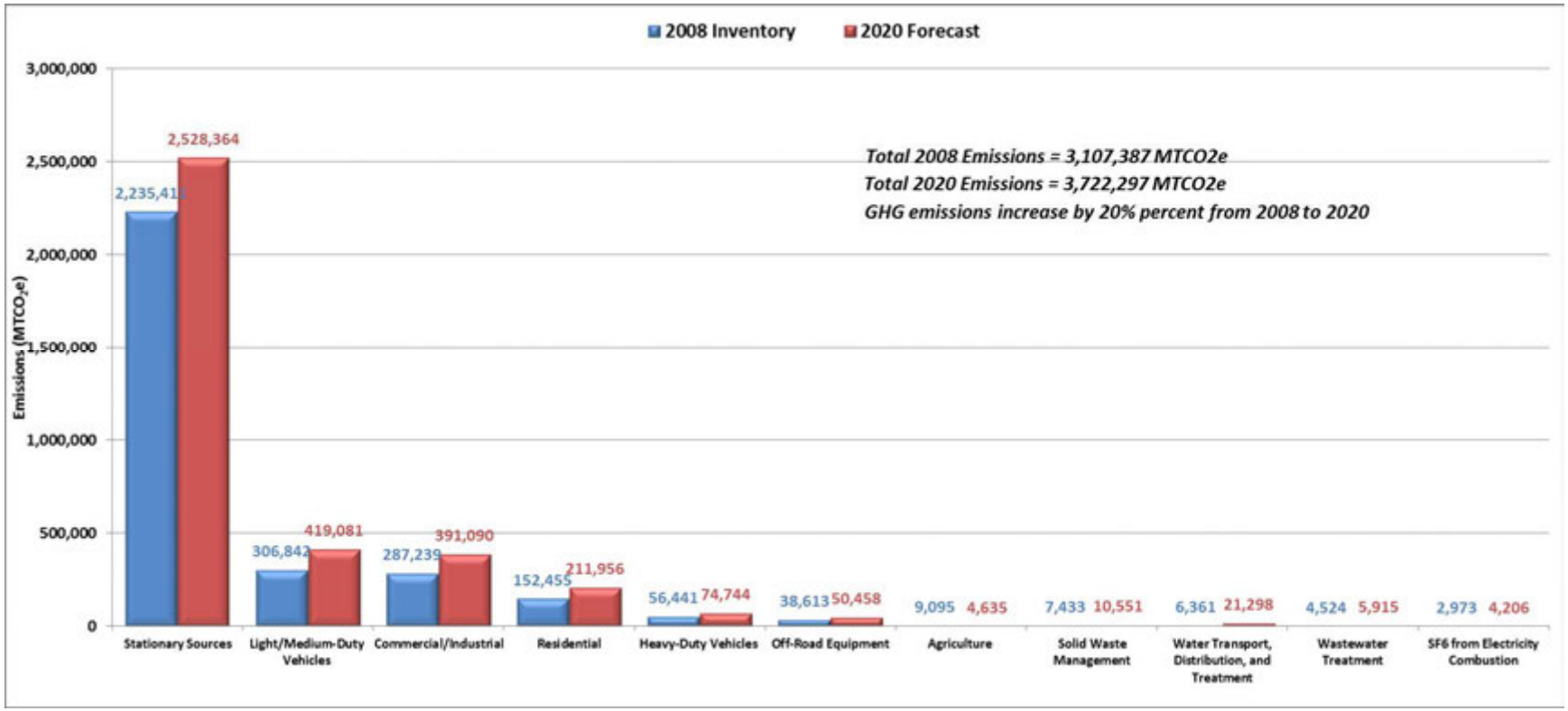


Figure 3-19c. Victorville GHG Emissions by Sector for 2008 without Cement Plant Emissions

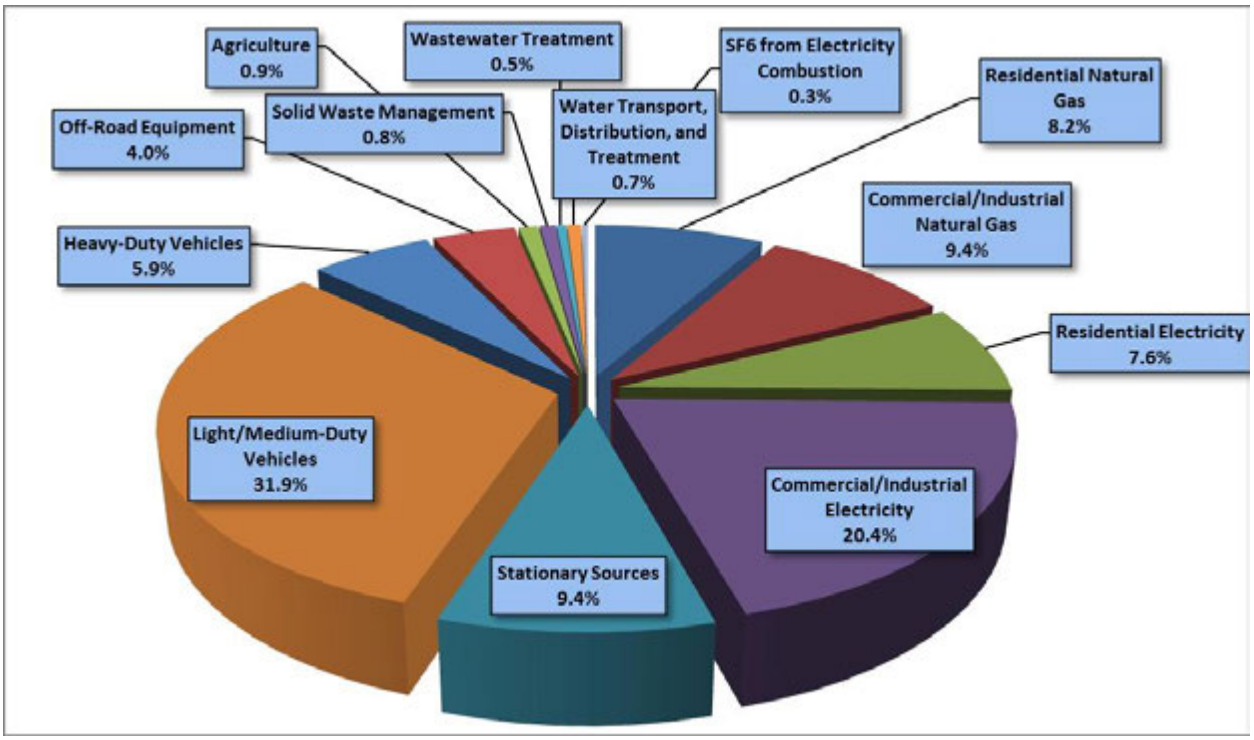
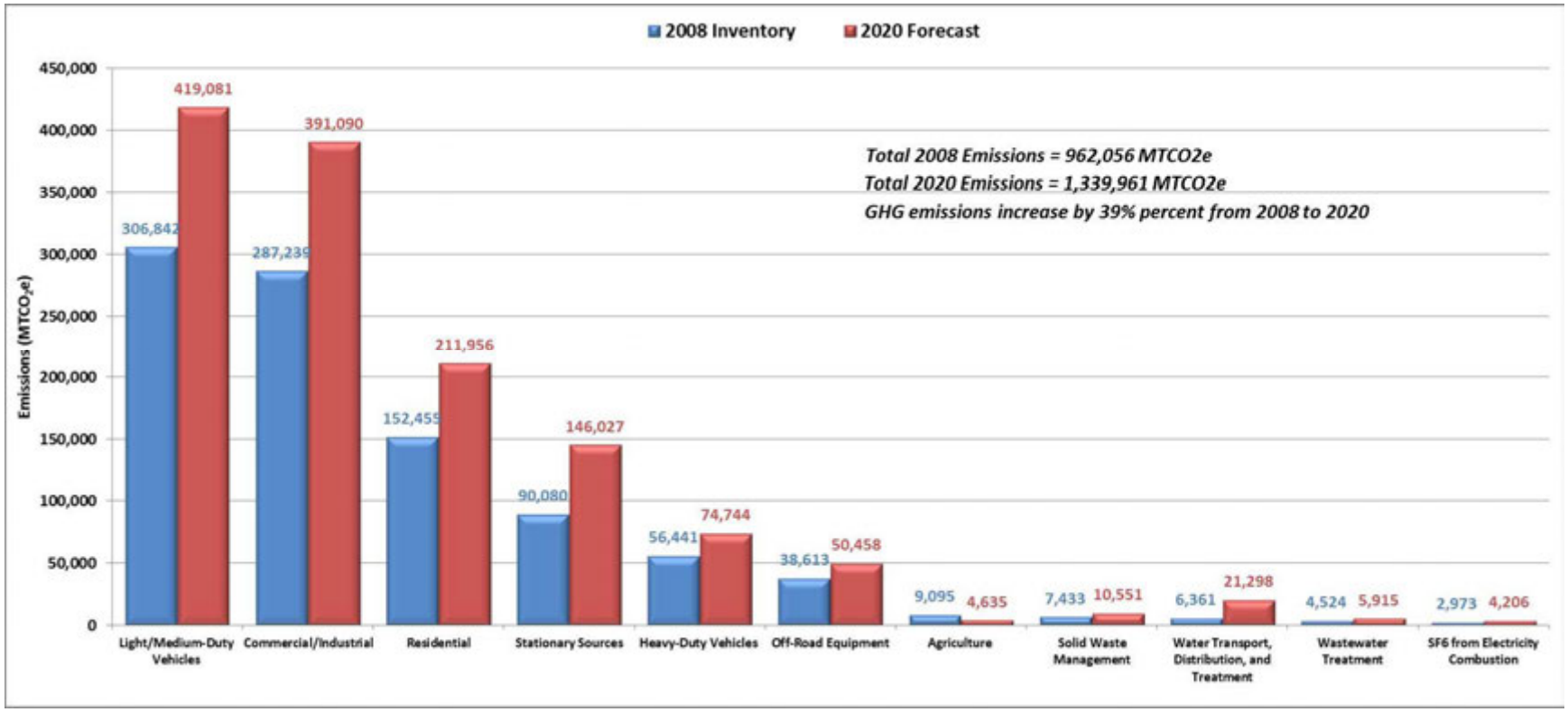


Figure 3-19d. Victorville GHG Emissions by Sector for 2008 and 2020 without Cement Plant Emissions



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

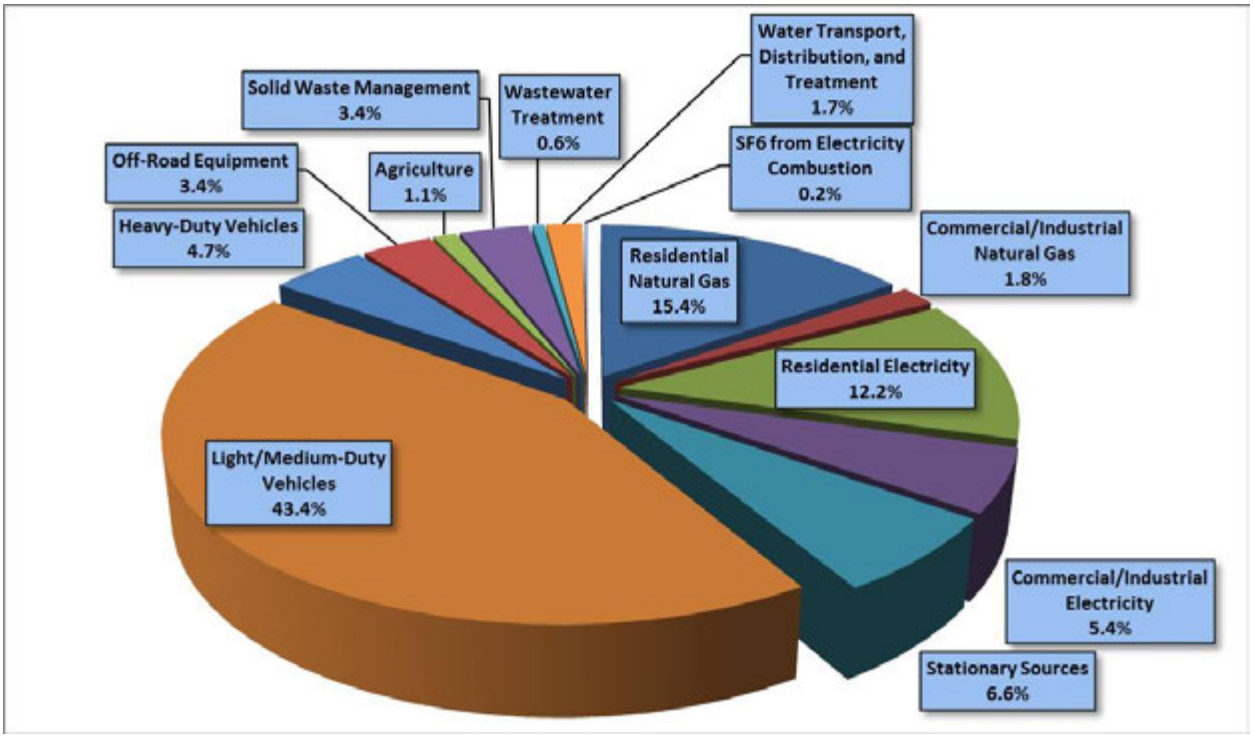
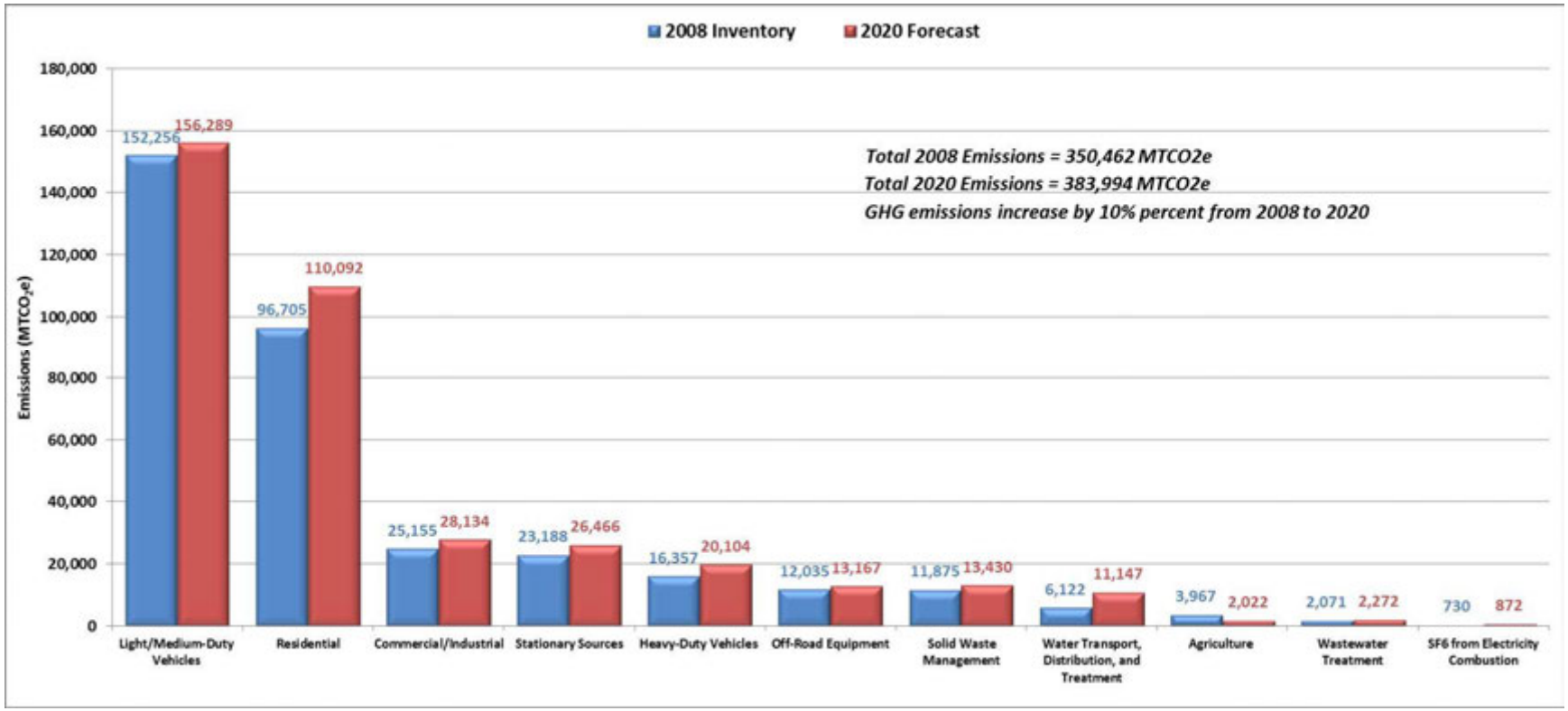


Figure 3-20b. Yucaipa GHG Emissions by Sector for 2008 and 2020



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

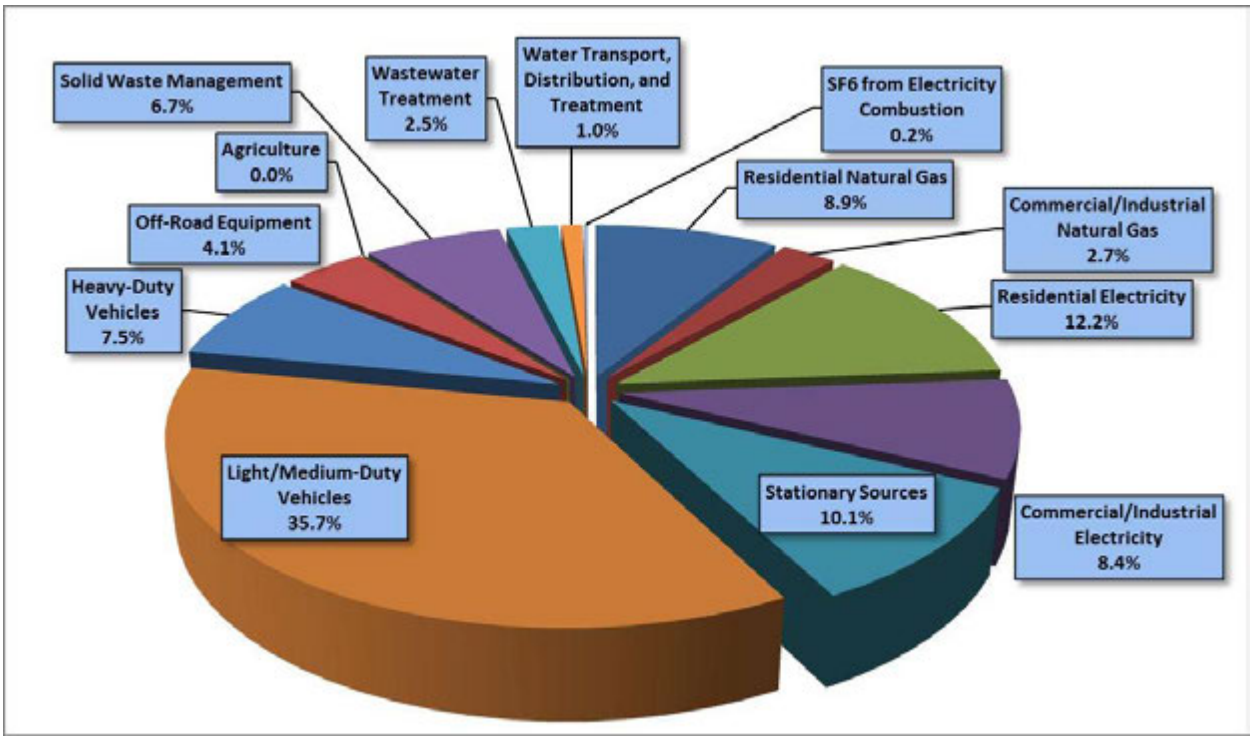
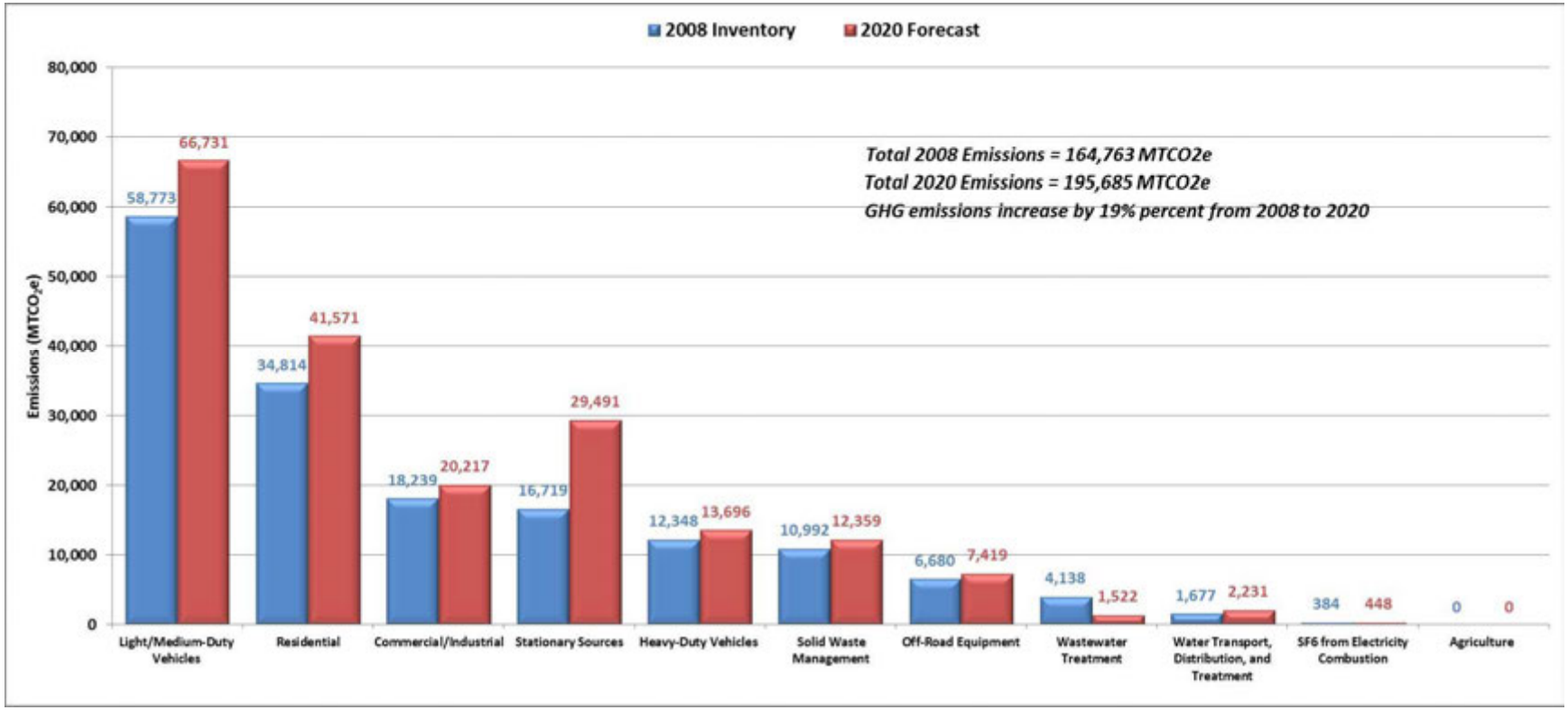


Figure 3-21b. Yucca Valley GHG Emissions by Sector for 2008 and 2020



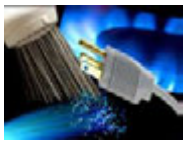
Section 4
Inventory Results by Sector

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.

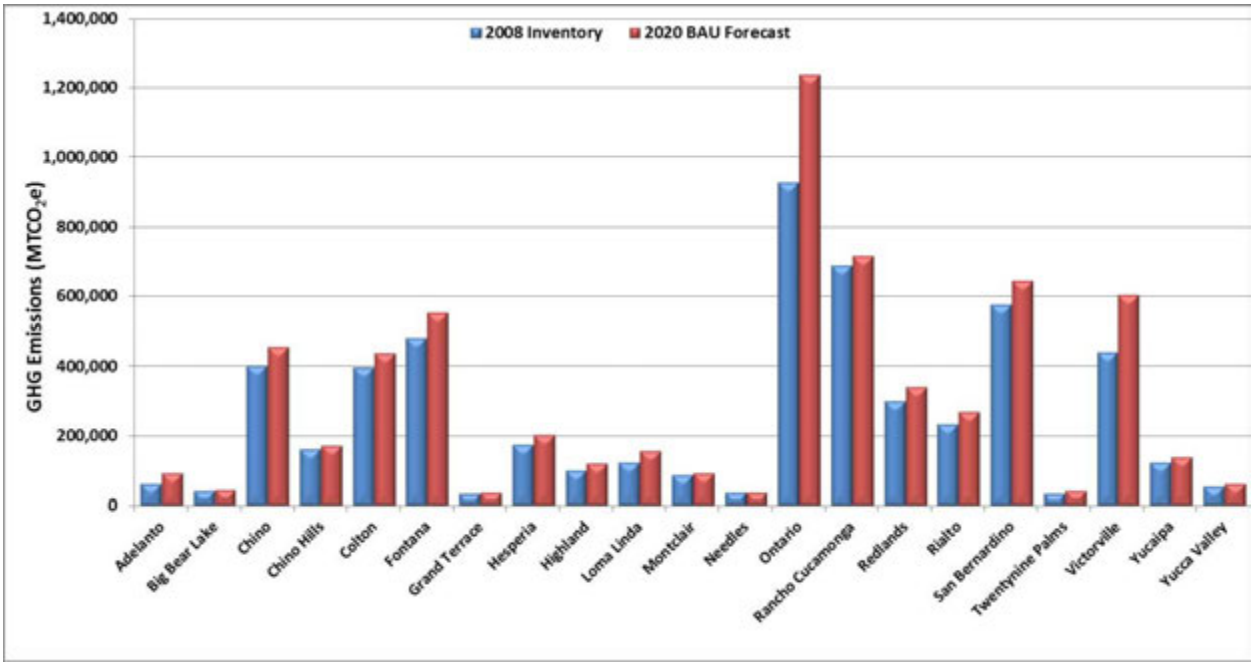
[1] Emissions from electricity or natural gas consumption by on-site stationary equipment are not included in the activity estimates for building energy. Please refer to Section 6.2, "Stationary Sources," for a discussion of these emissions.

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.

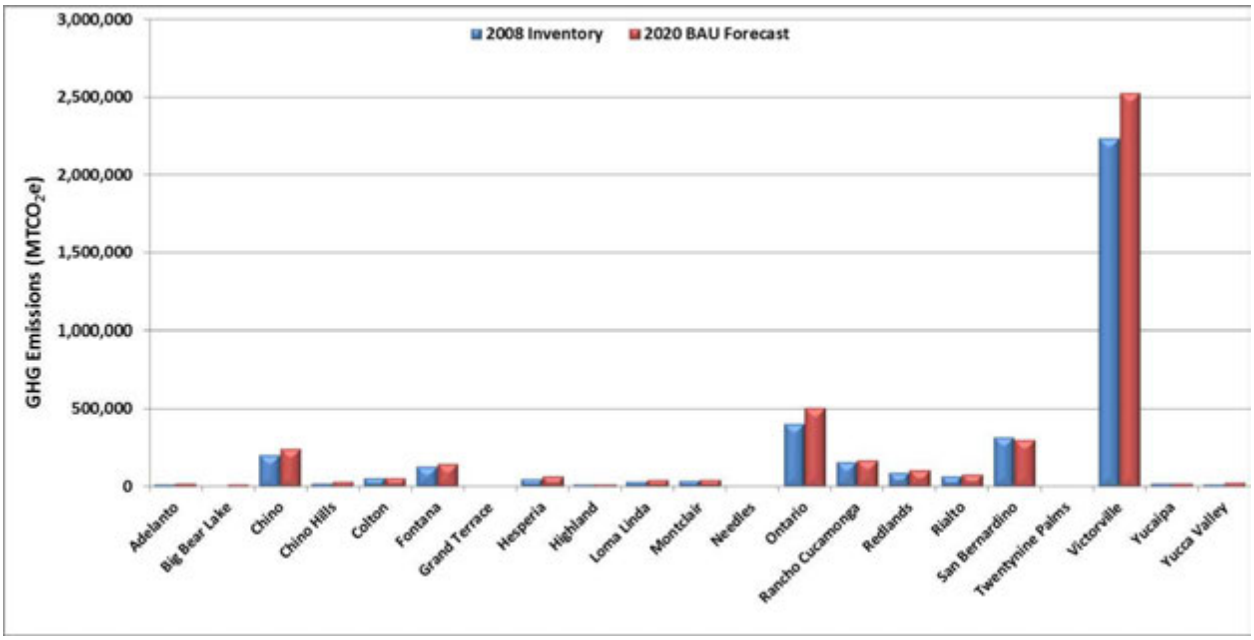
Table 4-2. 2008 Stationary Source Emissions by City ($MTCO_2e$)

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.

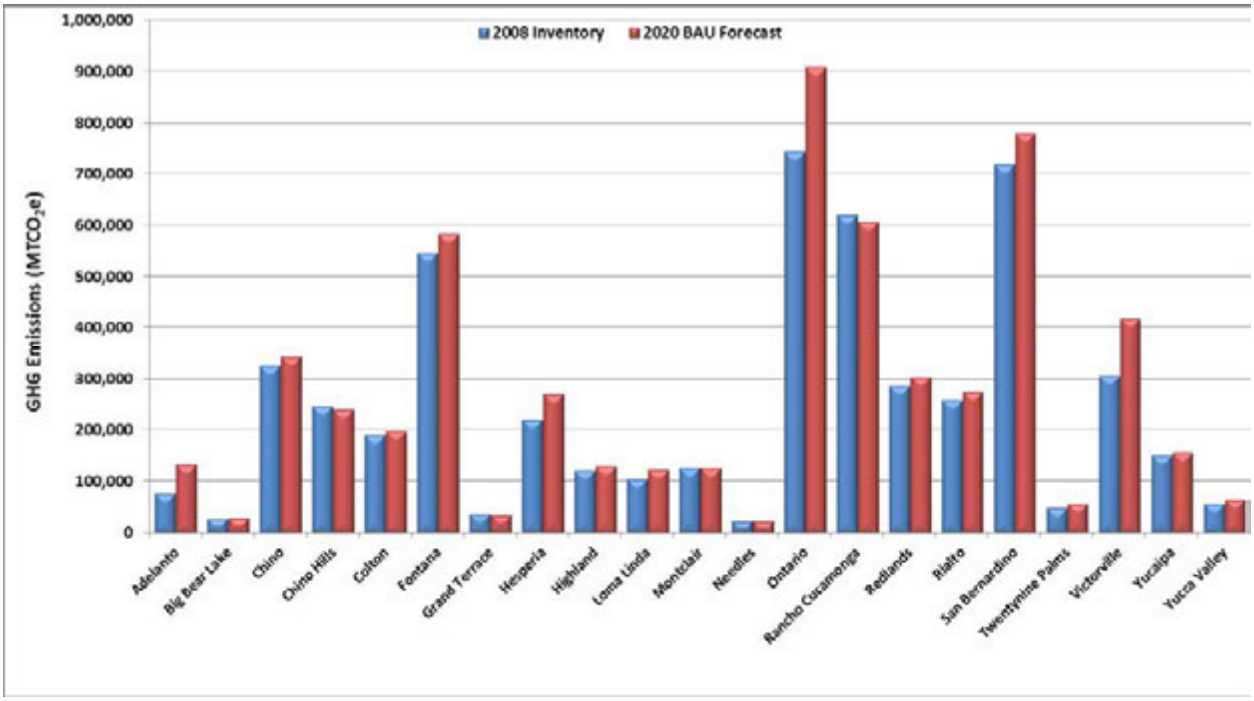
Table 4-4. 2008 Light/Medium-Duty Vehicle VMT and Emissions by City

		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.

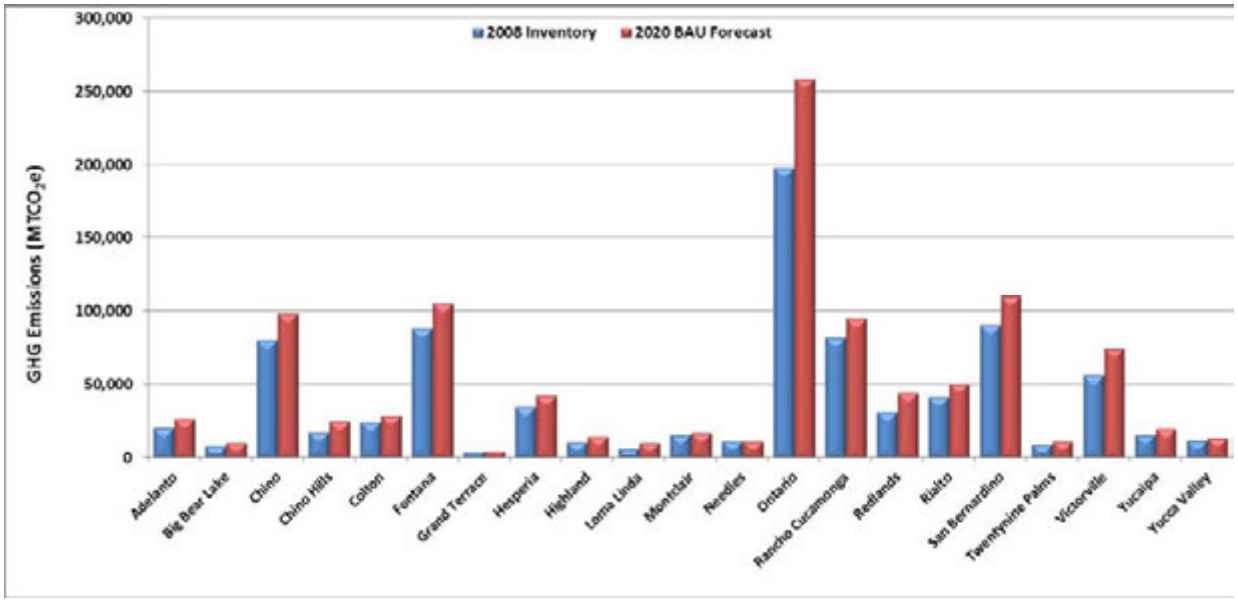
Table 4-6. 2008 Truck VMT and Emissions by City

		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

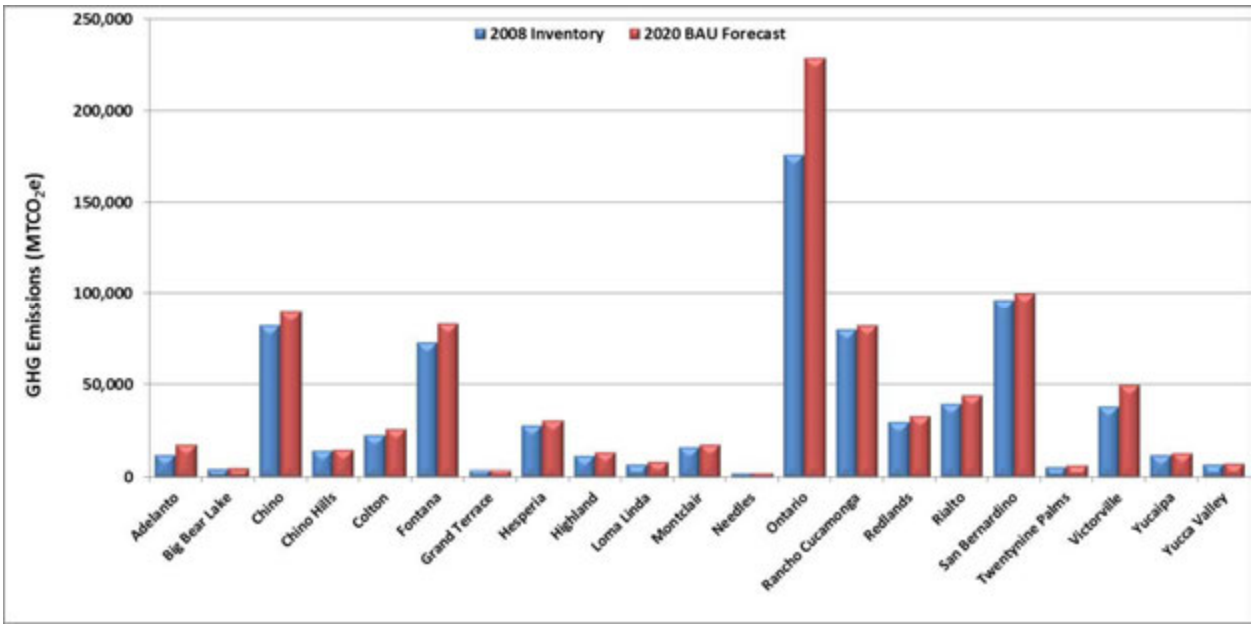
Off-road equipment emissions accounted for approximately 4% of the total Regional Emissions in 2008. These are direct emissions resulting from equipment fuel combustion. Off-road equipment includes recreational boats and vehicles and equipment for industry, construction, lawn and garden maintenance,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

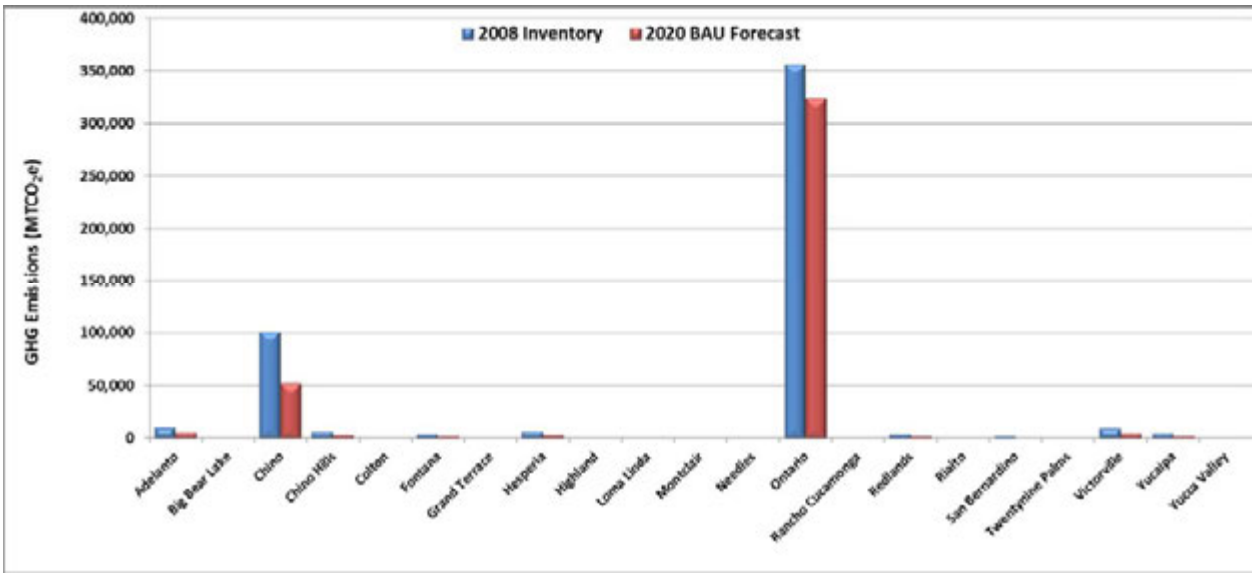
The three general sources of agricultural emissions evaluated in this inventory include livestock enteric fermentation, livestock manure management, and N_2O emissions from the application of fertilizer. See Appendix A for more detail.

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.

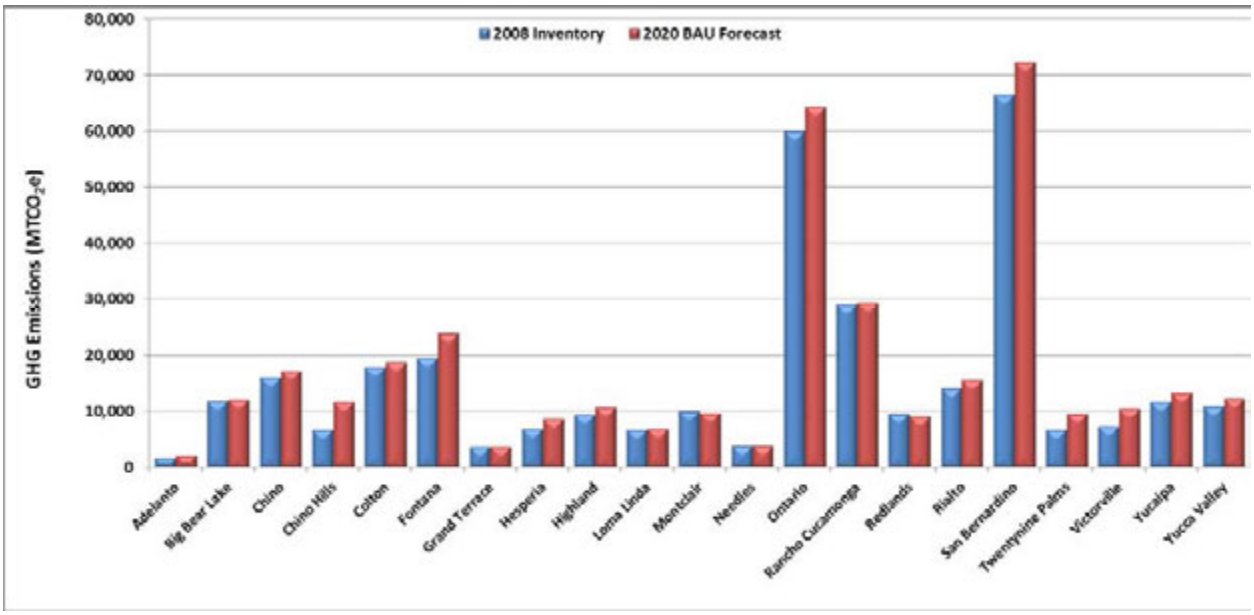
Table 4-10 presents 2008 and 2020 BAU emissions for generation-based solid waste emissions. Figure 4-7 presents 2008 and 2020 emissions for each city. Solid waste management emissions are generally a function of population and employment in each city.

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.

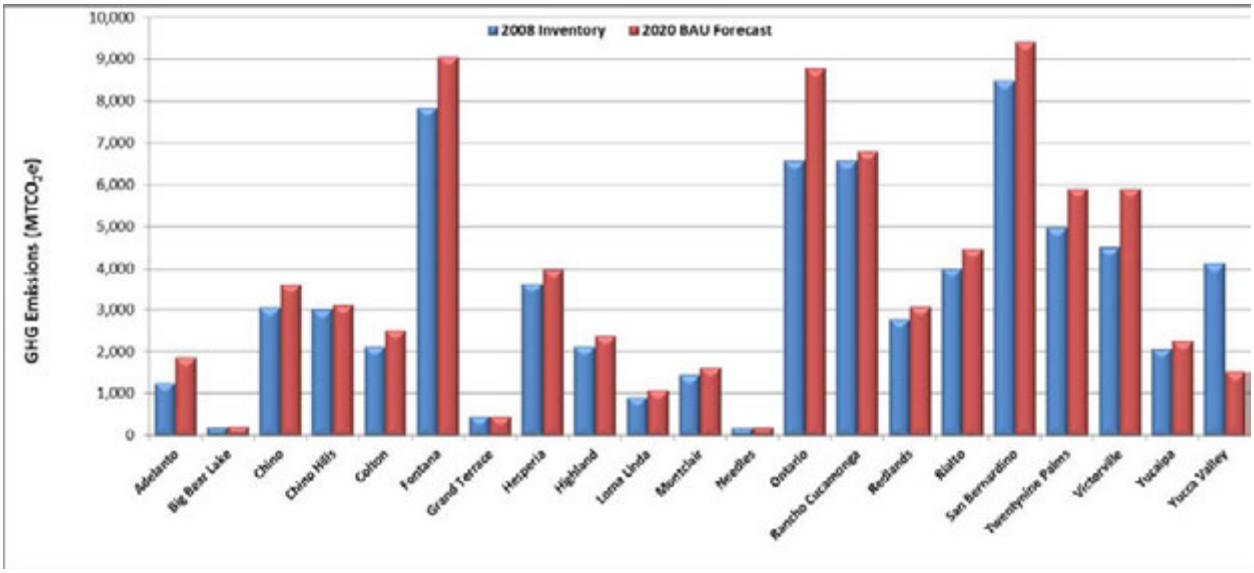
In addition, some cities rely on municipal septic systems as opposed to centralized WWTPs, including Twentynine Palms and Yucca Valley. Septic systems also release fugitive emissions of CH_4. These emissions are included in the inventory and in Table 4-11.

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.

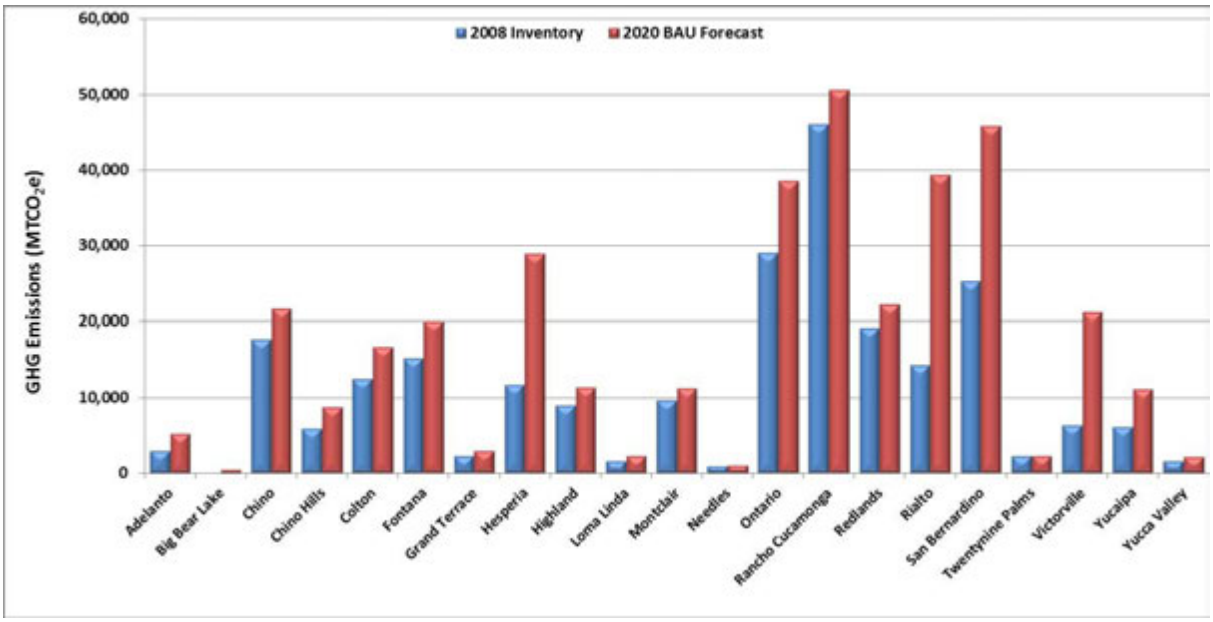
Table 4-12. 2008 Water Transport, Distribution, and Treatment GHG Emissions by City

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

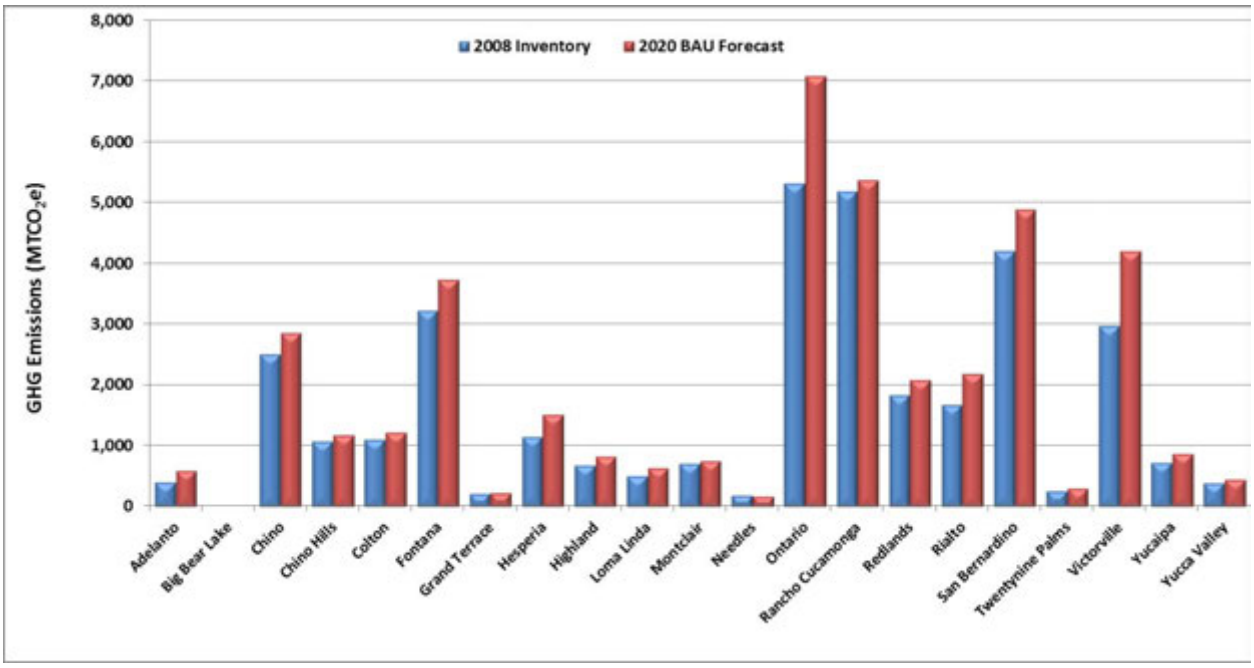
Emissions of SF_6 from transmission of electricity to each city accounted for approximately 0.2% of total 21-city region emissions in 2008. These emissions include leaked SF_6 from electrical transmission and distribution systems, and are an indirect emissions source. SF_6 is used to insulate power switching 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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Appendix B
GHG Reduction Measure Methods

B.1 Introduction

This Appendix provides a detailed overview of the calculations and assumptions used to quantify greenhouse gas (GHG) emissions reductions for each of the San Bernardino Regional Greenhouse Gas Reduction Plan (Plan) GHG reduction measures. A qualitative discussion of benefits is also presented. The following information is provided for each measure.

- **Measure Description**: Details the implementation requirement(s) and reduction goal for each measure.
- **Assumptions**: Includes all assumptions used in calculating emissions reductions.
- **Analysis Details**: Presents the methods for calculating 2020 business-as-usual (BAU) emissions[1], 2020 emissions with state measures and 2020 emissions with local measures. A qualitative summary of benefits is also provided. For additional information, please refer to the citations provided for each measure.

As an introduction to the measure details, this Appendix begins with an overview of the general GHG quantification methods by emissions sector.

B.2 Overview of GHG Methods

The quantification of GHG reductions was based on guidance provided by the California Air Pollution Control Officers Association (CAPCOA), other reference sources (such as the U.S. Environmental Protection Agency), and professional experience obtained from preparing climate action plans (CAP) for other jurisdictions in California. The majority of calculations were performed using standard factors and references, rather than performing a specific analysis of individual technologies. The following sections provide an overview of general calculation methods by emissions sector.

To avoid double counting emissions savings achieved by state programs, emissions reductions attributed to the candidate measures subtract reductions achieved through the relevant state measures first. Likewise, emissions reductions attributed to certain candidate measures subtract reductions achieved by overlapping local measures. By removing overlapping reductions, one can combine GHG reduction strategies to determine the cumulative effect of several measures without double counting measure effectiveness.

[1] BAU emissions are defined as those that would occur without the implementation of state (e.g., renewable energy portfolio, Title 24) or local action (e.g., Energy-1, Energy-2).

B.2.1 State Measures

The Reduction Plan includes emissions benefits from nine statewide initiatives. These State measures span multiple emission sectors, but are primarily targeted at the building energy and transportation sectors. Emissions reductions achieved by these measures were apportioned to the city-level using statewide estimates of measure effectiveness and sector-specific information. For example, the California Air Resources Board (CARB) estimates that implementation of Assembly Bill 1109 will reduce indoor residential lighting by at least 50% and reduce indoor commercial and outdoor lighting by at least 25% by 2018 (compared to 2007). GHG reductions achieved by Assembly Bill 1109 within the Partnership cities were therefore quantified by multiplying city-level 2020 BAU emissions from residential lighting and commercial lighting by 50% and 25%, respectively. It is important to note that while the Partnership cities will achieve emissions reductions as a result of State programs, implementation of State measures does not require local action.

B.2.2 San Bernardino County Measures

The County of San Bernardino plans to install methane capture systems at a number of county-owned and operated landfills. Since these landfills serve a number of the Partnership cities, the cities would see emission reductions from their solid waste management sector, as fewer fugitive methane emissions from the decomposition of city-generate waste would be released into the atmosphere.

B.2.3 Local Measures

The section summarizes local efforts that the Reduction Plan proposes to further reduce community-wide GHG emissions. Measures that are required by State law, such as compliance with Assembly Bill 1109, or city regulations, such as an Idling Ordinance, would be mandatory for either existing and/or new development (and are identified with a [M]). Each Partnership city would require implementation of these measures, pursuant to state and new or existing local laws and regulations. Measures that would be implemented through incentive-based approaches, such as building retrofits, would be voluntary and are marked with a [V]. GHG reductions associated with these voluntary measures were quantified based on anticipated participation rates. Measures that would be implemented by each Partnership city for municipal measures are marked with a [CITY] mark. An example of this is Land Use-1: Tree Planting Programs. Some measures are a combination of city measures and voluntary or mandatory measures.

B.2.4 GHG Performance Standard for New Development

The GHG Performance Standard for New Development (PS) provides a streamlined and flexible program for new projects to reduce their emissions. This approach uses a performance standard for new private developments as part of the discretionary approval process under CEQA. New projects would be required to quantify project-generated GHG emissions and adopt feasible reduction measures to reduce project emissions to a level which is a certain percentage below BAU project emissions, as specified by each Partnership city. This approach does not require project applicants implement a pre-determined set of measures. Rather, project applicants are encouraged to choose the most appropriate measures for achieving the reduction goal, while taking into consideration cost, environmental or economic benefits, schedule, and other project requirements.

In order to quantify the reductions achieved for the PS approach, the amount of new development emissions from 2012 to 2020 was estimated for each Partnership city along with the GHG reductions needed to achieve the overall PS reduction goal for each city. Then the value of the other state and local measures for new development was estimated for each Partnership city and subtracted from the PS reduction goal to derive the net additional reductions that would result from the PS implementation. This does not mean that the state and local other measures would apply on an equal basis for every single project, and thus individual new development projects may have higher or lower project-level burdens than the average. Analysis of this measure indicates that the bulk of reductions needed to meet the PS would be from other state and local measures and a smaller portion from project-level reductions.

B.2.5 Building Energy Use

Reduction measures to address GHG emissions from building energy use are separated into two categories: energy efficiency and renewable energy. Emissions reductions associated with these measures were quantified using estimates of electricity kilowatt hour (kWh) and natural gas (therms) consumed by residential, commercial, and industrial buildings. Activity data was provided for the existing inventory year (2008), which was scaled to 2020 under BAU conditions using the socioeconomic data summarized in the San Bernardino Regional Inventory Methods (GHG Inventory) (ICF International 2012).

Emissions reductions achieved by energy efficiency and renewable energy measures were quantified using a general standards and factors. Specifically, percent reductions in energy consumption for various actions, such as exceeding the Title 24 Standard, were obtained from CAPCOA and other literature sources. These reductions were applied to the expected 2020 energy usage to quantify total reductions in energy consumption. GHG emissions that would have been emitted had the energy been consumed were then calculated using utility-specific emission factors.

B.2.6 Transportation

Measures within the transportation sector seek to both reduce the number of vehicle trips, as well as encourage mode shifts from single occupancy vehicles to alternative transportation. There are two local transportation measures included in the plan; SB 375 and Smart Bus. The effect of SB 375 on transportation emissions by 2035 in the county was quantified by SCAG using their regional transportation demand model. These reductions were scaled to 2020 and by city. Smart Bus reductions were estimated using data on average weekday and annual ridership, vehicle miles, and passenger miles from Omnitrans along with standard transportation emission factors.

B.2.7 Waste Generation

The waste reduction strategy aims to reduce the amount of waste produced by each community. Existing waste generation volumes and diversion rates were obtained from CalRecycle (2010a). GHG emissions that would have been generated by waste if they had not been diverted were quantified using the CARB First Order Decay (FOD) model and the methods described in the GHG Inventory (ICF International 2012).

B.2.8 Water Consumption

The Reduction Plan seeks to reduce energy and GHG emissions associated with water consumption through adoption of the voluntary CALGreen water efficiency measures for existing and new development and encourage water-efficient landscaping practices in the participating cities. Fixture flow rates from CALGreen (2010) and CAPCOA (2010) along with socioeconomic data were used to estimate the water savings from CALGreen standards. Information from CAPCOA was used to estimate the water savings from water-efficient landscaping practices. Indirect GHG emissions from electricity required to pump, treat, distribute and/or heat the consumed water were calculated using state-specific emission factors.

B.2.9 Wastewater Treatment

The Reduction Plan includes three wastewater measures; one to capture methane produced during the wastewater treatment process, one to improve the energy efficiency of wastewater treatment and pumping equipment, and one to reduce the need for freshwater through the use of recycled water.

GHG savings from methane capture were calculated assuming the majority of methane generated by wastewater treatment plants is captured and not released into the atmosphere. GHG savings associated with improvements in energy efficiency were calculated using the Inland Empire Utilities Agency's (IEUA) energy intensity factor for the treatment of waste and planned improvements (Pompa pers. comm.). Emission reductions from the increased use of recycled water are based on the reduced energy intensity associated with producing recycled water, compared to conveying water to southern California from the State Water Project.

B.2.10 Land Use

The Reduction Plan includes a measure to expand urban forestry programs to plant a certain number of new trees per year, depending on the city, and another measure to install green roofs on certain buildings. Emissions benefits from increased shade were quantified based on information provided by ICLEI and CAPCOA. Regional tree planting lists were consulted to determine the types of tree species appropriate for planting along city streets and in open spaces. It was assumed that tree planting would begin in 2012 and occur on an annual basis.

B.2.11 Off-Road Vehicle Activity

Measures within the off-road sector seek to increase the use of electricity and reduce the consumption of fossil fuels in heavy-duty off-road equipment. GHG emissions in 2020 for off-road activity within the participating cities were quantified using the CARB OFFROAD2007 emissions model. OFFROAD2007 provides detailed estimates of fuel consumption, hours of operation, and emissions by equipment type and horsepower. GHG emissions associated with electrifying portions of the off-road vehicle fleet were determined by multiplying the model outputs by the anticipated emission reductions estimated by CAPCOA (2010). GHG reductions from vehicle idling restrictions were also quantified using OFFROAD2007 and standard fuel consumption factors.

B.3 Overview of Measure Benefits

Many of the GHG reduction measures would result in financial, environmental, and public benefits for the cities and communities that are additional to the expected GHG emission reductions. These benefits include cost savings over conventional activities, reductions in criteria pollutants, job growth, economic growth, and public health improvements. Studies have shown that climate action in California can produce net gains for the statewide economy, increasing growth and creating jobs (Roland-Host 2008). Climate policies can produce positive economic growth through monetary savings from improvements in energy efficiency and reduced energy bills, as well as investing in technologies for innovation, which can provide new stimulus for employment (Roland-Host 2008). Addressing and mitigating GHG emissions on a national level can yield a large savings potential, benefit the global economy, and can be mostly achieved through implementation of existing technology (Roland-Host 2008). Based on literature reviews, a qualitative discussion of anticipated benefits is provided for each of the Partnership city's GHG reduction measures. Benefits are identified using the following icons.

Benefits for the Reduction Plan's GHG Reduction Measures

Reduced Energy Use

Reduced Energy Price Volatility

Reduced Waste Generation

Economic Growth

Resource Conservation

Public Health Improvements

Energy Diversification and/or Security

Increased Quality of Life

Reduced Air Pollution

Reduced Urban Heat Island Effect

Increased Property Values

Smart Growth

State-1: Senate Bill 1078 (2002)/Senate Bill 107 (2006) and Senate Bill 2 (2011) Renewable Portfolio Standard

Measure Description

Obligates investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure 20% of retail sales from eligible renewable sources by 2013, 25% by 2016. EO S-14-08 also sets forth a longer range target of procuring 33% of retail sales by 2020.

Assumptions

Quantification of this measure employs the following assumptions:

- The 2020 BAU renewable energy mix for each utility is as follows:
  - 13.8% for Southern California Edison (SCE) (California Energy Commission 2009)
  - 10.6% for Bear Valley Electric Service (BVES), which is the California average (California Energy Commission 2008a)
  - 4.6% for Colton Public Utilities (CPU) = (California Energy Commission 2011)
  - 5.7% for the City of Needles = (Energy Information Administration 2010a)

Analysis Details

GHG Analysis

Implementation of the Renewable Portfolio Standard (RPS) will increase the proportion of renewable energy within the energy supply mix of the utilities serving the participating cities. Renewable resources, such as wind and solar power, produce the same amount of energy as coal and other traditional sources, but do not emit any GHGs. By generating a greater amount of energy through renewable resources, electricity provided to the each Partnership city by their utilities will be cleaner and less GHG intensive.

<u>2020 BAU Emissions</u>

The GHG Inventory (ICF International 2012) estimates that community-wide electricity consumption[2] in 2020 for the participating cities would be approximately 11,724 gigawatt hours (GWh). The 2020 BAU renewable energy mix for each utility was determined as follows:

a) SCE: the direct renewable percentage for 2008 from the CEC's Utility Energy Supply Plans was used.

b) BVES: the California average renewable percentage from the CEC's 2008 Net System Power Report was used.

c) CPU: the direct renewable percentage for 2008 from the CEC's Utility Energy Supply Plans was used.

d) City of Needles: The City of Needles purchases its power from out of state so its BAU electricity emission factor was assumed to be the eGRID Arizona-New Mexico (AZNM) factor. In order to calculate the renewable energy percentage for the AZMN region, the total renewable electricity generation for each state within the region (Arizona, New Mexico, Nevada, and Utah) was added (13,633 GWh) and divided by the total amount of electricity generated within each state (238,138 GWh) to yield the factor of 5.7%. These electricity generation figures were taken from the EIA's State Renewable Electricity Profiles 2008.

<u>Emissions Reductions</u>

Based on the renewable energy mix assumptions listed above, achievement of the RPS will reduce the carbon intensity of the 2020 CO_2 emission factor for each utility as follows:

[2] Includes electricity consumed by buildings.

e) From 631 pounds per MWh to 490 pounds per MWh for SCE (The Climate Registry 2009; California Energy Commission 2009a).

f) From 681 pounds per MWh to 456 pounds per MWh for BVES (U.S. Environmental Protection Agency 2010; California Energy Commission 2008a).

g) From 2,073 pounds per MWh to 1,455 pounds per MWh for CPU (Lincus Incorporated 2012; California Energy Commission 2011).

h) From 1,253 pounds per MWh to 890 pounds per MWh for the City of Needles (Energy Information Administration 2010a).

Similar reductions will be achieved by the statewide CH_4 and N_2O emission factors as reported by the U.S. EPA (U.S. Environmental Protection Agency 2010). GHG emissions that would be generated by community-wide electricity consumption in 2020 will therefore be lower as a result of the RPS-adjusted emission factors.

GHG emissions generated from electricity consumption were calculating assuming implementation of the RPS by multiplying 2020 community-wide electricity consumption by the RPS-adjusted emissions factors. The difference in emissions between the 2020 BAU and 2020 RPS scenarios represents the emissions reductions achieved by this measure.

Co-Benefit Analysis

The RPS provides California with a flexible, market-based strategy to increase renewable energy generation and distribution. As discussed above, renewable energy provides the same amount of power as tradition sources (e.g., coal), but does not emit any GHGs or other criteria pollutants. Renewable energy therefore represents a clean source of power for the State and the participating cities. The following benefits are expected from implementation of the RPS (International Energy Agency 2007; U.S. Environmental Protection Agency 2009b).

Reduced Air Pollution: San Bernardino utilities generate power through a combination of sources, but the majority of electricity is provided by fossil fuels (e.g., coal, natural gas). The extraction and processing of fossil fuels generates localized pollutants emissions at the place of mining and at the source of power generation. These pollutants may be dispersed into the atmosphere, where they can be transported over long distances and result in regional air pollution. Reducing the amount of fossil fuels processed at power stations through increased generation of renewable energy would contribute to cumulative reductions in criteria pollutants throughout the State.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, substations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering local economies from the volatile global energy market.

Economic Development: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for local and regional economies.

Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

State-2: Title 24 Standards for Non-Residential and Residential Buildings (Energy Efficiency Standards and CALGreen)

Measure Description

Requires that building shells and building components be designed to conserve energy and water. 2008 T24 standards are effective starting January 1, 2009, and 2013 T24 standards are effective starting January 1, 2014. The standards will be periodically updated between 2014 and 2020.

Assumptions

Quantification of this measure employs the following assumptions:

- The 2013 Title 24 standards are 25% and 14% more stringent than the 2008 T24 standards for single-family homes and multi-family homes, respectively (California Energy Commission 2012). This is equivalent to an increase in stringency of approximately 21% on average for all residential buildings the county as a whole.
- The 2013 Title 24 standards are 30% more stringent than the 2008 T24 standards for nonresidential buildings (California Energy Commission 2012).
- Stringency of the residential Title 24 standards will be increased by 17% every three years starting in 2017 (Maziar pers. comm.)
- Stringency of the nonresidential Title 24 standards will be increased by 7% every three years starting in 2017 (Maziar pers. comm.)

Analysis Details

GHG Analysis

Energy efficiency upgrades as a result of the Title 24 standards will reduce electricity and natural gas consumption, thereby resulting in GHG emissions savings.

<u>2020 BAU Energy Consumption</u>

The GHG Inventory (ICF International 2012) estimates that community-wide electricity consumption in 2020 for the participating cities is approximately 11,724 GWh and community-wide natural gas consumption in 2020 for the participating cities is approximately 480 million therms.

<u>Emissions Reductions</u>

The stringency of the Title 24 Standards will be increased three times relative to the GHG inventory base year (2008) by 2020.[3] The 2013 standards represent a 21% and 30% increase in energy efficiency (electricity and natural gas) compared to the 2008 T24 standards for residential and non-residential buildings, respectively. Assuming a 17% and 7% tri-annual increase in the stringency of the residential and non-residential Title 24 standards, respectively, after 2014, 2020 residential energy use would be reduced to 54.1% of the 2008 code.[4] Non-residential energy use would likewise be reduced to 60.5% of the 2008 code. However, because the Title 24 code is revised on a semi tri-annual basis, only a fraction of total energy use is subject to each code revision. To avoid-double counting, estimated energy reductions were multiplied by the annual fraction of electricity subject to each code revision. The average reduction in residential energy use in 2020 as a result of the Title 24 Standards was therefore estimated to be 17.9% (82.1% of the 2008 code), and the average non-residential reductions were estimated to be 19.5% (80.5% of the 2008 code).

[3] Increases assumed in 2014, 2017, and 2020.

[4] Assumes 100% in 2005 and a 17% reduction every three years beginning in 2008.

Energy reductions achieved by Title 24 were calculated by multiplying 17.9% and 19.5% by each Partnership city's 2020 BAU electricity and natural gas consumption for residential and non-residential development, respectively. GHG emissions reductions were quantified by multiplying the total energy reductions by the appropriate utility emission factors.[5]

Co-Benefit Analysis

The following benefits are expected from implementation of improvement of the Title 24 standards over time.

Reduced Energy Use: Energy retrofits and standards would improve the efficiency of residential and non-residential buildings. As such, the amount of energy (e.g., electricity, natural gas) consumed per unit of activity would be lowered.

Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

Resource Conservation: Increased building efficiency would reduce water consumption, which would help conserve freshwater.

Increased Property Values: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

Public Health Improvements: Reduced regional and local air pollution would contribute to overall improvements in public health. A well-built, energy-efficient structure is also more durable and directly reduces certain health aliments. For example, properly sealed ducts help prevent mold and dust mites that can cause asthma.

Increased Quality of Life: The reduction of health aliments (see above) contributes to increased quality of life. Additionally, energy-efficient structures improve general comfort by equalizing room temperatures and reducing indoor humidity.

[5] Utility emission factors account for decreased carbon intensities as a result of the State's RPS.

State-3: AB 1109 (Huffman) Lighting Efficiency and Toxics Reduction Act

Measure Description

Structured to reduce statewide electricity consumption in the following ways: 1) At least 50% reduction from 2007 levels for indoor residential lighting, and 2) At least 25% reduction from 2007 levels for indoor commercial and outdoor lighting, by 2018.

Assumptions

Quantification of this measure employs the following assumptions:

- Approximately 6.2% of electricity is used for commercial outdoor lighting (California Energy Commission 2006, Table 10-3).
- Approximately 29% of electricity is used for commercial indoor lighting (California Energy Commission 2006, Table 10-3).
- Approximately 39% of electricity is used for "other appliances and lighting" in residences in San Bernardino County based on climate zone (Energy Information Administration 2009, Table AP5).
- Of electricity is used for "other appliances and lighting," 50% is used for lighting (estimate); this means that approximately 20% of total residential electricity use is for lighting (39% * 50%).
- This measure results in a reduction of 50% for electricity used for indoor residential lighting and a reduction of 25% for electricity used for indoor commercial and outdoor lighting.

Analysis Details

GHG Analysis

Lighting requires the production of electricity to power the lights, which represents an indirect source of GHG emissions. Different light fixtures have different efficacies; in other words, certain bulbs can utilize less energy to obtain the same output. Replacing less efficient bulbs with energy-efficient ones therefore reduces energy consumption, and thus GHG emissions.

<u>2020 BAU Lighting Electricity Consumption</u>

Electricity usage from outdoor lighting in commercial developments within each city was estimated by multiplying the total anticipated energy use in 2020 under BAU conditions by 6.2% (California Energy Commission 2006, Table 10-3). Electricity usage from indoor lighting in residential and commercial developments within the each city was estimated by multiplying the total anticipated energy use in 2020 under BAU conditions by 20% and 29%, respectively (California Energy Commission 2006, Table 10-3; Energy Information Administration 2009, Table AP5).

<u>Emissions Reductions</u>

AB 1109 will reduce indoor residential lighting by at least 50%. Energy reductions within the residential sector were calculated by multiplying the BAU indoor energy consumption for residential lighting by 0.50. AB1109 will reduce both outdoor and indoor commercial lighting by at least 25%. Energy reductions within the commercial sector were calculated by multiplying the BAU energy consumption for commercial lighting by 0.25. GHG emissions reductions were then quantified by multiplying the total energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of AB1109.

Reduced Energy Use: Energy-efficient lighting (e.g., compact fluorescent lamps [CFL]) consumes, on average, 75% less electricity than incandescent bulbs.

Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity).

Increased Property Values: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

Increased Quality of Life: CFLs have a much longer lifetime than incandescent bulbs, resulting in reduced bulb turn-over and the need to purchase new fixtures.

State-4: AB 1470 (Huffman) Solar Water Heaters

Measure Description

Creates a $25 million per year, 10-year incentive program to encourage the installation of solar water heating systems that offset natural gas use in homes and businesses throughout the state.

Assumptions

Quantification of this measure employs the following assumptions:

- Solar water heaters reduce natural gas use by 130 therms (California Air Resources Board 2008a).
- An average of 0.013 water heaters per home will be replaced as a result of AB 1470 (California Air Resources Board 2008a; California Department of Finance 2000).

Analysis Details

GHG Analysis

California relies heavily on natural gas for water heating. Rooftop solar water heating technologies are designed to reduce fuel consumption, and thus GHG emissions. It is estimated that by creating a mainstream market, California can save more than 1 billion therms of natural gas per year—24% of the state's residential natural gas usage. (Huffman et. al. 2007)

Emissions Reductions

CARB estimates that implementation of AB 1470 would result in the installation of 200,000 solar water heaters by 2020. Assuming that an average of 0.013 heaters per home would be replaced as a result of AB 1470, and that the participating cities would have 520,241 single- and multifamily homes in 2020 (Southern California Association of Governments 2012b), a total of 6,503 water heaters would be replaced with solar water heaters. Each solar water heater will reduce natural gas use by 130 therms (California Air Resources Board 2008a). Natural gas reductions were therefore calculated by multiplying 130 therms by 6,503. GHG emissions reductions were then quantified by multiplying the total energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of AB 1470.

Reduced Energy Use: Solar water heaters consume, on average, 130 therms less natural gas than non-solar units.

Reduced Air Pollution: Reduced energy use would contribute to corresponding reductions in local air pollution (from reduced burning of natural gas).

Increased Property Values: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

State-5: Industrial Boiler Efficiency

Measure Description

This measure evaluated by ARB would require one or more of the following: annual tuning of all boilers, the installation of an oxygen trim system, and/or a non-condensing economizer to maximize boiler efficiency. A source could also replace an existing boiler with a new one that is equipped with these systems.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- For cities without separate industrial natural gas emissions, the statewide ratio of commercial to industrial natural gas emissions was used to estimate industrial natural gas emissions. This value is 66% (California Air Resources Board 2008b).
- 80% of all industrial natural gas emissions in the State are affected by this measure (California Air Resources Board 2008a); the same percent effectiveness rate was used for the Partnership cities.
- The Industrial Boiler Efficiency measure will reduce emissions by 5% (California Air Resources Board 2008a); the same percent reduction was used for the Partnership cities.

Analysis Details

GHG Analysis

Newer, more efficient industrial boilers consume less natural gas, thereby reducing GHG emissions from natural gas combustion.

2020 BAU Emissions

The GHG Inventory quantified emissions associated with commercial and industrial natural gas use in 2020 under BAU conditions. Because the Industrial Boiler Efficiency measure only applies to industrial natural gas use, 2020 BAU emissions from commercial and industrial natural gas use were quantified by multiplying BAU emissions from this sector by 0.66.[6]

Emissions Reductions

CARB estimates that implementation of the Industrial Boiler Efficiency measure will reduce statewide emissions from industrial natural gas use by 4% (80% penetration multiplied by a 5% reduction) (California Air Resources Board 2008a). Since statewide emissions from industrial natural gas use account for 66% of total emissions from industrial and commercial natural gas use combined (California Air Resources Board 2008b), the net reduction in statewide industrial and commercial natural gas use emissions is 2.6% (4% multiplied by 66%).

GHG reductions achieved by the Industrial Boiler Efficiency measure within the Partnership cities were therefore quantified by multiplying 2020 BAU emissions from commercial plus industrial natural gas consumption by 0.026.

Co-Benefit Analysis

The following benefits are expected from implementation of the Industrial Boiler Efficiency Measure.

Reduced Energy Use: Newer, more efficient industrial boilers consume less natural gas. As such, the amount of energy (e.g., natural gas) consumed per unit of activity would be lowered.

[6] Value based on 38.41 $MMTCO_2e$ for statewide emissions in 2020 from natural gas use in the commercial and industrial sectors combined, with 25.4 $MMTCO_2e$ due to industrial natural gas use (California Air Resources Board 2008b)

Reduced Air Pollution: Reduced energy use would contribute to reductions in local air pollution (from reduced burning of natural gas).

Increased Property Values: Buildings with newer, more efficient boilers will likely have higher property values and resale prices than buildings with older, less efficient boilers.

Public Health Improvements: Reduced local air pollution would contribute to overall improvements in public health.

Increased Quality of Life: The reduction of health aliments (see above) contributes to increased quality of life.

State-6: AB 1493 (Pavley)/Advanced Clean Cars and Executive Order S-1-07 (Low Carbon Fuel Standard)

Measure Description

AB 1493 (Pavley) will reduce GHG emissions from automobiles and light duty trucks by 30% from 2002 levels by the year 2016. The regulations affect 2009 models and newer. The "Advanced Clean Cars" regulations introduces new standards for model years 2017–2025, and will reduce GHG emissions from automobiles and light duty trucks by34 percent from 2017 levels by 2025.

The Low Carbon Fuel Standard (LCFS) reduces GHG emissions by requiring a low carbon intensity of transportation fuels sold in California by at least 10% by the year 2020.

Assumptions

Quantification of this measure employs the following assumptions:

- Assumptions are embodied in the EMFAC2011 model (California Air Resources Board 2011b).

Analysis Details

GHG Analysis

Engine efficiency improvements will reduce fuel consumption, thereby reducing GHG emissions from fossil fuel combustion.

The LCFS is a policy-based strategy that targets carbon emissions generated through the lifecycle of transportation fuels (i.e., from extraction to production to consumption). The standard assigns a maximum level of GHG emissions per unit of fuel produced for several refiners and importers. Companies that exceed the LCFS through development of biofuels and other clean technologies are able to sell their excess credits, creating a flexible and dynamic market for low-carbon transportation fuels (Sperling and Yen 2009).

The U.S. Fresno Federal District court ruled in December 2011 that the LCFS violates the Commerce Clause of the U.S. Constitution and issued an injunction preventing California from implementing the LCFS. CARB appealed this ruling in early January, 2012. The injunction was lifted in April, 2012 pending a ruling on the appeal. While the legal issues are being resolved, it is assumed for the time being that the LCFS will be ultimately implemented by 2020 as proposed. If the LCFS were ultimately to be blocked from implementation due to federal legal constraints, then the goals for local reduction by cities may need to be adjusted downward accordingly.

<u>2020 BAU Emissions</u>

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions using emission factors generated by EMFAC 2011 and VMT data provided by SCAG (California Air Resources Board 2011b). These emission factors do not assume the implementation of Pavley/Advanced Clean Cars and the LCFS.

<u>Emissions Reductions</u>

The EMFAC2011 model was used to generate emission factors for vehicles traveling within San Bernardino County (in the Mojave Desert Air Basin and South Coast Air Basin) for the year 2020 with implementation of Pavley/Advanced Clean Cars and LCFS (California Air Resources Board 2011b). These emission factors were multiplied by the 2020 BAU VMT for the county and compared to the 2020 BAU emissions. The difference in emissions equal the reductions associated with Pavley/Advanced Clean Cars and the LCFS.

Co-Benefit Analysis

The following benefits are expected from implementation of Pavley/Advanced Clean Cars and the LCFS.

Reduced Energy Use: Pavley/Advanced Clean Cars would increase the fuel efficiency of passenger

vehicles, which would reduce the amount of fossil fuels consumed per mile travelled. The LCFS would reduce the carbon content of transportation fuels by 10%. The combustion of hydrocarbons generates numbers air pollutants, including particulate matter, carbon monoxide, sulfur dioxide[7], and ozone precursors[8]. Reducing the carbon content of transportation fuels would therefore reduce local and regional air pollution.

Reduced Air Pollution: Efficient vehicles burn less fuel per mile travelled then less efficient vehicles. Air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide, and ozone precursors, would therefore be reduced.

Public Health Improvements: Fossil fuel combustion releases several toxic air containments known to cause adverse human health effects. Improvements in vehicle efficiency would reduce the amount of fuel combusted, resulting in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

Energy Security: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (Energy Information Administration 2010b). Reducing fuel consumption by passenger vehicles would lessen the demand for petroleum and ultimately the demand for imported oil.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, fuel prices would likely be subject to fluctuations and frequent price spikes. Biofuels and other renewable technologies would contribute to the diversification of the energy supply mix, thereby buffering local economies from the volatile global energy market.

Economic Development: The development of biofuels and other clean technologies would create new jobs, taxes, and revenue for local and regional economies.

[7] Sulfur dioxide contributes to acid rain.

[8] Ozone precursors (reactive organic compounds and nitrogen oxides) contribute to smog formation.

State-7: AB 32 Transportation Reduction Strategies

Measure Description

The AB 32 Scoping Plan includes vehicle efficiency measures (in addition to Pavley/Advanced Clean Cars and LCFS) that focus on maintenance practices. The Tire Pressure Program will increase vehicle efficiency by assuring properly inflated automobile tires to reduce rolling resistance. The Low Friction Oils Program will increase vehicle efficiency by mandating the use of engine oils that meet certain low friction specifications. The Heavy-Duty Vehicle GHG Emission Reduction Program will increase heavy-duty vehicle (long-haul trucks) efficiency by requiring installation of best available technology and/or CARB approved technology to reduce aerodynamic drag and rolling resistance.

Assumptions

Quantification of this measure employed the following assumptions:

- Tire Pressure Program will reduce statewide emissions from passenger vehicles by 0.6 million MT CO_2e (California Air Resources Board 2011a), corresponding to a 0.39% reduction in Statewide 2020 BAU emissions.
- Low Friction Oils Program will reduce statewide emissions from passenger vehicles by 2.8 million MT CO_2e (California Air Resources Board 2011a), corresponding to a 1.8% reduction in Statewide 2020 BAU emissions.
- Heavy-Duty Vehicle GHG Emission Reduction Program will reduce statewide emissions from heavy-duty vehicles by 0.9 million MT CO_2e (California Air Resources Board 2011a), corresponding to a 2.2% reduction in Statewide 2020 BAU emissions.
- The percent reduction in transportation emissions in the participating cities will be equal to the percent reduction in transportation emissions reductions on a state level.

Analysis Details

GHG Analysis

Improvements in engine efficiency and vehicle technology will reduce fuel consumption, thereby reducing GHG emissions from fossil fuel combustion.

<u>2020 BAU Emissions</u>

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions. The Tire Pressure and Low Friction Oils programs primarily affect light-duty vehicles, whereas the Heavy-Duty GHG Emissions Reduction Program affects heavy-duty vehicles. 2020 BAU emissions from light-duty autos and heavy-duty vehicles are approximately 5.8 and 1.1 million $MTCO_2e$, respectively.

<u>Emissions Reductions</u>

Tire Pressure

CARB estimates that implementation of the Tire Pressure Program will reduce statewide emissions from passenger vehicles by 0.6 million MT CO_2e, or by approximately 0.39% (California Air Resources Board 2011a). GHG reductions achieved by the Tire Pressure Program within the participating cities were therefore quantified by multiplying 2020 BAU emissions from passenger vehicles by 0.0039.

Low Friction Oils

CARB estimates that implementation of the Low Friction Oils Program will reduce statewide emissions from passenger vehicles by 2.8 million MT CO_2e, or by approximately 1.8% (California Air Resources Board 2011a). GHG reductions achieved by the Low Friction Oils Program within the participating cities were therefore quantified by multiplying 2020 BAU emissions from passenger vehicles by 0.018.

Heavy-Duty Vehicle GHG Emissions Reductions

CARB estimates that implementation of the Heavy-Duty Vehicle GHG Emission Reduction Program will reduce statewide emissions from heavy-duty vehicles by 0.9 million MT CO_2e, or by approximately 2.2% (California Air Resources Board 2011a). GHG reductions achieved by the Heavy-Duty Vehicle GHG Emission Reduction Program within the participating cities were therefore quantified by multiplying 2020 BAU emissions from heavy-duty vehicles by 0.022.

Co-Benefit Analysis

The following benefits are expected from implementation of AB 32 Transportation Reduction Strategies.

Reduced Energy Use: The AB32 Transportation Reduction Strategies would increase the efficiency of passenger vehicles and heavy-duty trucks, which would reduce the amount of fossil fuels consumed per mile travelled.

Reduced Air Pollution: Efficient vehicles burn less fuel per mile travelled then less efficient vehicles. Air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide, and ozone precursors, would therefore be reduced.

Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Improvements in vehicle efficiency would reduce the amount of fuel combusted, resulting in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

Energy Security: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (Energy Information Administration 2010b). Reducing fuel consumption by passenger vehicles would lessen the demand for petroleum and ultimately the demand for imported oil.

State-8: Executive Order S-1-07 (Low Carbon Fuel Standard) for Offroad Equipment

Measure Description

Requires a 10% reduction in the carbon intensity of California's transportation fuels by 2020.

Assumptions

Quantification of this measure employs the following assumptions:

- Low Carbon Fuel Standard (LCFS) will reduce statewide emissions from transportation-based fuels[9] by 15 million $MTCO_2e$ (California Air Resources Board 2011a). This is equivalent to a 8.9% reduction in emissions from transportation fuels.

Analysis Details

GHG Analysis

See measure State-6 above for a detailed description of the LCFS. State-8 applies the LCFS to the Offroad Transportation and Equipment sector only (State-6 applies to on-road transportation only).

2020 BAU Emissions

The GHG Inventory quantified emissions associated with off-road transportation and equipment in 2020 under BAU conditions.

Emissions Reductions

CARB estimates that implementation of the LCFS will reduce statewide emissions from transportation-based fuels[17] by 15 million MT CO_2e, or by approximately 8.9% (California Air Resources Board 2011a). GHG reductions achieved by the LCFS within the Partnership cities were therefore quantified by multiplying BAU off-road emissions by 0.089.

Co-Benefit Analysis

The following benefits are expected from implementation of LCFS.

Reduced Air Pollution: The LCFS would reduce the carbon content of transportation fuels by 10%. The combustion of hydrocarbons generates numbers air pollutants, including particulate matter, carbon monoxide, sulfur dioxide, and ozone precursors. Reducing the carbon content of transportation fuels would therefore reduce local and regional air pollution.

Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Improvements in vehicle efficiency would reduce the amount of fuel combusted, resulting in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

Energy Security: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (Energy Information Administration 2010b). Reducing the carbon-content of transportation fuels would reduce the consumption and demand for imported petroleum.

[9] Excludes aviation fuel, residual fuel oil, and lubricants.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, fuel prices would likely be subject to fluctuations and frequent price spikes. Biofuels and other renewable technologies would contribute to the diversification of the energy supply mix, thereby buffering local economies from the volatile global energy market.

Economic Development: The development of biofuels and other clean technologies would create new jobs, taxes, and revenue for local and regional economies.

State-9: AB 32 Landfill Methane Program

Measure Description

CARB's Landfill Methane Rule requires gas collection and control systems on landfills with greater than 450,000 tons of waste-in-place. The measure also establishes statewide performance standards to maximize methane capture efficiencies.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- Nine landfills (see below) would install a methane system with a capture efficiency of 75%.

Analysis Details

GHG Analysis

Methane capture systems can reduce the amount of methane released from the decomposition of waste. CARB estimates that approximately 53 landfills will be affected by the Landfill Methane Rule, resulting in a statewide reduction of 0.8 million MT CO_2e in 2020 (California Air Resources Board 2008a).

Emissions Reductions

According to CalRecycle, the participating cities deposited waste to over 60 landfills between 1995 and 2010. A review of the waste-in-place at these landfills indicates that the following nine landfills would be subject to CARB's Landfill Methane Rule:

- Antelope Valley Public Landfill
- Barstow Sanitary Landfill
- Big Bear Refuse Disposal Site
- Boron Sanitary Landfill
- Calexico Solid Waste Site
- Hay Road Landfill
- Mojave-Rosamond Sanitary Landfill
- Shafter-Wasco Sanitary Landfill
- USMC - 29 Palms Disposal Facility

None of these landfills currently have methane capture systems. Pursuant to the Landfill Methane Rule, it was assumed that by 2020, all nine landfills would install a methane system with a capture efficiency of 75%.[10] GHG emissions generated by city-generated waste in 2020 were re-calculated using these assumptions and the methods outlined in the GHG Inventory.

Co-Benefit Analysis

The following benefits are expected from implementation of the Landfill Methane Rule.

Reduced Air Pollution: Capture systems prevent methane from migrating into the atmosphere and contributing to local smog.

Resource Conservation: Anaerobic digesters help prevent groundwater contamination by reducing the leaching of organic pollutants. The integrity of freshwater systems would therefore be conserved.

[10] Based on the Clean Air and Climate Protection protocol for default methane capture efficiency assumptions.

Increased Quality of Life: Methane capture helps reduce odors and other hazards associated with landfill gas emissions.

County-1: San Bernardino County GHG Reduction Plan Landfill Controls

Measure Description

The County of San Bernardino, through their adopted GHG Emissions Reduction Plan, will install landfill gas controls on the following County-owned and operated landfills (County of San Bernardino 2011):

- 95% capture at Mid-Valley landfill
- 85% capture at Milliken and Colton landfills
- 75% capture at Barstow and Landers landfills

Since these landfills serve some of the cities of San Bernardino County, these cities will realize GHG reductions from the county's installation of landfill gas controls.

Assumptions

Quantification of this measure employs the following assumptions:

- The methane capture rate increases at the Mid-Valley landfill from 75% to 95%
- The methane capture rate increases at the Milliken landfill from 54% to 85% and at the Colton landfill from 37% to 85%
- The methane capture rate increases at the Barstow and Landers landfills from 0% to 75%

Analysis Details

GHG Analysis

Methane capture systems can reduce the amount of methane released from the decomposition of waste.

Emissions Reductions

The landfills listed above would install landfill gas controls as noted above. Some of these landfills currently have methane capture systems. Pursuant to this measure, it was assumed that by 2020, all 5 landfills would install a methane system with capture efficiencies as noted above. GHG emissions generated by city-generated waste in 2020 were re-calculated using these assumptions and the methods outlined in the GHG Inventory.

Co-Benefit Analysis

The following benefits are expected from implementation of the San Bernardino County GHG Plan Landfill Controls.

Reduced Air Pollution: Capture systems prevent methane from migrating into the atmosphere and contributing to local smog.

Resource Conservation: Anaerobic digesters help prevent groundwater contamination by reducing the leaching of organic pollutants. The integrity of freshwater systems would therefore be conserved.

Increased Quality of Life: Methane capture helps reduce odors and other hazards associated with landfill gas emissions.

PS-1: GHG Performance Standard for New Development [M]

Measure Description

Individual cities could adopt a GHG Performance Standard for New Development (PS), which would provide a streamlined and flexible program for new projects to reduce their emissions. This measure would include a performance standard for new private developments as part of the discretionary approval process under CEQA. New projects would be required to quantify project-generated GHG emissions and adopt feasible reduction measures to reduce project emissions to a level which is a certain percent below BAU project emissions.

One potential PS reduction goal could be 29%, based on San Joaquin Air Pollution Control District's recommended CEQA significance threshold and based on the calculations of reductions necessary at the state level to meet AB 32 at the time of the Scoping Plan (29% below forecasted 2020 levels = 1990 levels based on data available at that time). Another potential PS reduction goal could be 20 to 22%, based on calculations of reductions necessary at the state level to meet AB 32 based on the most recent state inventory forecasts for 2020 available as of fall 2012.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- Emissions were estimated for the year 2012 for each Partnership city using socioeconomic data. Socioeconomic data for the year 2012 was not available, so population, jobs, and housing were estimated using linear growth from 2010-2020.
- The PS percent reduction in new development emissions was determined by the cities on a city-by-city basis.
- Some state measures which will affect new development, and therefore might overlap with the PS measure, could not be broken down into reductions associated with new development only (e.g., RPS, Pavley). Consequently, these measures were not included in the calculation of the PS.

Analysis Details

GHG Analysis

Implementation of the performance standard would reduce GHG emissions attributable to new discretionary development projects by 2020 by the percentage goal selected by individual cities selecting this measure. Measurable reductions of GHG emissions would be achieved through each city's review and discretionary approval of residential, commercial, and industrial development projects. It is expected that project proponents would often include energy efficiency and alternative energy strategies to help reduce their project's GHG emissions because these are often the most cost-effective approach to reducing GHG emissions but are free to propose any valid measures that would achieve the overall reduction goal.

<u>2020 BAU Emissions</u>

The GHG Performance Standard for New Development would apply to all new buildings built in 2013 and later, so an estimate of emissions in 2012 was performed using inventory and socioeconomic data for 2008 and 2020. 2012 emissions were estimated using the same methods that were used to forecast 2008 emissions to 2020, as feasible. Socioeconomic data for 2012 was not available. This data was estimated using linear growth from 2010-2020.

<u>Emissions Reductions</u>

In order to calculate the reductions from this measure, a percent reduction from new development emissions from 2012 to 2020 was estimated for each city, depending on the PS percent reduction selected by each city (e.g., 29%). State measures and local mandatory measures were quantified for new development for each city. These measures achieve a certain portion of the PS goal, depending on the city. The PS contributes the remaining percent reduction required to achieve the PS goal in new developments.

The value of these state and local measures for new development were subtracted from the PS reduction to derive the net additional reductions that would result from the PS implementation. This does not mean

that the other state and local measures would apply on an equal basis for every single project; individual new development projects may have higher or lower project-level burdens than the average. However, state and local mandatory measures are still expected to result in the largest share of the burden in meeting the PS reduction target for all cities (with a smaller portion from project-level reductions).

Co-Benefit Analysis

Co benefits will depend on the exact measures selected by individual project proponents, but would be the same as the corresponding strategies described below, i.e., if a project proponent were to select energy-efficiency measures as part of meeting their project reductions, the benefits would be similar in character to those described below for energy efficiency retrofits.

Energy-1: Energy Efficiency Incentives and Programs to Promote Retrofits for Existing Buildings [V]

Measure Description

Promote energy efficiency in existing residential buildings and nonresidential buildings, and remove funding barriers for energy efficiency improvements. Actions may include, but are not limited to: implementing a low-income weatherization program, launching energy efficiency outreach/education campaigns targeted at residents and businesses, promoting the smart grid, leveraging funding mechanisms and grant funding, scheduling energy efficiency tune-ups and promoting energy efficiency management services for large energy users.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The assumed market penetration rate for buildings (residential and nonresidential) performing retrofits was determined by the cities on a city-by-city basis.
- Participating residences perform weatherization for low-income households. To calculate reductions from low-income weatherization, the following assumptions were used:
    - The number of low-income households in each city was determined by multiplying the total number of households in each city (Southern California Association of Governments 2012b) by the percent of homes classified as extreme low income, very low income, and lower income (Southern California Association of Governments 2011). This percent ranges from 14% to 64% of households, depending on the city.
    - Weatherization only applies to low-income households.
    - Desert and Valley cities (except Needles) use 2,283 kWh per household on average for electrical heating assuming that these cities have <2,000 Cooling Degree Days (CDD) and <4,000 Heating Degree Days (HDD) (California Energy Commission 2008b; Energy Information Administration 2005).
    - Needles uses 1,182 kWh per household on average for electrical heating assuming that Needles has >2,000 CDD and <4,000 HDD (California Energy Commission 2008b; Energy Information Administration 2005).
    - Mountain cities (e.g. Big Bear) use 3,229 kWh per household on average for electrical heating assuming that these cities have <2,000 CCD and 5,500 to 7,000 HHD (California Energy Commission 2008b; Energy Information Administration 2005).
    - Energy savings from low-income weatherization are 20%, 32%, and 32% for heating electricity, natural gas, and fuel oil, respectively (Schweitzer 2005)
- Participating cities will launch energy efficiency campaigns targeted at residents and promote smart grid. This will result in a 5% energy savings (electricity and natural gas). This value was discounted from ICLEI's Climate and Air Pollution Planning Assistant (CAPPA) value of 10% for the measure "Energy Efficiency Education Targeted at Residents" in order to be more conservative (ICLEI Local Governments for Sustainability 2010).
- Participating cities will support and/or incentivize energy efficiency tune-ups and promote energy efficiency management services for large nonresidential energy users. To calculate reductions from low-income weatherization, the following assumptions were used:
    - This will result in a 10% energy savings (electricity and natural gas) from the CAPPA "Energy Efficiency Retrofits of Existing Measures" measure (ICLEI Local Governments for Sustainability 2010).
    - The penetration rate for participating nonresidential buildings, as determined by the participating cities individually, applies to the total nonresidential energy use in each city. For

example, for a penetration rate of 25%, 25% of total nonresidential energy use within a city will be reduced by 10%.

- Participating cities will launch energy efficiency campaigns targeted at businesses. This will result in a 5% energy savings (electricity and natural gas). This value was discounted from the CAPPA value of 10% for the measure "Energy Efficiency Education Targeted at Businesses" in order to be more conservative (ICLEI Local Governments for Sustainability 2010).

Analysis Details

GHG Analysis

Existing buildings generate a considerable amount of GHG emissions. Older developments are typically less energy-efficient and therefore consume greater amounts of electricity and natural gas, relative to newly constructed facilities.

BAU Energy Use

BAU electricity and natural gas use for residential and nonresidential buildings were used to calculate reductions for this measure. The GHG inventory documents the energy use and assumptions employed for the BAU analysis.

Emissions Reductions

Energy savings for each sub-measure were generally calculated by multiplying BAU energy use by a penetration rate, and then by a percent reduction in energy use. Emission reductions were then calculated by multiplying the energy savings by the appropriate emission factors.

For low-income weatherization, the total number of homes existing in 2008 (base inventory year) for each Partnership city was multiplied by the percent of low-income homes as determined by SCAG (Southern California Association of Governments 2011). The number of low-income homes was then multiplied by the penetration rate for each city. Then, the energy used for electric heating, natural gas heating, and fuel oil use was estimated by multiplying the number of low-income households by the respective energy use factors as detailed in the assumptions section above. The resulting energy use was multiplied by the percent reduction in energy use for low-income weatherization by energy source (see assumptions above) to determine energy reductions.

For efficiency campaigns targeted at residents, the total residential energy use (electricity and natural gas) in 2008 for each Partnership city was multiplied by the penetration rate for each city. The resulting energy use was then multiplied by 5% to determine energy savings for residential buildings.

For energy efficiency tune-ups and promote energy efficiency management services for large energy users, the total nonresidential energy use (electricity and natural gas) in 2008 for each Partnership city was multiplied by the penetration rate for each city. The resulting energy use was then multiplied by 10% to determine energy savings for nonresidential buildings.

For energy efficiency campaigns targeted at businesses, the total nonresidential energy use (electricity and natural gas) in 2008 for each Partnership city was multiplied by the penetration rate for each city. The resulting energy use was then multiplied by 5% to determine energy savings for nonresidential buildings.

GHG emissions savings were then quantified by multiplying the energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-1.

Reduced Energy Use: Energy retrofits would improve the efficiency of residential buildings. As such, the amount of energy (e.g., electricity, natural gas) consumed per unit of activity would be lowered.

Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

Increased Property Values: Energy-efficient homes have higher properity values and resale prices than less efficient homes.

Public Health Improvements: Reduced regional and local air pollution would contribute to overall improvements in public health. A well-built, energy-efficient structure is also more durable and directly reduces certain health aliments. For example, properly sealed ducts and air leaks helps prevent mold and dust mites that can cause asthma.

Increased Quality of Life: The reduction of health aliments (see above) contributes to increased quality of life. Additionally, energy-efficient homes improve general comfort by equalizing room temperatures and reducing indoor humidity.

Energy-2: Outdoor Lighting Upgrades for Existing Development [CITY, V]

Measure Description

Adopt outdoor lighting standards in the Zoning Ordinance to reduce electricity consumption above and beyond the requirements of AB 1109. Require a certain percentage of residential and nonresidential outdoor lighting fixtures use high efficiency light-emitting diodes (LEDs) and a certain percentage of traffic signals use LEDs by 2020.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- Approximately 5.27% of total residential electricity in each Partnership city is used for residential outdoor lighting (California Energy Commission 2006).[11]
- Approximately 6.21% of total commercial electricity in each Partnership city is used for commercial outdoor lighting (California Energy Commission 2006).[12]
- The 2020 BAU percentage of outdoor LED lights in residences is 10% (estimate).
- The percent of outdoor lights in residences and commercial buildings that will be LEDs by 2020 was identified by each Partnership city on a city-by-city basis.
- The 2020 BAU percentage of outdoor halogen lights in commercial buildings is 10% (estimate).
- Installation of an outdoor LED fixture achieves a 75% reduction in energy usage, relative to an incandescent bulb (U.S. Environmental Protection Agency 2011a). This factor was used for residential outdoor lights and traffic signals.
- LEDs consume about 90% less energy than traditional incandescent traffic lights (California Air Pollution Control Officers Association 2010). This value was used for commercial outdoor lights.
- There are approximately 0.032 traffic signals per capita in the Participating cities (Lee pers. comm. 2010).
- The wattage of an incandescent traffic light is 150 (U.S. Department of Energy 2004), and there are 3 bulbs per traffic signal.
- Traffic signals operate 24 hours per day.
- The 2020 BAU percentage of LED traffic signals is 50% (estimate).
- The percent of traffic signals that will be LEDs by 2020 was identified by each Partnership city on a city-by-city basis.

[11] For the SCE service area, Table 10-3. This value is calculated by taking the exterior lighting electricity intensity for commercial lodging (0.7kWh/ft^2-year) and dividing by the total electricity intensity (13.28 kWh/ft^2-year) = 5.27%. Residential electricity intensity was not available, so commercial lodging was used as a proxy.
[12] For the SCE service area, Table 10-3. This value is calculated by taking the exterior lighting electricity intensity for all commercial buildings (0.85 kWh/ft^2-year) and dividing by the total electricity intensity (13.69 kWh/ft^2-year) = 6.21%.

Analysis Details

GHG Analysis

Lighting requires the production of electricity to power the lights, which represents an indirect source of GHG emissions. Different light fixtures have different efficacies; in other words, certain bulbs can utilize less energy to obtain the same output. Replacing less efficient bulbs with energy-efficient ones therefore reduces energy consumption, and thus GHG emissions.

2020 BAU Emissions and 2020 Emissions with State Measures

Outdoor Lights (Private)

Electricity reductions achieved by overlapping State (e.g., Title 24 and Assembly Bill [AB] 1109) were first removed to obtain energy consumption after the implementation of state measures. Electricity usage from outdoor lighting in existing residential and commercial developments was then estimated by multiplying the total anticipated energy use in 2020 under BAU conditions by 5.27% and 6.21%, respectively.

Traffic Signals

The number of existing and future traffic signals within the each Partnership city was determined using 0.032 signals per capita. BAU electricity consumption by traffic signals was calculated using the following equation.

Energy Consumption = [(City population * (0.032 traffic signals per person) * (50% non-LED lights) * (incandescent wattage per bulb) * (3 bulbs per traffic signal)] + [(City population * (0.032 traffic signals per person) * (50% LED lights) * (incandescent wattage per bulb) * (3 bulbs per traffic signal) * (90% reduction in energy use due to LED lights)] * 365 days * 24 hours

Emissions Reductions

Outdoor Lights (Private)

Energy reductions associated with the installation of LED blubs in existing outdoor residential and commercial lighting fixtures was calculated by multiplying the BAU outdoor lighting energy consumption by the penetration rate for each Partnership city and then by a scaling factor (city-specific penetration rate for LED lights under the measure minus 10% LED lights in the BAU case). The resulting energy use was then multiplied by 75% for residential and 90% for commercial, which are the anticipated reduction in electrical demand associated with LED lights (U.S. Environmental Protection Agency 2011a; California Air Pollution Control Officers Association 2010). GHG emissions reductions were then quantified by multiplying the energy reductions by the appropriate utility emission factors.

Traffic Lights

Energy reductions associated with the installation of LED traffic signals was calculated by first calculating the number of LED traffic signals installed in each Partnership city, which is equal to:

(City population) * (0.032 traffic signals per person) * (city-specific penetration rate for LED lights)

Electricity savings were calculated by using the following equation:

(Number of new LED traffic signals) * (incandescent wattage per bulb) * (3 bulbs per traffic signal) * (90% reduction in energy use due to LED lights) * 365 days * 24 hours

GHG emissions reductions savings were then quantified by multiplying the energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-2.

Reduced Energy Use: Energy-efficient lighting (e.g., CFL fixtures) consumes, on average, 75% less electricity than incandescent bulbs.

Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity).

Increased Property Values: Energy efficient bulidings have higher properity values and resale prices than less efficient buildings.

Increased Quality of Life: CFLs have a much longer lifetime than incandescent bulbs, resulting in reduced bulb turn-over and the need to purchase new fixtures.

Energy-3: Green Building Ordinance For New Buildings [M]

Measure Description

Adopt a Green Building Ordinance (GBO) that exceeds Title 24 (T24) Standards (or any subsequent standards that replaces the current Title 24 Standards) by a certain percentage (e.g. 15%, which is currently the same as CALGreen Tier 1) starting in 2013 and proceeding through to 2020. This measure applies to both residential and nonresidential buildings.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The percent by which Energy-1 exceeds T24 standards was identified by each Partnership city on a city-by-city basis.
- All new buildings (residential and nonresidential) built in 2013 and later must comply with the GBO.
- The ratio of single-family household electricity and natural gas use to multi-family household electricity and natural gas use is 1.39 and 1.23, respectively (Energy Information Administration 2009)
- The Participating cities are in climate zone 10 (California Air Pollution Control Officers Association 2010).
- The energy reduction for a 1% improvement over 2008 T24 standards for Climate Zone 10 are as follows (California Air Pollution Control Officers Association 2010):
    - 0.18% reduction in electricity use for single-family homes
    - 0.83% reduction in natural gas use for single-family homes
    - 0.26% reduction in electricity use for multi-family homes
    - 0.80% reduction in natural gas use for multi -family homes
    - 0.30% reduction in electricity use for commercial buildings
    - 0.61% reduction in natural gas use for commercial buildings

Analysis Details

GHG Analysis

BAU Energy Use

The GHG Inventory quantified electricity and natural gas emissions associated with existing residential and commercial facilities in 2008. The 2008 values were projected to 2012 in order to determine electricity and natural gas use and emissions for all new buildings built from 2013 to 2020, which are subject to the GBO. The number of single-family and multi-family residences in 2012 was estimated by interpolating from the 2008 and 2020 values for each city.

Emissions Reductions

Energy reductions associated with State-2 (T24), State-3 (AB1109), and Energy-2 (outdoor lighting) were subtracted from the energy used by all new buildings built from 2013 to 2020. This was done in order to determine the energy used by new buildings after the implementation of preceding measures, before the application of the GBO.

New energy use (2013-2020) for single-family and multi-family homes was estimated by multiplying total residential energy use by the ratios listed in the assumptions section above, taking into consideration the number of single-family and multi-family homes within each Partnership city.

Energy reductions (electricity and natural gas) were then estimated by multiplying the new energy use for single-family homes, multi-family homes, and nonresidential buildings by the percent reduction beyond T24 as specified by the cities (e.g., 15%) and then multiplying by the appropriate factor from CAPCOA for a

1% reduction beyond 2008 T24 standards (California Air Pollution Control Officers Association 2010).

GHG emissions reductions achieved by Energy-1 were quantified by multiplying the energy reductions for each building type by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-1.

Reduced Energy Use: Energy retrofits and standards would improve the efficiency of residential and non-residential buildings. As such, the amount of energy (e.g., electricity, natural gas) consumed per unit of activity would be lowered.

Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

Resource Conservation: Increased building efficiency would reduce water consumption, which would help conserve freshwater.

Increased Property Values: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

Public Health Improvements: Reduced regional and local air pollution would contribute to overall improvements in public health. A well-built, energy-efficient structure is also more durable and directly reduces certain health aliments. For example, properly sealed ducts and air leaks helps prevent mold and dust mites that can cause asthma.

Increased Quality of Life: The reduction of health aliments (see above) contributes to increased quality of life. Additionally, energy-efficient structures improve general comfort by equalizing room temperatures and reducing indoor humidity.

Energy-4: Solar Installations in New Housing Developments [V]

Measure Description

Encourage residents to install rooftop solar using Power Purchase Agreements (PPAs) and other low or zero up-front cost options for installing solar photovoltaic systems. This could be implemented through discretionary approvals and permitting for new projects. Establish a goal for solar installations on new homes to be achieved before 2020. Each Partnership city will choose its own goal. Potential goals might be (or other options):

- 75% of new single-family homes have solar installations
- 50% of new single-family homes have solar installations
- 25% of new single-family homes have solar installations

Assumptions

The following assumptions were considered in the evaluation of this measure:

- This measure only affects new single-family homes (those built in 2013 and later).
- The market penetration rate for new homes installing solar was determined by the cities on a city-by-city basis.
- The energy generated by solar photovoltaics (PV) is carbon neutral (California Air Pollution Control Officers Association 2010).
- The average annual electricity generation per solar system is 7,683 kWh (National Renewable Energy Laboratory 2012).
- The amount of electricity generated by the panels will offset electricity provided by the utilities. For example, a system which generates 7,683 kWh in a year will offset 7,683 kWh produced by power plants, and therefore reduce emissions associated with 7,683 kWh of electricity generation.

Analysis Details

GHG Analysis

Utilizing electricity generated by solar photovoltaic panels displaces electricity demand that would ordinarily be provided by the utilities. Although SCE purchases a substantial amount of energy from renewable sources, electricity supplied by SCE still represents a source of indirect GHG emissions. Carbon neutral sources, such solar, do not emit GHGs (California Air Pollution Control Officers Association 2010).

Emissions Reductions

The number of single-family homes in each city in 2012 was subtracted from the projected number of single-family homes in each city in 2020 in order to determine the number of new single-family homes. This number was then multiplied by the percent penetration rate as specified by each Partnership city to determine the number of new homes installing solar PV. This number was then multiplied by 7,683 kWh, which is the annual amount of electricity provided by the average solar system in the county (National Renewable Energy Laboratory 2012). This determines the total amount of renewable energy provided by the panels, and offset from the utilities.

Carbon neutral sources do not emit GHGs. The kWh affected by this measure would therefore result in a 100% reduction in emissions, relative to BAU conditions. GHG emissions reductions achieved by Energy-4 were quantified by multiplying the resulting solar electricity production for each city by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-4.

Reduced Air Pollution: Generating community electricity through renewable sources would

displace a portion of electricity generated by fossil fuels. As such, combustion at regional power stations would be reduced, contributing to cumulative reductions in criteria pollutants.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

Economic Development: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for the local economy.

Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

Increased Property Values: If renewable infrastcuture is added to San Bernardino County buildings as a result of this measure, properity and resale values of those structures may be increased.

Energy-5: Solar Installations for New Commercial/Industrial Development [V]

Measure Description

Encourage new businesses to install rooftop solar using Power Purchase Agreements and other low or zero up-front cost options for installing solar photovoltaic systems. This could be implemented through discretionary approvals and permitting for new projects. Establish a goal for solar installations on new buildings to be achieved before 2020. Each Partnership city will choose its own goal. Potential goals might be (or other options):

- 30% of energy requirements for new development supplied with solar power
- 15% of energy requirements for new development supplied with solar power
- 5% of energy requirements for new development supplied with solar power

Assumptions

The following assumptions were considered in the evaluation of this measure:

- This measure only affects new nonresidential buildings (buildings built in 2013 or after).
- The percent energy requirements for new development supplied with solar power were determined by the cities on a city-by-city basis.
- The energy generated by solar PV is carbon neutral (California Air Pollution Control Officers Association 2010).
- The average annual electricity generation per solar system is 1,539 kWh per kW of solar PV installed (National Renewable Energy Laboratory 2012).
- The amount of electricity generated by the panels will offset electricity provided by the utilities. For example, a system which generates 7,683 kWh in a year will offset 7,683 kWh produced by power plants, and therefore reduce emissions associated with 7,683 kWh of electricity generation.

Analysis Details

GHG Analysis

Utilizing electricity generated by solar photovoltaic panels displaces electricity demand that would ordinarily be provided by the utilities. Although SCE purchases a substantial amount of energy from renewable sources, electricity supplied by SCE still represents a source of indirect GHG emissions. Carbon neutral sources, such solar, do not emit GHGs (California Air Pollution Control Officers Association 2010).

<u>BAU Electricity Emissions</u>

The GHG Inventory quantified electricity emissions associated with existing commercial facilities in 2008. The 2008 values were projected to 2012 using employment data in order to determine electricity use and emissions for all new commercial buildings built from 2013 to 2020, which are subject to Energy-5.

<u>Emissions Reductions</u>

Energy reductions associated with State-2 (T24), State-3 (AB1109), Energy-2 (outdoor lighting), Energy-3 (Green Building Ordinance), Land Use-1 (Tree Planting Programs), and Water-1 (CALGreen Water Efficiency Measures for New Construction) were subtracted from the energy used by all new nonresidential buildings built from 2013 to 2020. This was done in order to determine the energy used by new buildings after the implementation of preceding measures, before installation of solar PV.

The remaining quantity of electricity used by new nonresidential buildings was then multiplied by the percent energy requirements for new development supplied with solar power penetration rate, as determined by the participating cities. The resulting number of kWh was assumed to be provided by solar PV under Energy-5. The amount of solar PV in kW was then determined by dividing this kWh figure by 1,539 kWh per kW of solar PV (National Renewable Energy Laboratory 2012).

Carbon neutral sources do not emit GHGs. The kWh affected by this measure would therefore result in a

100% reduction in emissions, relative to BAU conditions. GHG emissions reductions achieved by Energy-5 were quantified by multiplying the resulting solar electricity production for each city by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-5.

Reduced Air Pollution: Generating community electricity through renewable sources would displace a portion of electricity generated by fossil fuels. As such, combustion at regional power stations would be reduced, contributing to cumulative reductions in criteria pollutants.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

Economic Development: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for the local economy.

Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

Increased Property Values: If renewable infrastcuture is added to San Bernardino County buildings as a result of this measure, properity and resale values of those structures may be increased.

Energy-6: Onsite Solar Energy for New and Existing Warehouse Space [V]

Measure Description

Applies to new and existing warehouse space. Promote and incentivize solar installations on existing warehouse space through partnerships with SCE and other private sector funding sources including SunRun, SolarCity, and other solar lease or PPA companies. Establish a goal such that all new warehousing projects install solar to provide a minimum of 25% or more of the project's new on-site energy needs. This goal could be supported through non-financial incentives or streamlined permitting. The participating cities may also act as a resource for connecting project proponents with funding opportunities.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The percent of warehouses participating in this measure and installing solar PV was determined by the cities on a city-by-city basis.
- The energy generated by solar PV is carbon neutral (California Air Pollution Control Officers Association 2010).
- The average annual electricity generation per solar system is 1,539 kWh per kW of solar PV installed (National Renewable Energy Laboratory 2012).
- Warehouses are one story; this means that for each square foot of building floor space there is one square foot of building roof space (for which to install solar PV) in warehouses.
- Each square foot of solar PV produces 8 watts of electricity (BEST Contracting Services 2010).
- The amount of electricity generated by the panels will offset electricity provided by the utilities. For example, a system which generates 7,683 kWh in a year will offset 7,683 kWh produced by power plants, and therefore reduce emissions associated with 7,683 kWh of electricity generation.

Analysis Details

GHG Analysis

Utilizing electricity generated by solar photovoltaic panels displaces electricity demand that would ordinarily be provided by the utilities. Although SCE purchases a substantial amount of energy from renewable sources, electricity supplied by SCE still represents a source of indirect GHG emissions. Carbon neutral sources, such solar, do not emit GHGs (California Air Pollution Control Officers Association 2010).

Emissions Reductions

The total amount of warehouse building square footage in each Partnership city was multiplied by the penetration rate to determine the total square footage of warehouses installing solar under this measure. The participating square footage was then multiplied by 8 watts per square foot of solar PV to determine the total power output in kW of solar (BEST Contracting Services 2010). The kW value was then multiplied by 1,539 kWh per kW of solar PV to determine the total annual kWh of electricity produced by the panels (National Renewable Energy Laboratory 2012).

Carbon neutral sources do not emit GHGs. The kWh affected by this measure would therefore result in a 100% reduction in emissions, relative to BAU conditions. GHG emissions reductions achieved by Energy-6 were quantified by multiplying the resulting solar electricity production for each city by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-6.

Reduced Air Pollution: Generating community electricity through renewable sources would displace a portion of electricity generated by fossil fuels. As such, combustion at regional power stations would be reduced, contributing to cumulative reductions in criteria pollutants.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

Economic Development: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for the local economy.

Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

Increased Property Values: If renewable infrastcuture is added to San Bernardino County buildings as a result of this measure, properity and resale values of those structures may be increased.

Energy-7: Solar Installations for Existing Housing [V]

Measure Description

Encourage residents to install rooftop solar using Power Purchase Agreements and other low or zero up-front cost options for installing solar photovoltaic systems. This could be implemented through discretionary approvals and permitting for new projects. Establish a goal for solar installations on existing homes to be achieved before 2020. Each Partnership city will choose its own goal. Potential goals might be (or other options):

- 25% of existing single-family homes have solar installations
- 20% of existing single-family homes have solar installations
- 15% of existing single-family homes have solar installations

Assumptions

The following assumptions were considered in the evaluation of this measure:

- This measure only affects existing single-family homes (those built before 2013).
- The market penetration rate for existing homes installing solar was determined by the cities on a city-by-city basis.
- The energy generated by solar PV is carbon neutral (California Air Pollution Control Officers Association 2010).
- The average annual electricity generation per solar system is 7,683 kWh (National Renewable Energy Laboratory 2012).
- The amount of electricity generated by the panels will offset electricity provided by the utilities. For example, a system which generates 7,683 kWh in a year will offset 7,683 kWh produced by power plants, and therefore reduce emissions associated with 7,683 kWh of electricity generation.

Analysis Details

GHG Analysis

Utilizing electricity generated by solar photovoltaic panels displaces electricity demand that would ordinarily be provided by the utilities. Although SCE purchases a substantial amount of energy from renewable sources, electricity supplied by SCE still represents a source of indirect GHG emissions. Carbon neutral sources, such solar, do not emit GHGs (California Air Pollution Control Officers Association 2010).

Emissions Reductions

The number of single-family homes in each city in 2012 (those that are considered existing) was multiplied by the percent penetration rate as specified by each Partnership city to determine the number of new homes installing solar PV. This number was then multiplied by 7,683 kWh, which is the annual amount of electricity provided by the average solar system in the county (National Renewable Energy Laboratory 2012). This determines the total amount of renewable energy provided by the panels, and offset from the utilities.

Carbon neutral sources do not emit GHGs. The kWh affected by this measure would therefore result in a 100% reduction in emissions, relative to BAU conditions. GHG emissions reductions achieved by Energy-7 were quantified by multiplying the resulting solar electricity production for each city by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-7.

Reduced Air Pollution: Generating community electricity through renewable sources would displace a portion of electricity generated by fossil fuels. As such, combustion at regional power stations

would be reduced, contributing to cumulative reductions in criteria pollutants.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

Economic Development: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for the local economy.

Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

Increased Property Values: If renewable infrastcuture is added to San Bernardino County buildings as a result of this measure, properity and resale values of those structures may be increased.

Energy-8: Solar Installations for Existing Commercial / Industrial Buildings [V]

Measure Description

Encourage existing businesses (commercial and industrial) to install rooftop solar using Power Purchase Agreements and other low or zero up-front cost options for installing solar photovoltaic systems. This could be implemented through discretionary approvals and permitting for new projects. Establish a goal for solar installations on new buildings to be achieved before 2020. Each Participating City will choose its own goal. Potential goals might be:

- 25% of existing commercial/industrial buildings install solar to provide at least 15% of electricity needs
- 20% of existing commercial/industrial buildings install solar to provide at least 15% of electricity needs
- 15% of existing commercial/industrial buildings install solar to provide at least 15% of electricity needs

This measure does not apply to warehouses, which are addressed in Energy-6.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The percent of existing commercial/industrial buildings that install solar was determined by the cities on a city-by-city basis.
- The energy generated by solar PV is carbon neutral (California Air Pollution Control Officers Association 2010).
- Each solar PV system supplies 15% of a building's total electricity demand.
- The amount of electricity generated by the panels will offset electricity provided by the utilities. For example, a system which generates 7,683 kWh in a year will offset 7,683 kWh produced by power plants, and therefore reduce emissions associated with 7,683 kWh of electricity generation.

Analysis Details

GHG Analysis

Utilizing electricity generated by solar photovoltaic panels displaces electricity demand that would ordinarily be provided by the utilities. Although SCE purchases a substantial amount of energy from renewable sources, electricity supplied by SCE still represents a source of indirect GHG emissions. Carbon neutral sources, such solar, do not emit GHGs (California Air Pollution Control Officers Association 2010).

<u>BAU Electricity Emissions</u>

The GHG Inventory quantified electricity emissions associated with existing commercial facilities in 2008. The 2008 values were projected to 2012 using employment data in order to determine electricity use and emissions for all existing commercial buildings built before 2012, which are subject to Energy-8.

<u>Emissions Reductions</u>

Energy reductions associated with State-3 (AB1109), Energy-1 (Energy Efficiency for Existing Buildings), Energy-6 (Solar Installations for Warehouses) and Water-2 (Promotion of Water-Efficiency for Existing Development) were subtracted from the energy used by all existing nonresidential buildings built before 2012. This was done in order to determine the energy used by existing nonresidential buildings after the implementation of preceding measures, before installation of solar PV.

The remaining quantity of electricity used by existing nonresidential buildings was then multiplied by the percent of existing commercial/industrial buildings that will install solar under this measure, as determined by the participating cities. This new kWh value was then multiplied by 15%, which is the amount of each existing building's energy demand that will be supplied by the solar PV panels.

Carbon neutral sources do not emit GHGs. The kWh affected by this measure would therefore result in a 100% reduction in emissions, relative to BAU conditions. GHG emissions reductions achieved by Energy-8 were quantified by multiplying the resulting solar electricity production for each city by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-8.

Reduced Air Pollution: Generating community electricity through renewable sources would displace a portion of electricity generated by fossil fuels. As such, combustion at regional power stations would be reduced, contributing to cumulative reductions in criteria pollutants.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

Economic Development: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for the local economy.

Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

Increased Property Values: If renewable infrastcuture is added to San Bernardino County buildings as a result of this measure, properity and resale values of those structures may be increased.

Energy-9: Install Co-Generation Facilities [V]

Measure Description

Co-generation facilities simultaneously generate electricity and useful heat. They are typically used in district heating systems. As feasible, encourage co-generation facilities to supply 15% of building energy in new commercial and industrial facilities greater than 100,000 square feet. Example buildings are university campuses or large medical centers.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- Only new buildings install co-gen engines (buildings built in 2013 or after).
- 36% of all nonresidential buildings in each Partnership city are greater than 100,000 square feet. This value is for the Pacific Region from the EIA's Commercial Building Energy Consumption Survey (Energy Information Administration 2008).[13]
- Energy use is approximated by square footage; since 36% of buildings are greater than 100,000 square feet, then 36% of total building energy use occurs in these buildings.
- Co-generation engines use reciprocating engine technology (100 kW rich burn with 3-way catalyst)
- The market penetration rate for existing homes installing solar was determined by the cities on a city-by-city basis.
- The percent of a building's total electricity demand supplied by co-generation engines was determined by the cities on a city-by-city basis.
- The percent reduction in CO_2 emissions for these 100 kW engines in the SCE service area is 14% (California Air Pollution Control Officers Association 2010).
- The co-gen engines operate 8,760 hours per year (24 hours per day, 365 days per year) (California Air Pollution Control Officers Association 2010).

Analysis Details

GHG Analysis

For the same level of power output, combined heat and power (CHP) systems (or co-generation systems) utilize less input energy than traditional separate heat and power (SHP) generation, resulting in fewer CO_2 emissions. In traditional SHP systems, heat created as a by-product is wasted by being released into the environment. In contrast, CHP systems harvest the thermal energy and use it to heat onsite or nearby processes, thus reducing the amount of natural gas or other fuel that would otherwise need to be combusted to heat those processes. In addition CHP systems lower the demand for grid electricity, thereby displacing the CO_2 emissions associated with the production of grid electricity (California Air Pollution Control Officers Association 2010).

<u>BAU Electricity Emissions</u>

The GHG Inventory quantified electricity emissions associated with existing nonresidential facilities in 2008. The 2008 values were projected to 2012 using employment data in order to determine electricity use and emissions for all new commercial buildings built from 2013 to 2020, which are subject to Energy-9.

<u>Emissions Reductions</u>

Energy reductions associated with State-1 (T24), State-3 (AB1109), Energy-2 (Outdoor Lighting), Energy-3

[13] The 36% is calculated as follows: 1,007 million square feet for buildings 100,001 to 200,000 square feet + 977 million square feet for buildings 200,001 to 500,000 square feet + 1,119 million square feet for buildings greater than 500,000 square feet = 3,103 million square feet, divided by 8,613 million square feet total.

(Green Building Ordinance), Land Use-2 (Rooftop Gardens), and Water-1 (Water Conservation for New Construction) were subtracted from the energy used by all new nonresidential buildings built from 2013 to 2020. This was done in order to determine the energy used by new buildings after the implementation of preceding measures, before the installation of co-gen.

The remaining quantity of electricity used by new nonresidential buildings was then multiplied by 36% in order to estimate the electricity demand of buildings greater than 100,000 square feet. This kWh value was then multiplied by the city-specific penetration rate for the amount of each participating building's energy demand that will be supplied by the co-gen engines.

GHG emissions reductions achieved by Energy-9 were quantified by multiplying the resulting go-gen electricity production for each city by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-9.

Reduced Air Pollution: Co-generation systems use waste heat to reduce the amount of natural gas or other fuel that would otherwise need to be combusted to heat processes and also lower the demand for grid electricity. As such, combustion at regional power stations would be reduced, contributing to cumulative reductions in criteria pollutants.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Utilizing waste heat in co-generation systems would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

Economic Development: Development of co-generation systems and associated infrastructure would create new jobs, taxes, and revenue for the local economy.

Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

Transportation-1: SB 375 Sustainable Communities Strategy [CITY,V]

Measure Description

SB 375 provides for a new planning process that coordinates land use planning, regional transportation plans (RTPs), and funding priorities in order to help California meet the GHG reduction goals established in AB 32. While Pavley/Advanced Clean Cars and LCFS seek to reduce fuel consumed and reduce the carbon content of fuel consumed, SB 375 seeks to reduce VMT through land use planning. SB 375 requires RTPs, developed by metropolitan planning organizations (MPOs) to incorporate a "sustainable communities strategy" (SCS) in their RTPs. The goal of the SCS is to reduce regional vehicle miles traveled (VMT) through land use planning and consequent transportation patterns. The regional GHG reduction target for Southern California Associated Governments (SCAG) is 9% by 2020 and a 16% reduction by 2035 compared to 2005 GHG emissions on a per capita basis. SCAG's 2012-2035 RTP/SCS successfully achieves and exceeds these targets set by ARB (Southern California Association of Governments 2012a).

This measure applies only to individual cities who decide that their local land use planning supports, in general, SCS style land use and transportation planning, that will result in VMT reductions.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The percentage reduction in per-capita VMT associated with the SCS in the SCAG region is 2.4% by 2035 (Fehr and Peers 2011, Table 11).[14]
- The percentage reduction in per-capita VMT associated with the SCS in 2020 is approximately 1% (linear interpolation from 2008 to 2035)
- Each Partnership city will achieve a range of 0.5 to 1% reduction in per-capita light/medium-duty VMT based on city identification.
- The percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs.
- Needles and Twentynine Palms will not benefit from this measure since they will not be affected by the SCS due to their remote location in the county far from transit opportunities facilitated by the SCS.

Analysis Details

GHG Analysis

VMT reduction through land use planning will reduce GHG emissions associated with on-road transportation.

<u>BAU On-Road Emissions</u>

The GHG Inventory quantified emissions associated with on-road transportation in 2008 and in 2020 under BAU conditions. Population for 2008 and 2020 was used to determine per-capita light/medium-duty VMT for 2008 and 2020 BAU.

<u>Emissions Reductions</u>

The percent change in per-capita light/medium-duty VMT from 2008 to 2020 under BAU conditions was calculated for each Partnership city. Cities choosing this measure selected a percentage between 0.5 to 1%. The city-identified percentage value was subtracted from this value to determine the new percent change in per-capita light/medium-duty VMT from 2008 to 2020 with implementation of this measure. Then the per-capita light/medium-duty VMT in 2008 was multiplied by the new percent change in per-capita VMT to determine the new per-capita VMT in 2020. The new per-capita VMT in 2020 was then multiplied by the projected population in 2020 to determine a new total 2020 VMT. The VMT reduction was calculated by

[14] Percentage Reduction in VMT/HH from 2035 Trip-Based Model, in Table 11.

subtracting the new 2020 VMT from the 2020 BAU VMT.

For example, if the 2008 per-capita VMT is 10,000 and the 2020 BAU per-capita VMT is 9,000, then the change in per-capita VMT is -10%. Subtracting 1% from this yields a -11% change. A -11% change in per-capita VMT from 2008 is 8,900. So, the reduction in VMT would be 100 miles per-capita.

The percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the BAU emissions for light-duty autos.

Co-Benefit Analysis

The following benefits are expected from implementation of Transportation-1.

Reduced Energy Use: Increased density would reduce the number of private vehicle trips made within each city. As a result, gasoline and diesel consumption would be reduced.

Reduced Air Pollution: Because less petroleum would be consumed by vehicles, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide, and ozone precursors, would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

Energy Security: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (Energy Information Administration 2010b). Reducing fuel consumption would lessen the demand for petroleum and ultimately the demand for imported oil.

Increased Quality of Life: Increased density along transit routes, employment corridors, and in downtown areas would increase the accessibility of public transportation and basic services. Reductions in the number of vehicle trips may also reduce congestion and travel times.

Smart Growth: Increased density in the urban core is a form of smart growth development that creates more walkable and accessible environments.

Transportation-2: Smart Bus Technologies [CITY]

Measure Description

Smart Bus Technologies include Automatic Vehicle Location (AVL) systems and real-time passenger information at bus stations. Omnitrans plans to implement these technologies system-wide on all bus routes serving San Bernardino Valley (Omnitrans service area) to enable information sharing, enhance rider services, and attract potential riders. The AVL system has been implemented. The Bus Arrival Prediction Information System (BAPIS) will be installed in two phases. In Phase I, real-time rider information will be available via text messaging, Quick Response (QR), website, Interactive Voice Response (IVR), and mobile phone devices. Implementation completion is slated for December 2012. In Phase II Omnitrans will be installing electronic signs at all major transit hubs and provide General Transit Feed Specification (GTFS) data to the general public to build apps for mobile devices like smartphones and tablet computers. Phase II completion is slated for December 2013 (Kuruppu pers. comm.; Omnitrans 2012).

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The growth rate in Omnitrans ridership from 2008 to 2020 is 0.56% (Onmitrans n.d.).
- Several sources in the literature suggest that these technologies may lead to a 20-50% reduction in wait times at transit stations and a 9-20% saving in fuel consumption. 50% was used as the reduction in wait time because of the systemwide deployment proposed by Omnitrans (a sensitivity analysis using a 30% reduction in wait time was also performed to verify this value).
- A 10% saving in fuel consumption was used for Smart Bus technologies.
- Omnitrans' CNG buses had an average fuel economy of 3.3 miles per gallon (GGE) in 2010 which was assumed to remain constant out to 2020 (Federal Transit Administration 2010).
- A transit wait time elasticity of -0.5 was used. This implies that a 10% reduction in transit wait time is expected to result in a 5% increase in ridership (Transportation Research Board 2004).
- All of the additional transit riders switch modes from automobiles to transit.
- Not all additional transit riders previously drove alone (to be conservative in the analysis).
- Average vehicle occupancy (AVO) data was used to estimate the light duty VMT reduction resulting from these additional transit trips (Southern California Association of Governments 2012a).
- Omnitrans system-wide improvements associated with Transportation-1 will equally affect each city served by Omnitrans.

Analysis Details

GHG Analysis

GHG emissions are expected to be reduced because the AVL technologies could lead to more fuel efficient bus operations for Omnitrans and the BAPIS technologies could potentially attract more transit riders who may switch modes from automobiles. Omnitrans' Demand Response Services, OmniLink and Access, do not operate on a fixed schedule or route and are not included in this analysis

<u>Emissions Reductions</u>

Omnitrans provided data on average weekday and annual ridership, vehicle miles, and passenger miles for all routes included in fixed route, fixed schedule service. Weekday values are for 2012, year to date through March and annual values are for 2011. Average weekday trip lengths for 2011 and 2012 are also available. The growth rate in Omnitrans ridership from 2011 to 2012 (year to date) is approximately 8% but the

average annual growth rate for the last 10 years (2002-2012) is 0.56%[15]. 0.56% was used to project ridership in 2020.

System-wide VMT reductions were calculated using the following approach:

1. Calculate annual Omnitrans ridership in 2020 using average annual growth rate of 0.56% from 2002-2012. (15,333,567 riders)
2. Calculate annual increase in Omnitrans ridership from improved traveler information and reduced wait times in 2020. (3,833,392)
3. Calculate annual reduction in light duty VMT from additional transit riders switching modes from autos, using -0.5 elasticity and average passenger trip length, assumed same from 2011. (13,676,319)
4. Calculate annual reduction in CNG consumption from increased operational efficiency due to use of AVL systems. (319,280 GGE/gallons)

System-wide GHG emission reductions were calculated using the following approach:

1. Calculate annual emission benefit of light duty VMT reduction using 2020 emission factors for CO_2, CH_4, N_2O, and CO_2 equivalent. (4,253 metric tons of CO_2e)
2. Calculate annual emission benefit of CNG gallons saved using default factors from Climate Registry (2012). (2,286 metric tons of CO_2e)
3. Sum the two sources of emission reduction. (6,539 metric tons of CO_2e)

The system-wide reductions were then apportioned equally to each Partnership city that is served by Omnitrans. Since there are 15 cities served by Omnitrans, each city was assigned 436 $MTCO_2e$ of reductions. The actual benefit of this measure will not be distributed evenly, as cities with greater potential for new riders will have more benefit than those with lesser potential. However, due to limited data about the effects of this measure on a city-by-city basis, reductions were apportioned evenly.

A sensitivity analysis assuming 30% reduction in wait time (as opposed to 50%) results in a 0.07% reduction in GHG emissions. A sensitivity analysis assuming 50% reduction in wait time and 30% of additional transit riders switching modes from autos results in a 0.05% reduction in GHG emissions.

Co-Benefit Analysis

The following benefits are expected from implementation of Transportation-2.

Reduced Energy Use: More attractive transit would encourage motorists to utilize public transportation instead of private vehicles. As a result, the number of vehicle trips made within each city, and thus gasoline and diesel consumption, would be reduced.

Reduced Air Pollution: Because less petroleum would be consumed by vehicles within each city, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide, and ozone precursors, would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including

[15] Based on Omnitrans data available on http://www.omnitrans.org/about/quik-facts.shtml

respiratory irritation and reduced plant productivity.

Increased Quality of Life: Increased transit service would help reduce transit passenger travel time and may make public transportation more comfortable and enjoyable. Reductions in the number of vehicle trips may also reduce congestion and travel times.

Waste-1: Increased Waste Diversion [M]

Measure Description

Continue to provide public education and collection services to community residents and business. Exceed the waste diversion goals recommended by Assembly Bill 939 and CALGreen by adopting citywide waste goals of at least 75% of waste diversion.

Assumptions

The following assumptions were considered for the quantification of this measure.

- The 2020 BAU waste diversion rate equals the 2006 diversion rate for each Partnership city (CALRecycle 2010b).[16]
- The cities participating in this measure will increase their diversion rates linearly from their 2006 rate to their selected new diversion rate goal by 2020. These rates range from 50% to 75%.

Analysis Details

GHG Analysis

Diversion programs reduce the amount of waste deposited in regional landfills. Because waste generates methane emissions during decomposition, reducing the volume of waste sent to landfills directly reduces GHG emissions. In general, waste diversion rates have risen dramatically since the early 1980s. The U.S. achieved 51% diversion in fiscal year 2009 (U.S. Environmental Protection Agency 2011b).

2020 BAU Emissions

The GHG Inventory projected 2020 waste volumes for each city using historic landfill data obtained from CalRecycle. The 2006 diversion rate for each city was assumed to remain constant under 2020 BAU conditions.

Emissions Reductions

Implementation of Waste-1 would increase the BAU diversion rate for each city by 2020 (e.g., to 75%). The amount of waste diverted by material type under BAU conditions was therefore increased by the difference between the BAU diversion rate and the new diversion rate selected by the cities. GHG emissions that would have been generated by the diverted waste if it had been deposited in regional landfills were quantified using CARB's FOD Model and new waste disposal quantities based on the new 2020 waste diversion goal for each city.

CAPCOA recommends the use of the U.S. Environmental Protection Agency's Waste Reduction Model (WARM) to quantify emissions reductions from diverting landfill waste to composting or recycling. The WARM model calculates life-cycle emission reductions, which includes emissions and avoided emissions upstream and downstream from the point of use. This approach is not consistent with the method used in the inventory, and EPA recommends against using this life-cycle approach for inventories because of the diffuse nature of the emissions and emission reductions within a single WARM emission factor. Consequently, the WARM model was not used to calculate reductions from Waste-1. CARB's FOD Model was used to calculate reductions because it is consistent with the inventory and does not have a lifecycle component.

Co-Benefit Analysis

The following benefits are expected from implementation of Waste-1.

[16] Diversion rates for years after 2006 are not available from CALRecycle.

Reduced Air Pollution: The decomposition of landfilled waste emits methane, which can react with other species in the atmosphere to form local smog. By sending less waste to regional landfills, methane emissions would be reduced.

Resource Conservation: Waste that is diverted to recycling centers can be converted into reusable products, thereby reducing the need for raw materials.

Agriculture-1: Methane Capture at Large Dairies [V]

Measure Description

This is a voluntary measure to be undertaken by large dairies and encourages the installation of methane digesters to capture methane emissions from the decomposition manure. The methane could be used as on-site as an alternative to natural gas in combustion, power production, or as a transportation fuel. Further, individual project proponents can sell GHG credits associated with these installations on the voluntary carbon market.

Assumptions

The following assumptions were considered for the quantification of this measure.

- The only cities with large dairies (1,000+ head of dairy cows) subject to this measure are Chino and Ontario
- 157.06 kg of methane is emitted per head of cattle per year from manure management (California Air Resources Board 2010)
- 73% of dairy cows at dairies with 1,000+ head will already be feeding digesters through voluntary action (California Air Resources Board 2008a, pg. I-64)
- The BAU methane capture rate is 0% (i.e. no methane capture)
- The methane capture rate is 75% (selected by Ontario)

Analysis Details

GHG Analysis

Dairies produce large quantities of methane from enteric fermentation and manure management of dairy cows. Capturing this methane, instead of allowing it to be released into the atmosphere, will reduce GHG emissions associated with dairies. Biodigesters recover methane from animal manure through a process called anaerobic digestion. The captured methane can be flared, combusted to produce electricity, or converted to fuel such as natural gas.

<u>2020 BAU Emissions</u>

The GHG Inventory projected 2020 dairy emissions for each city using the number of head of dairy cattle in 2008 and a growth facto obtained for the county. Only dairy emissions from Chino and Ontario could be affected by this measure (if Chino or Ontario selects this measure), because they are the only cities with large dairies.

<u>Emissions Reductions</u>

Implementation of Agriculture-1 would result in the capture of 86% of the methane generated from the manure of 73% of the dairy cows within Chino and Ontario. Total BAU emissions from dairy cows for these cities were multiplied by 73% and then by 75% (methane capture rate) to determine the quantity of methane captured within each city.

Co-Benefit Analysis

The following benefits are expected from implementation of Agriculture-1.

Reduced Air Pollution: Manure management at dairies emits methane, which can react with other species in the atmosphere to form local smog. By capturing much of this methane, emissions would be reduced.

Resource Conservation: Methane can be used to generate electricity or produce other useful fuels, thereby reducing the need for energy.

Economic Development: Development of renewable energy infrastructure (e.g., anaerobic digesters) would create new jobs, taxes, and revenue for the local economy.

Agriculture-2: Utilize Methane Captured at Dairies [V]

Measure Description

Implement a program to reuse biogas (methane from manure) captured at dairies. This biogas could be destroyed on-site, transported for off-site use (e.g., through gas distribution or transmission pipeline), or used to power vehicles. Using captured biogas could potentially offset natural gas use or offroad fuel use (reductions may be achieved in the building energy sector and/or the off-road sector).

Assumptions

The following assumptions were considered for the quantification of this measure.

- The only cities with large dairies (1,000+ head of dairy cows) subject to this measure are Chino and Ontario
- 25% of methane is destroyed on site (flared) (estimate)
- 75% of methane is used for offsite use energy generation (estimate)
- Efficiency factor for converting methane into electricity is 85% (California Air Pollution Control Officers Association 2010)
- The energy content of biomethane is 1,012 btu per cubic foot (California Air Pollution Control Officers Association 2010)
- Combustion emission factors for biomethane are 52.07 kg CO_2/MMBtu, 0.032 kg CH_4/MMBtu, and 0.0042 kg N_2O/MMBtu (Climate Registry 2012)

Analysis Details

GHG Analysis

Dairies produce large quantities of methane from enteric fermentation and manure management of dairy cows. Capturing this methane, instead of allowing it to be released into the atmosphere, will reduce GHG emissions associated with dairies. Biodigesters recover methane from animal manure through a process called anaerobic digestion. The captured methane can be flared, combusted to produce electricity, or converted to fuel such as natural gas.

<u>2020 BAU Emissions</u>

The GHG Inventory projected 2020 dairy emissions for each city using the number of head of dairy cattle in 2008 and a growth facto obtained for the county. Only dairy emissions from Chino and Ontario could be affected by this measure, because they are the only cities with large dairies (and only if one or both of these cities selects this measure). The quantity of captured methane was obtained from Agriculture-1.

<u>Emissions Reductions</u>

Implementation of Agriculture-2 would result in the flaring of 25% of the methane captured from dairies (calculated in Agriculture-1) and the combustion for electricity of 75% of this methane.

The quantity of methane captured from implementation of Agriculture-1 was multiplied by 75% to determine the quantity of methane combusted for electricity. This was converted to energy units (MMBtu) and then into electricity production using the efficiency factor of 85%. GHG emissions reductions achieved by Agriculture-2 were quantified by multiplying the electricity reduction by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Agriculture-2.

Reduced Air Pollution: Generating community electricity through renewable sources would displace a portion of electricity generated by fossil fuels. As such, combustion at regional power stations would be reduced, contributing to cumulative reductions in criteria pollutants

Resource Conservation: Methane used to generate electricity or produce other useful fuels reduces the need for energy.

Reduced Energy Use: This measure would increase the production of renewable electricity, which would reduce the amount of fossil fuels consumed to produce electricity in power plants.

Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

Economic Development: Development of renewable energy infrastructure (e.g., anaerobic digesters) would create new jobs, taxes, and revenue for the local economy.

Wastewater-1: Methane Recovery [V]

Measure Description

Work with the IEUA or other local wastewater treatment (WWT) providers to identify funding, and cooperating agencies for establishing methane recovery systems at all wastewater treatment plants that service San Bernardino County residents by 2020, as appropriate. Install equipment for the combustion of digester gas to generate electricity at all wastewater treatment plants by 2020.

Assumptions

The following assumptions were considered for the quantification of this measure.

- IEUA, which serves the cities of Chino, Chino Hills, Fontana, Rancho Cucamonga, Montclair, and Ontario, already captures 100% of generated methane and combusts 25% of this methane to generate electricity, so these cities do not benefit from this measure (Pompa pers. comm.).
- Wastewater providers that already capture methane at their plants are assumed to capture 100% of generated methane (same as IEUA). These providers include the City of San Bernardino (San Bernardino, Loma Linda, and Highland), Victor Valley Wastewater Agency (Victorville and Hesperia), Veolia Water North America Operating Services, Inc., and City of Rialto (Rialto), the City of Redlands (Redlands), and Yucaipa Valley Water District (Yucaipa) (City of San Bernardino 2013; Victor Valley Wastewater Reclamation Authority 2012; Veolia Water North America 2010; City of Redlands 2013; Yucaipa Valley Water District 2012; Big Bear Area Regional Wastewater Agency 2012).
- 29 Palms and Yucca Valley will not benefit from this measure since they are on septic systems and do not have WWTPs.
- Wastewater providers that already have cogeneration or electricity production capacity (see list above), 75% of methane is combusted and 25% of methane is flared (same as IEUA). Exceptions to this rule include:
    - Victor Valley Wastewater Agency, which has 50% combustion and 50% flaring (actual percentages are not known).
    - Veolia Water North America Operating Services, Inc., and City of Rialto, the City of Adelanto Water Department (Adelanto), and the Yucaipa Valley Water District (Yucaipa) have 0% combustion and 100% flaring (no electricity production capacity) (Veolia Water North America 2010; Yucaipa Valley Water District 2012; City of Adelanto 2012;).
- The new methane capture rate at participating plants that do not already have methane capture is 99.7% (California Air Pollution Control Officers Association 2010, measure AE-6)
- For participating plants, 75% of captured methane will be combusted to generate electricity; 25% will be flared
- Standard conversion factors were used to convert methane into energy, including: 662 grams methane per cubic meter; 35.3 cubic feet per cubic meter; 1,012 btu per cubic feet of methane; 0.00009 kWh per btu energy conversion factor (California Air Pollution Control Officers Association 2010, measure AE-6)
- The efficiency factor for converting methane into electricity is 0.85 (California Air Pollution Control Officers Association 2010, measure AE-6).
- Reductions are allocated regionally (reductions are proportionate to emissions)

If better data for the WWTP operations are available in the future, this analysis can be updated for later drafts.

Analysis Details

GHG Analysis

Wastewater treatment plants (WWTP) produce large quantities of methane from wastewater processing. Capturing this methane, instead of allowing it to be released into the atmosphere, will reduce GHG emissions associated with wastewater treatment.

2020 BAU Emissions

The GHG Inventory projected 2020 wastewater treatment emissions of fugitive methane using population projections for each city.

Emissions Reductions

The CAPCOA method for estimating emission reductions for measure AE-6 was followed in order to calculate reductions for this measure. First, the CAPCOA method was used to determine 2020 BAU emissions of methane (California Air Pollution Control Officers Association 2010). Then, the mitigated method for *Mitigation Option 1—Methane is captured and flared* was used to calculate mitigated emissions of methane. Comparing the BAU methane emissions to the mitigated methane emissions yielded a methane capture rate of 99.7%. For all cities participating that are not already served by WWTPs that capture 100% of generated methane, this represents an emission reduction (going from 0% or 50% capture to 99.7% capture; see assumptions above). For cities which are already served by WWTPs that capture 100% of generated methane, there are no emission reductions (since these plants already capture all of the methane they generate).

The amount of electricity generated through combustion of the captured methane was calculated by multiplying the total amount of methane captured by 75%, converting the resulting methane into btus of energy, and multiplying by the 0.85 efficiency factor. The following equation was used:

- Total methane captured (metric tons) * 1,000,000 grams per metric ton ÷ 662 grams methane per cubic meter * 75% combustion rate * 35.3 cubic feet per cubic meter * 1,012 btus per cubic feet of methane * 0.85 * 0.00009 kWh generated per btu of methane combusted.

GHG emissions reductions achieved by Wastewater-1 were quantified by multiplying the resulting electricity production for each city by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Wastewater-1.

Reduced Air Pollution: Wastewater treatment processes emit methane, which can react with other species in the atmosphere to form local smog. By capturing much of this methane, emissions would be reduced.

Resource Conservation: Methane can be used to generate electricity or produce other useful fuels, thereby reducing the need for energy.

Economic Development: Development of renewable energy infrastructure (e.g., anaerobic digesters, methane capture systems) would create new jobs, taxes, and revenue for the local economy.

Wastewater-2: Energy Efficiency Equipment Upgrades at WWTPs [V] [17]

Measure Description

Work with the IEUA or other local WWTP operators to upgrade and replace wastewater treatment and pumping equipment with more energy efficient equipment, as is financially feasible, at the existing facilities by 2020. Require all pumping and treatment equipment to be at least 5-10% more energy efficient at the time of replacement. Utilize best management practices for the treatment of waste.

Assumptions

The following assumptions were considered for the quantification of this measure

- The IEUA agency-wide energy intensity for wastewater treatment is 3,580 kWh/MG wastewater treated (Pompa pers. comm.). This value was used as a proxy for all WWTPs.
- This measure would result in a 7.5% improvement in energy efficiency by 2020 = 269 kWh saved/MG wastewater produced versus 2008 (Pompa pers. comm.)
- If a WWTP operator already has plans to upgrade their pumps, the cities served by these operators benefit from this measure. This includes IEUA (Chino, Chino Hills, Fontana, Rancho Cucamonga, Montclair, and Ontario), Victor Valley Wastewater Agency (Victorville and Hesperia), City of Adelanto Water Department (Adelanto), and City of Colton Public Utilities Wastewater Department (Grand Terrace) (City of Colton 2012).
- If a WWTP operator does not currently have plans to upgrade their pumps but a city wants to participate in this measure, then that city will benefit from this measure.
- 29 Palms and Yucca Valley will not benefit from this measure since they are not served by a centralized WWTP.

If better data for the WWTP operations are available in the future, this analysis can be updated for later drafts.

Analysis Details

GHG Analysis

Some of the wastewater generated within the county is treated by the IEUA and other WWTP operators in a number of WWTPs. Collection and treatment of the wastewater generates fugitive methane emissions from organic decomposition, as well as GHGs from electricity consumption.

Emissions Reductions

According to the IEUA, implementation of energy efficiency measures would achieve a 7.5% reduction in energy use for wastewater treatment (Pompa pers. comm.). According to IEUA, the current energy-intensity for wastewater treatment is 3,580 kWh/MG (Pompa pers. comm.). Electricity savings associated with implementation of Wastewater-2 is therefore 269 kWh saved/MG. This factor was applied to cities that are currently served by WWTP operators that already have plans to upgrade their pumps, along with cities that want to participate in this measure (but are served by WWTP operators that don't have current plans to upgrade).

[17] GHG emissions associated with electricity consumption at IEUA WWTPs were reported in the building energy sector of the GHG Inventory (only fugitive and process emissions were reported in the wastewater sector). Consequently, emissions reductions associated with reduced electricity use will be achieved in the building energy sector. However, these emissions reductions are reported as part of Wastewater-2 as they are a direct result of implementation of Wastewater-2.

Projected 2020 wastewater generation in MG for each city in 2020 was therefore multiplied by 269 kWh saved/MG to determine the amount of electricity saved through implementation of this measure. GHG emissions reductions achieved by Wastewater-2 were quantified by multiplying the electricity reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Wastewater-2.

Reduced Energy Use: The collection and treatment of wastewater requires electricity. Improving the efficiency of pumping and treatment equipment would therefore reduce electricity consumption at the IEUA WWTPs.

Reduced Air Pollution: Reduced electricity use would contribute to reductions in regional air pollution.

Wastewater-3: Recycled Water [V] [18]

Measure Description

Establish a goal of achieving 50% of all water used for non-potable sources (such as landscaping irrigation, dust control, or fire suppression) to be recycled (and treated) wastewater. Consider requiring all new parks and schools, or other public facilities to use 100% recycled water for non-potable outdoor uses as a first step as feasible depending on existing and planned RW infrastructure. Develop public educational materials that support and encourage the use of recycled water. Adopt a municipal goal of 100% use of recycled water for non-potable sources. Implementation will likely require coordination with regional WWTP and recycled water providers such as IEUA.

Assumptions

The following assumptions were considered for the quantification of this measure

- The percent of outdoor water use (after impact of other water measures take place) that will be recycled in 2020 was determined by the cities on a city-by-city basis.
- The electricity required to treat and distribute reclaimed water is 2,100 kWh/MG (California Air Pollution Control Officers Association 2010).

Analysis Details

GHG Analysis

Recycled water can have a lower energy intensity than high-intensity sources (such as imported water that require extensive pumping). Encouraging use of lower energy intensity water supplies to displace higher energy intensity water supplies can reduce electricity consumption and GHG emissions associated with transporting and treating that water.

California homes and businesses consume a significant amount of water through outdoor irrigation. Using recycled water instead of potable water for irrigation (and other water end-uses which can use non-potable water) can reduce the demand for fresh water conveyed to the cities from the State Water Project and other high energy intensive water resources.

Emissions Reductions

Outdoor water use reductions associated with Water-1 (Water Conservation for New Construction), Water-2 (Water Conservation for Existing Construction), and Water-3 (Water Efficient Landscaping Practices) were subtracted from the total 2020 BAU water outdoor use for all participating cities. This was done in order to determine the outdoor water use after the implementation of preceding measures, before the implementation of Wastewater-3. The remaining quantity of outdoor water use was multiplied by the city-specific recycled water percentage to determine the amount of water that would be replaced with recycled water due to implementation of this measure.

This quantity of water was multiplied by 2,100 kWh to determine the electricity needed to treat and distribute reclaimed water (California Air Pollution Control Officers Association 2010). This quantity of water was also multiplied by the BAU energy intensity factors for each city to determine the BAU energy use needed to convey, treat, and distribute this water in the absence of Wastewater-3. The difference in these two values represents the electricity savings associated with the implementation of Wastewater-3.

GHG emissions reductions achieved by Wastewater-3 were quantified by multiplying the electricity reductions by the appropriate utility emission factors.

[18] GHG emissions associated with the use of recycled water were reported in the water conveyance sector of the GHG Inventory (only fugitive and process emissions were reported in the wastewater sector). Consequently, emissions reductions associated with reduced electricity use from water conveyance will be achieved in the water conveyance sector. However, these emissions reductions are reported as part of Wastewater-3 as they are a direct result of implementation of Wastewater-3.

Co-Benefit Analysis

The following benefits are expected from implementation of Wastewater-3.

Reduced Energy Use: Water uses a great deal of electricity to pump, treat, and transport. Encouraging the use of lower energy intensity water supplies to displace higher energy intensity water supplies can reduce electricity consumption.

Reduced Air Pollution: Reduced electricity use would contribute to reductions in regional air pollution.

Resource Conservation: Using recycled water in place of freshwater would help conserve freshwater resources.

Water-1: Require Adoption of the Voluntary CALGreen Water Efficiency Measures for New Construction [M]

Measure Description

Require adoption of the Voluntary CALGreen water efficiency measures for New Construction. CALGREEN voluntary measures recommend use of certain water-efficient appliances, and plumbing and irrigation systems, as well as more aggressive water savings targets. Update building standards and codes for new buildings to require adoption of these voluntary measures, including:

• Use of low-water irrigation systems

• Installation of rainwater and graywater systems

• Installation of water-efficient appliances and plumbing fixtures, as well as composting toilets

• A 30-40% reduction over BAU conditions in indoor water use, and a 55-60% reduction in outdoor potable water use (CALGreen Tier 1 or 2)

Assumptions

The following assumptions were considered for the quantification of this measure:

- The market penetration rate for new buildings (residential and commercial) achieving CALGreen Tier 1 or 2 voluntary water efficiency measures and the penetration rate for new parks performing irrigation retrofits were determined by the cities on a city-by-city basis.
- The following voluntary CALGreen measures would be implemented by development.
  - Installation of water efficient appliances and plumbing fixtures (showerheads, faucets, toilets, urinals, and dishwashers).
  - Use of low-water irrigation systems.
  - Installation of gray water systems.
- 57% of total residential water use is for outdoor use / landscaping; the remaining 43% is used indoors (ConSol 2010)
- 35% of total nonresidential water use is for outdoor use / landscaping; the remaining 65% is used indoors (Yudelson 2010)
- Heating a gallon of hot water requires 0.0098 therms of natural gas or 0.19 kWh of electricity (ICLEI Local Governments for Sustainability 2010).
- 73% of water used in faucets and showerheads is hot water (U.S. Department of Energy 2012).
- 10.5% homes have electric water heaters (1.3 million households out of 12.4 million households used electricity to heat water in 2005 in California) (Energy Information Administration 2009, Table WH2).
- 40% of commercial buildings have electric heaters (2,771 million square feet out of 6,947 million square feet use electricity to heat water in 2003 in the Pacific Census Region) (Energy Information Administration 2009, Table B32).
- Assumptions for water-efficient faucets:
  - The current California standard residential faucet flow rate is 2.2 gallons/minute @ 60 psi; the mandatory CALGreen standard flow rate is 1.62 gallons/minute @ 60 psi (California Air Pollution Control Officers Association 2010). This equates to a savings of 0.6 gallons/minute for each faucet replaced.
  - The current California standard nonresidential bathroom faucet flow rate is 0.5 gallons/minute @ 60 psi; the voluntary CALGreen standard flow rate is 0.35 gallons/minute @ 60 psi (California Air Pollution Control Officers Association 2010). This equates to a savings of 0.2 gallons/minute

for each bathroom faucet replaced.

- There are 40 employees per faucet (20 employees per toilet and 2 toilets per faucet) (8 CCR Section 1526(a); 29 CFR 1910.141(c)(1)(i))
- There are 2.1 faucets per household on average (ICLEI Local Governments for Sustainability 2010).
- The average faucet use time (per capita or per employee) is 4.75 minutes use/day total: 0.75 minutes for bathroom faucets (three 0.25 minute uses for bathroom faucets) and 4 minutes for kitchen faucets (four one minute uses for kitchen faucets) (California Building Standards Commission 2011, p. 49)

- Assumptions for water-efficient showerheads:
  - The current California standard showerhead flow rate is 2.5 gallons/minute @ 60 psi; the mandatory CALGreen standard flow rate is 2.0 gallons/minute @ 60 psi (California Air Pollution Control Officers Association 2010). This equates to a savings of 0.5 gallons/minute for each showerhead replaced.
  - The average shower use time is 8 minutes per day per capita (California Building Standards Commission 2011, p. 49).
- Assumptions for water-efficient toilets/urinals:
  - The current California standard toilet water use rate is 1.6 gallons/flush; the mandatory CALGreen standard flow rate is 1.28 gallons/flush (California Air Pollution Control Officers Association 2010). This equates to a savings of 0.32 gallons/flush for each toilet replaced.
  - The current California standard urinal water use rate is 1.0 gallons/flush; the voluntary CALGreen standard flow rate is 0.5 gallons/flush (California Air Pollution Control Officers Association 2010). This equates to a savings of 0.5 gallons/flush for each toilet replaced
  - 2 toilet flushes per person per day (residential) and 2 urinal flushes per male employee per day (nonresidential) (California Building Standards Commission 2011, p. 49)
- Assumptions for water-efficient dishwashers:
  - The current California standard dishwasher water use rate for standard dishwashers is 6.5 gallons/cycle/cubic foot; the voluntary CALGreen standard water use rate is 5.8 gallons/cycle/cubic foot (California Air Pollution Control Officers Association 2010). This equates to a savings of 0.7 gallons/cycle for each standard dishwasher replaced.
  - The current California standard dishwasher water use rate for compact dishwashers is 4.5 gallons/cycle/cubic foot; the ENERGY STAR water use rate is 3.5 gallons/cycle/cubic foot (California Air Pollution Control Officers Association 2010). This equates to a savings of 1.0 gallons/cycle for each compact dishwasher replaced.
  - 0.1 average dishwasher runs per person per day (Mayer and DeOreo 1999)
  - 100% of water used in dishwashers is hot water.
- Assumptions for low-water irrigation systems:
  - The average lawn size per home is 0.2 acre (Grounds Maintenance 2012) (except for Yucca Valley, for which it was assumed 0.1 acres/lawn per home in order to more accurately calculate outdoor residential water use for this city),
  - An acre of lawn requires 652,000 gallons to irrigate per year (Watson et al. n.d.).
  - 35% of total nonresidential water use is for outdoor use / landscaping; the remaining 65% is used indoors (Yudelson 2010)
  - 25% of park/open space acreage is irrigated (estimate).

- 26% savings in landscaping water use for homes and buildings installing low-water irrigation systems (U.S. Environmental Protection Agency 2007).
- 25% of residential outdoor water use is replaced with gray water; 50% of nonresidential outdoor water use is replaced with gray water (estimate).

Analysis Details

GHG Analysis

Water use contributes to GHG emissions indirectly, via the production of the electricity that is used to pump, treat, and distribute the water. Installing low-flow or high-efficiency water fixtures in buildings reduces water demand, energy demand, and associated indirect GHG emissions.

In 2010, the California Building Standards Commission unanimously adopted Title 24 Part 11 (also known as CALGreen), the mandatory green building standards code and the first such code in the nation. CALGreen requires all new buildings in the state to be more energy efficient and environmentally responsible. Effective January 1, 2011, CALGreen requires that every new building constructed in California reduce water consumption by 20%. CALGreen voluntary measures recommend a 30–40% reduction over BAU conditions in indoor water use and 55–60% reduction over BAU outdoor potable water use.

California homes and businesses consume a significant amount of water through indoor plumbing needs and outdoor irrigation. ConSol estimates that an average three-bedroom home uses 174,000 gallons of water each year (ConSol 2010). A large portion of water use can be attributed to inefficient fixtures (e.g., showerheads, toilets). Recognizing that water uses a great deal of electricity to pump, treat, and transport, the state adopted SB X7-7, which requires a 20% reduction in urban per capita use by December 31, 2020 (20X2020 goal). Achieving this goal would not only reduce electricity consumption, but avoid GHG emissions and conserve water.

<u>Emissions Reductions</u>

Water savings were calculated for the installation of six different water-efficient fixtures/systems: faucets, showerheads, toilets/urinals, dishwashers, low-water irrigation systems, and gray water systems. Methods for calculating water savings for each of these are described below.

Faucets:

- Residential water savings (gallons) = total new households in 2020 * 100% market penetration rate * persons/household (varies by city) * 0.6 gallons of water saved/minute * 4.75 minutes of use/person per day * 365 days/year
- Nonresidential bathroom faucet water savings (gallons) = total number of new employees in 2020 * city-selected market penetration rate ÷ 40 employees/faucet * 0.2 gallons of water saved/minute * 0.75 minutes of use/employee per day * 260 workdays/year
- Nonresidential kitchen faucet water savings (gallons) = total number of new employees in 2020 * city-selected market penetration rate ÷ 40 employees/faucet * 1.4 gallons of water saved/minute * 4 minutes of use/employee per day * 260 workdays/year

Showerheads:

a) Residential water savings (gallons) = total new residents in 2020 * 100% market penetration rate * 0.5 gallons of water saved/minute * 8 minutes of shower use/person per day * 365 days/year

b) No savings for nonresidential

Toilets/urinals:

a) Residential water savings (gallons) = total new residents in 2020 * 100% market penetration rate * 0.32 gallons of water saved/flush * 2 flushes/person per day * 365 days/year

b) Nonresidential toilet water savings (gallons) = total number of new employees in 2020 * city-selected market penetration rate * 0.48 gallons of water saved/flush * (50% men * 1 flush/male

employee per day + 50% women * 3 flushed/female employee per day) * 365 days/year

c) Nonresidential urinal water savings (gallons) = total number of new employees in 2020 * city-selected market penetration rate * 0.5 gallons of water saved/flush * 50% men * 2 flushes/male employee per day * 260 workdays/year

Dishwashers:

a) Residential water savings (gallons) = total new residents in 2020 * city-selected market penetration rate * (50% standard dishwashers * 0.7 gallons of water saved/cycle for standard dishwashers + 50% compact dishwashers * 1.0 gallons of water saved/cycle for compact dishwashers) * 0.1 dishwasher runs/person per day * 365 days/year

b) No savings for nonresidential

Low-water irrigation systems:

a) Residential water savings (gallons) = total new homes in 2020 * 0.2 acres of lawn/home average * 100% market penetration rate * 652,000 gallons used for irrigation/acre per year * 26% reduction in water use for irrigation control sensors

b) Nonresidential building water savings (gallons) = total new 2020 water use * 35% outdoor water use for office buildings on average * city-selected market penetration rate * 26% reduction in water use for irrigation control sensors

c) Parks water savings (gallons) = total new 2020 park water use * city-selected market penetration rate * 26% reduction in water use for irrigation control sensors

Gray water systems:

a) Residential water savings (gallons) (total new homes in 2020 * 0.2 acres of lawn/home average * 100% market penetration rate * 652,000 gallons used for irrigation/acre per year – water saved from irrigation control sensors) * city-selected percentage of outdoor water use that is replaced with gray water

b) Nonresidential building water savings (gallons) = (total new 2020 water use * 35% outdoor water use for office buildings on average – water saved from irrigation control sensors) * city-selected percentage of outdoor water use that is replaced with gray water

Water use savings result in energy use reductions for three different categories. Electricity savings from reduced water conveyance, treatment, distribution, and wastewater treatment were quantified by multiplying the anticipated water reductions by the appropriate energy-intensities.

Electricity savings from reduced water heating for faucets, showerheads, and dishwashers were quantified as follows:

c) Residential electricity savings (kWh) = gallons of water saved * 73% hot water for faucets and showerheads OR 100% hot water for dishwashers * 10.5% of homes with electric water heaters * 0.19 kWh to heat a gallon of water

d) Nonresidential electricity savings (kWh) = gallons of water saved * 73% hot water for faucets and showerheads OR 100% hot water for dishwashers * 40% of commercial buildings with electric water heaters * 0.19 kWh to heat a gallon of water

Natural gas savings from reduced water heating for faucets, showerheads, and dishwashers were quantified as follows:

a) Residential natural gas savings (therms) = gallons of water saved * 73% hot water for faucets and showerheads OR 100% hot water for dishwashers * 89.5% of homes with natural gas water heaters * 0.0098 therms to heat a gallon of water

b) Nonresidential natural gas savings (therms) = gallons of water saved * 73% hot water for faucets

and showerheads OR 100% hot water for dishwashers * 40% of commercial buildings with electric water heaters * 0.19 kWh to heat a gallon of water

GHG savings from electricity and natural gas reductions were then calculated by multiplying the energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Water-1.

Resource Conservation: Reduced water consumption would help conserve freshwater resources.

Reduced Energy Use: Water uses a great deal of electricity to pump, treat, and transport. Likewise, water consumed during showers, dish washing, and clothes washing require electricity and natural gas to heat the water to a comfortable temperature. Consequently, reductions in water use would reduce energy consumption from pumping, treatment, transporting, and heating

Reduced Air Pollution: Reduced electricity use would contribute to reductions in regional air pollution.

Increased Property Values: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

Water-2: Implement a Program to Renovate Existing Buildings to Achieve Higher Levels of Water Efficiency [V][19]

Measure Description

Implement a program to renovate existing buildings to achieve higher levels of water efficiency. Education and outreach programs can help educate individuals on the importance of water efficiency and how to reduce water use. Rebate programs can help promote installation of water-efficient plumbing fixtures. The program could address:

- Development plans to ensure water conservation techniques are used (e.g., rain barrels, drought tolerant landscape).
- Water efficiency upgrades as a condition of issuing permits for renovations or additions of existing buildings.
- Adopt water conservation pricing, such as tiered rate structures, to encourage efficient water use.
- Incentives for projects that demonstrate significant water conservation through use of innovative water consumption technologies.

Assumptions

The assumptions described in Water-1 were used to quantify water, energy, GHG emissions reductions associated with this measure. The following assumptions were modified:

- The market penetration rate for buildings (residential and commercial) performing water efficiency retrofits and the penetration rate for parks performing irrigation retrofits were determined by the cities on a city-by-city basis.

Analysis Details

GHG Analysis

Water use contributes to GHG emissions indirectly, via the production of the electricity that is used to pump, treat, and distribute the water. Installing low-flow or high-efficiency water fixtures in buildings reduces water demand, energy demand, and associated indirect GHG emissions.

California homes and businesses consume a significant amount of water through indoor plumbing needs and outdoor irrigation. ConSol estimates that an average three-bedroom home uses 174,000 gallons of water each year (ConSol 2010). A large portion of water use can be attributed to inefficient fixtures (e.g., showerheads, toilets). Recognizing that water uses a great deal of electricity to pump, treat, and transport, the state adopted SB X7-7, which requires a 20% reduction in urban per capita use by December 31, 2020 (20X2020 goal). Achieving this goal would not only reduce electricity consumption, but avoid GHG emissions and conserve water.

<u>Emissions Reductions</u>

The methods described in Water-1 were used to quantify water, energy, and GHG emissions reductions associated with this measure. The following assumptions were modified.

- BAU water flow rates were based on the 1992 Energy Policy Act.[20]

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[19] Emissions reductions associated with reduced electricity and natural gas for hot water heating will be achieved in the building energy sector. However, these emissions reductions are reported as part of Water-2 as they are a direct result of implementation of water-efficient fixtures.

[20] Because this measure applies to existing developing, assuming BAU flow rates are equivalent to the 2010 building code is inappropriate. According to the City's Housing Element and the EIA, the majority of homes and commercial developments were constructed prior to 1980. Assuming the 1992 flow rate therefore represents a conservative assumption as several developments that comply with this measure will likely replace fixtures with flow rates much higher than required in 1992.

Co-Benefit Analysis

The following benefits are expected from implementation of Water-2.

Resource Conservation: Efficient appliances and fixtures would reduce water consumption would help conserve freshwater resources.

Reduced Energy Use: Water uses a great deal of electricity to pump, treat, and transport. Likewise, water consumed during showers, dish washing, and clothes washing require electricity and natural gas to heat the water to a comfortable temperature. Consequently, reductions in water use would reduce energy consumption from pumping, treatment, transporting, and heating.

Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

Increased Property Values: Energy-efficient buildings have higher property values and resale prices than less efficient buildings.

Water-3: Encourage Water-Efficient Landscaping Practices [V]

Measure Description

Encourage Water-Efficient Landscaping Practices. Adopt a landscaping water conservation plan that exceeds the requirements in the Model Landscape Ordinance (AB 1881).

Assumptions

The following assumptions were considered for the quantification of this measure:

- The market penetration rate for buildings (residential and commercial) and parks performing water-efficient landscaping practices was determined by the cities on a city-by-city basis.
- The average lawn size per home is 0.2 acre (Grounds Maintenance 2012) (except for Yucca Valley, for which it was assumed 0.1 acres/lawn per home in order to more accurately calculate outdoor residential water use for this city)
- An acre of lawn requires 652,000 gallons to irrigate per year (Watson et al. n.d.)
- Assuming an irrigation efficiency of 71% as specified in the Model Water Efficient Landscape Ordinance and no Special Landscape Area, the percent reduction in CO_2e for water-efficient landscapes is (California Air Pollution Control Officers Association 2010):
- 0% reduction if 100% of vegetation is Moderate Example Plant Factor (PF)
- 13% reduction if 40% of vegetation is Low PF, 40% is Moderate PF, and
- 20% is High PF
- 35% reduction if 50% of vegetation is Low PF and 50% is Moderate PF
- 70% reduction if 100% of vegetation is Low PF
- The average reduction in CO_2e is 30% (based on the percent reductions above).
- 6.1% reduction in CO_2e for water-efficient landscape irrigation systems (California Air Pollution Control Officers Association 2010)
- 35% of total nonresidential water use is for outdoor use / landscaping; the remaining 65% is used indoors (Yudelson 2010)
- 25% of park/open space acreage is irrigated (estimate).

Analysis Details

GHG Analysis

Water use contributes to GHG emissions indirectly, via the production of the electricity that is used to pump, treat, and distribute the water. California homes and businesses consume a significant amount of water through outdoor water use, which includes landscape irrigation. Designing water-efficient landscapes for a project site reduces water consumption and the associated indirect GHG emissions.

Examples of measures to consider when designing landscapes are reducing lawn sizes, planting vegetation with minimal water needs such as California native species, choosing vegetation appropriate for the climate of the project site, and choosing complimentary plants with similar water needs or which can provide each other with shade and/or water. Achieving this goal would not only reduce electricity consumption, but avoid GHG emissions and conserve water.

<u>Emissions Reductions</u>

The following steps were performed to calculate water savings:

i) Residential water savings (gallons) = total homes in 2020 * 0.2 acres of lawn/home average * city-selected market penetration rate * 652,000 gallons used for irrigation/acre per year * (30% average reduction in water use for water-efficient landscapes + 6.1% reduction in water use for

water-efficient landscape irrigation systems)

j) Nonresidential building water savings (gallons) = total 2020 water use * 22% outdoor water use for office buildings on average * city-selected market penetration rate * (30% average reduction in water use for water-efficient landscapes + 6.1% reduction in water use for water-efficient landscape irrigation systems)

k) Parks water savings (gallons) = total 2020 park water use * city-selected market penetration rate * (30% average reduction in water use for water-efficient landscapes + 6.1% reduction in water use for water-efficient landscape irrigation systems)

GHG savings from electricity reductions were then calculated by multiplying the energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Water-3.

Resource Conservation: Efficient irrigation systems would reduce water consumption would help conserve freshwater resources.

Reduced Energy Use: Water uses a great deal of electricity to pump, treat, and transport. Consequently, reductions in water use would reduce energy consumption from pumping, treatment, and transporting.

Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity).

Increased Property Values: Energy-efficient buildings have higher property values and resale prices than less efficient buildings.

Water-4: Senate Bill X7-7 The Water Conservation Act of 2009 [M]

Measure Description

SB X7-7 was enacted in November 2009 and requires urban water agencies throughout California to increase conservation to achieve a statewide goal of a 20 percent reduction in urban per capita use by December 31, 2020.

Assumptions

The assumptions described in Water-1 were used to quantify water, energy, GHG emissions reductions associated with this measure. The following additional assumptions were used:

- 20% reduction in total water use obtained by this measure.
- 33% of total residential indoor water use is hot water (Aquacraft, Inc. 2014).
- 22% of total commercial indoor water use is hot water (Yudelson 2010, U.S. Department of Energy 2012).

Analysis Details

GHG Analysis

Water use contributes to GHG emissions indirectly, via the production of the electricity that is used to pump, treat, and distribute the water. Installing low-flow or high-efficiency water fixtures in buildings reduces water demand, energy demand, and associated indirect GHG emissions.

California homes and businesses consume a significant amount of water through indoor plumbing needs and outdoor irrigation. ConSol estimates that an average three-bedroom home uses 174,000 gallons of water each year (ConSol 2010). A large portion of water use can be attributed to inefficient fixtures (e.g., showerheads, toilets). Recognizing that water uses a great deal of electricity to pump, treat, and transport, the state adopted SB X7-7, which requires a 20% reduction in urban per capita use by December 31, 2020 (20X2020 goal). Achieving this goal would not only reduce electricity consumption, but avoid GHG emissions and conserve water.

<u>Baseline Emissions and Emissions Reductions</u>

Each urban water retailer in the county has adopted a 2010 Urban Water Management Plan (UWMP). Each plan establishes a 2020 urban water use target for the retailer's service area. These targets vary by city and depend on the baseline per-capita water use rate identified in each UWMP. These targets represent the level of water consumption needed to achieve the 20X2020 goal for each water retailer.

Baseline per-capita water use rates range from 77 gallons per capita per day (gpcd) to 360 gpcd, and per-capita water use rate targets range from 77 gpcd to 292 gpcd. Most UWMPs specify a 20% reduction in water use rates to comply with SB X7-7, but some UWMPs state that the SB X7-7 target is already obtained in their service area. For cities served by these water retailers, no reductions were calculated for Water-4.

The following steps were performed to calculate water savings:

a) 2020 water use reductions from Water-1, 2, and 3 were subtracted from the BAU 2020 water use in order to determine the percent reduction in water use already achieved through these measures.

b) The percent reduction in per-capita water use rates due to the implementation of SB X7-7 was calculated using the baseline and target per-capita water use values for each city from the 2010 UWMPs.

c) If the water use percent reductions from Water-1, 2, and 3 exceed the SB X7-7 percent reduction from 2020 BAU water use, then Water-4 will yield no reductions.

d) If the water use percent reductions from Water-1, 2, and 3 *do not* exceed the SB X7-7 percent reduction from 2020 BAU water use, then the water use reductions achieved by Water-4 are equal to the amount of additional water reductions needed to achieve the SB X7-7 per-capita water use

targets.

e) Water savings were calculated by source (SWP, groundwater, etc.) and sector (residential, commercial, indoor, outdoor) using the assumptions identified in Water-1.

f) Hot water savings were calculated (residential and commercial) using the assumptions identified above.

g) Electricity and natural gas reductions in the building energy sector (for water heating) and the water conveyance sector (conveyance, treatment, etc.) associated with the reduced water use were then calculated.

h) Wastewater treatment emission reductions associated with Water-4, taking into account reductions from Wastewater-1, Water-1, and Water-2, were then calculated.

GHG savings from electricity reductions were then calculated by multiplying the energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Water-4.

Resource Conservation: Reduced water consumption would help conserve freshwater resources.

Reduced Energy Use: Water uses a great deal of electricity to pump, treat, and transport. Consequently, reductions in water use would reduce electricity consumption.

Reduced Air Pollution: Reduced electricity use would contribute to reductions in regional air pollution.

Increased Property Values: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

Land Use-1: Tree Planting Programs [CITY][21]

Measure Description

Establish a city-wide tree planting goal or tree preservation goal. Possible implementation mechanisms might include a requirement to account for trees removed and planted as part of new construction and/or establishing a goal and funding source for new trees planted on city property. To maximize GHG and other environmental benefits, new trees would be targeted to the downtown and urban areas. This measure will reduce energy consumption and associated GHG emissions in the building energy sector by reducing the heat island effect.

Assumptions

The following assumptions were considered for the quantification of this measure.

- Tree planting programs begin in 2012.The number of trees planted per year was determined by the cities on a city-by-city basis.
- Annual energy savings from planting 1 tree due to decreased heat island effect = 7 kWh (ICLEI Local Governments for Sustainability 2010).
- Tree shading effects were not considered.
- Carbon sequestration was not considered.

Analysis Details

GHG Analysis

The exact location of where the trees would be planted in each city is not known at this point. Trees planted along transportation corridors and roadways, or in parks and open space areas, would not shade buildings (which can reduce summer cooling energy consumption). Therefore, to be conservative, tree shading effects were not considered for this measure. In addition, carbon sequestration benefits from new trees were not considered because the BAU inventories do not have a BAU assessment of carbon sequestration for each city.

Trees can also reduce the urban heat island effect through both shading and evapotranspiration. Thus, quantification of this measure focused on reduced urban heat island effect. The GHG benefits achieved from tree planting would vary based on the species, age, and size of tree planted.

Emissions Reductions

The total number of trees planted by each city per year was multiplied by 9 years of tree plantings (2012-2020 inclusive) and then by 7 kWh saved/tree per year to determine electricity reductions associated with the tree's ability to reduce the heat island effect.

GHG savings from electricity reductions were then calculated by multiplying the energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Land Use-1.

Reduced Energy Use: Trees planted adjacent to buildings shade, which cools buildings and reduces the need for summer-time air conditioning use. As a result, less electricity is consumed.

[21] Emissions reductions associated with reduced electricity for ventilation and cooling as a result of reducing the heat island effect will be achieved in the building energy sector. However, these emissions reductions are reported as part of Land Use-1 as they are a direct result of tree-planting programs.

Reduced Air Pollution: Reduced electricity use would contribute to reductions in regional air pollution. Trees planted adjacent to congested roadways may also help filter particulate matter and other local pollutants.

Reduced Urban Heat Island Effect: Urban heat isalnd effect occurs when the ambient temperature in urban areas increases as a reuslt of high energy consumption (e.g., air conditioning use during the summertime). Trees provide shade, which reduces the cooling load of buildings and helps mitigate the urban heat island effect.

Increased Quality of Life: Trees improve the aesthetic quality of buildings, as well as reduce stormwater runoff during periods of heavy rain.

Land Use-2: Promote Rooftop Gardens [V] [22]

Measure Description

Encourage 5% of new multi-family residences and 15% of new commercial facilities over 100,000 square feet to construct rooftop gardens. This measure will also reduce energy consumption and associated GHG emissions in the building energy sector.

Assumptions

The following assumptions were considered for the quantification of this measure.

- The market penetration rates for the number of new multi-family residences and new commercial facilities installing rooftop gardens were determined by the cities on a city-by-city basis.
- Multi-family residential building assumptions:
  - The average per-unit floor area in new multi-family buildings is 1,107 square feet in the western region of the U.S. (U.S. Census Bureau 2011a)
  - The average number of floors per multi-family building is 2.26 [23] in the western region of the U.S. (U.S. Census Bureau 2011b).
  - The average per-unit floor area of lobby/hallway space is 100 square feet (estimate).
  - Based on the above assumptions, the average roof space per multi-family unit is 590 square feet (1,107 square feet per unit ÷ 2.26 floors per building + 100 lobby/hallway square feet)
  - 25% of the total roof space on buildings can be a green roof (estimate)
- Commercial building assumptions:
  - Total commercial building square footage in each city was estimated using the total energy consumption (electricity and natural gas) and dividing by 13.69 kWh per building square foot (California Energy Commission 2006, Table 10-1) and 0.23 therms per square foot (California Energy Commission 2006, Table 10-2) for all commercial buildings in the SCE service area and taking the average of those two results.
  - 36% of all nonresidential buildings in each Participating City are greater than 100,000 square feet. This value is for the pacific region from the EIA's Commercial Building Energy Consumption Survey (see Energy-9 for calculation details) (Energy Information Administration 2008).
  - The roof space to floor space ratio is 0.3 (estimate).
  - 50% of the total roof space on buildings can be a green roof (estimate)
  - The annual direct electricity savings per green roof square foot is 0.45 kWh
  - The annual indirect electricity savings per green roof square foot is 0.25 kWh

[22] Emissions reductions associated with reduced electricity for ventilation and cooling will be achieved in the building energy sector. However, these emissions reductions are reported as part of Land Use-2 as they are a direct result of green roof programs.

[23] 87% of multifamily buildings built in 2008 were 1-3 floors; 13% were 4 floors or more. The average number of floors was calculated as follows: 87% * 2 floors + 13% * 4 floors = 2.26 floors.

Analysis Details

GHG Analysis

A green roof or rooftop garden is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. Green roofs serve several purposes for a building, such as absorbing rainwater, providing insulation, creating a habitat for wildlife, and helping to lower urban air temperatures and mitigate the heat island effect.

Emissions Reductions

The following steps were performed to calculate electricity savings associated with green roofs:

a) Residential electricity savings (kWh) = total new multifamily homes in 2020 * market penetration rate (determined by cities) * 590 square feet of roof space per multi-family unit * 25% of roof space is a green roof * (0.45 direct kWh saved per square foot of green roof per year + 0.25 indirect kWh saved per square foot of green roof per year)

b) Nonresidential electricity savings (kWh) = total new building square footage in 2020 * 36% of buildings are greater than 100,000 square feet * market penetration rate (determined by cities) * 0.3 (roof space to floor space ratio) * 50% of roof space is a green roof * (0.45 direct kWh saved per square foot of green roof per year + 0.25 indirect kWh saved per square foot of green roof per year)

GHG savings from electricity reductions were then calculated by multiplying the energy reductions by the appropriate utility emission factors.

Co-Benefit Analysis

The following benefits are expected from implementation of Land Use-2.

Reduced Energy Use: Green roofs can provide cooling and heating which reduces the need for summer-time air conditioning use and winter heating. As a result, less electricity is consumed.

Reduced Air Pollution: Reduced electricity use would contribute to reductions in regional air pollution. Vegetation on buildings adjacent to congested roadways may also help filter particulate matter and other local pollutants.

Reduced Urban Heat Island Effect: Urban heat isalnd effect occurs when the ambient temperature in urban areas increases as a reuslt of high energy consumption (e.g., air conditioning use during the summertime). Rooftop vegetation provides shade, which reduces the cooling load of buildings and helps mitigate the urban heat island effect.

Increased Quality of Life: Trees and vegetation improve the aesthetic quality of buildings, as well as reduce stormwater runoff during periods of heavy rain.

Off-Road-1: Electric-Powered Construction Equipment [V]

Measure Description

Offer incentives (e.g., reduced procedural requirements; preference points when bidding on city contracts, partner with CARB or the South Coast Air Quality Management District (SCAQMD) to leverage funding) to construction contractors that utilize electric equipment in a certain percentage of their fleet. Fleet percentage goals might be:

- 25% of equipment on annual projects occurring within the city
- 15% of equipment on annual projects occurring within the city
- 5% of equipment on annual projects occurring within the city

Achieving the goal would require close coordination with the air district which sets air quality related requirements on construction vehicles and also provides mitigation options related to construction vehicles through Voluntary Emission Reduction Agreement (VERA) programs which may overlap with this measure.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The percent of construction equipment which is electric by 2020 was determined by the cities on a city-by-city basis.
- The percent emission reductions for a fully electric vehicle in SCE's service area by engine type is provided below (California Air Pollution Control Officers Association 2010):
    - Diesel: 61.8%
    - CNG: 67.9%
    - Gasoline: 2-stroke: 49.5%
    - Gasoline: 4-stroke, < 25 horsepower: 49.5%
    - Gasoline: 4-stroke, 25-50 horsepower: 72.3%
    - Gasoline: 4-stroke, 50-120 horsepower: 72.0%
    - Gasoline: 4-stroke, 120-175 horsepower: 71.2%
    - Gasoline: 4-stroke, 175-500 horsepower: 70.4%

Analysis Details

GHG Analysis

Utilizing electric power would offset direct GHG emissions from fuel combustion. Indirect emissions from electricity are significantly lower than direct emissions from fuel combustion. Electrifying construction vehicles therefore results in a reduction in GHG emissions.

<u>Emissions Reductions</u>

Emission reductions associated with State-8 (LCFS for Off-Road Equipment) were subtracted from 2020 BAU construction equipment emissions. This was done in order to determine the emissions from offroad construction equipment after the implementation of the LCFS, before the application of the Off-Road-1.

The OFFROAD2007 model calculates vehicle operating emissions by fuel type (e.g., diesel, gasoline) and average horsepower. Model emissions outputs by vehicle class were multiplied by the percent of construction equipment which is electrified by 2020 (determined by the cities) and then multiplied by CAPCOA's anticipated percent reduction in GHG emissions for switching to electric power (see assumptions above).

Co-Benefit Analysis

The following benefits are expected from implementation of Off-Road-1.

Reduced Air Pollution: Utilizing electricity in place of diesel would reduce local air pollution.

Public Health Improvements: Diesel combustion release several toxic air containments known to cause adverse human health effects to construction workers. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

Increased Quality of Life: Electric equipment is quieter and typically easier to maneuver than diesel-powered equipment.

Off-Road-2: Idling Ordinance [M]

Measure Description

Adopt an Ordinance that limits idling time for heavy-duty construction equipment beyond CARB or local air district regulations and if not already required as part of CEQA mitigation. Recommended idling limit is 3 minutes (California Air Pollution Control Officers Association 2010). Encourage contractors as part of permitting requirements or city contracts to submit a construction vehicle management plan that includes such things as: idling time requirements; requiring hour meters on equipment; documenting the serial number, horsepower, age, and fuel of all onsite equipment. California state law currently requires all off-road equipment fleets to limit idling to no more than 5 minutes.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- 0.9 gallons of diesel fuel are consumed per hour of idling (U.S. Environmental Protection Agency 2009a)
- 6.32 gallons of diesel fuel are consumed per hour of operation for construction equipment.
- On average, construction equipment spend approximately 29.4% of daily operating time idling (U.S. Environmental Protection Agency 2009a)
- This measure results in a 40% reduction in idling emissions (the change from 5 minutes to 3 minutes for max idling time)

Analysis Details

GHG Analysis

Equipment idles during rest periods, which requires fuel and results in GHG emissions. Regulating idling time would therefore reduce fuel consumption and GHG emissions.

2020 BAU Emissions

BAU emissions from construction equipment idling were quantified using the ratio of idle to operating fuel consumption. Fuel consumption for off-road equipment will vary by type. However, according to the EPA, a typical mid-size track-type tractor consumes 0.9 gallon of fuel for every one hour at idle (U.S. Environmental Protection Agency 2009a). Based on an URBEMIS2007 model run for a similar equipment piece, approximately 64 kilograms of carbon dioxide are emitted. Assuming 10.21 kilograms of carbon dioxide per gallon of diesel fuel (Climate Registry 2012), 6.28 gallons of fuel are consumed per hour of operation.

CARB does not regulate idling time for off-road equipment. Anticipated BAU idling times were therefore estimated using case studies of construction equipment. The EPA (2009a) estimates that on average, construction equipment spend approximately 29.4% of daily operating time idling. Assuming an average workday of 8 hours, this equates to approximately 141 minutes per day. Based on this assumption, and the estimated gallons of fuel consumed (above), BAU idling emissions were estimated for each city.

Emissions Reductions

Emission reductions associated with State-8 (LCFS for Off-Road Equipment) and Off-Road-1 (Construction Equipment) were subtracted from 2020 BAU construction equipment emissions. This was done in order to determine the emissions from off-road construction equipment after the implementation of the LCFS, before the application of the Off-Road-2.

Implementation of Off-Road-2 would reduce idling time to no more than 3 minutes at any one time. Although construction equipment idles for over 141 minutes today, it is unlikely the idling occurs a single time. The CARB's regulations for heavy duty vehicle (5 minutes) was used a proxy to determine the percent reduction in potential idling emissions from implementation of Off-Road-2. Reducing idling time from 5 minutes to 3 minutes is a 40% reduction. Emissions savings associated with this measure were therefore calculated by multiplying BAU idling emissions by 0.40.

Co-Benefit Analysis

The following benefits are expected from implementation of Off-Road-2.

Reduced Energy Use: Equipment idles during rest periods, which requires fuel. Regulating idling time therefore reduces fossil fuel consumption.

Reduced Air Pollution: Reduced idling and fuel combustion would contribute to reductions in toxic air contaminates, ozone precursors, and other inorganic and organic air pollutants.

Public Health Improvements: Construction workers are exposed to pollutants that cause adverse health effects when they work near idling vehicles. By reducing vehicle idling time, exposure periods would be decreased, which may contribute to long-term health improvements.

Off-Road-3: Electric Landscaping Equipment [V]

Measure Description

Adopt an ordinance that reduces gasoline-powered landscaping equipment use and/or reduces the number and operating time of such equipment. Require a certain percentage (e.g., 75%) of each participating cities' landscaping equipment be electric by 2020 and 100% by 2030. Cities would work in close cooperation with the air district in drafting an ordinance or developing outreach programs to be consistent with current air district rules and CEQA guidelines. The ordinance could also include the following provisions for community landscaping equipment.

Assumptions

The following assumptions were considered in the evaluation of this measure:

- The percent of landscaping equipment which is electric by 2020 was determined by the cities on a city-by-city basis.
- The percent emission reductions for electric landscaping equipment (compared to gasoline-powered equipment) in SCE's service area by horsepower is provided below (California Air Pollution Control Officers Association 2010):
- < 25 horsepower: 49.5%
- 25-50 horsepower: 72.3%
- 50-120 horsepower: 72.0%
- 120-175 horsepower: 71.2%
- 175-500 horsepower: 70.4%
- This measure applies to the following equipment as modeled in OFFROAD2007: lawn mowers, chainsaws, leaf blowers, trimmers, shredders, commercial turf equipment, chippers, and other lawn and garden equipment
- Converting diesel landscaping equipment to electric equipment will provide the same percent reduction in GHG emissions for gasoline equipment (it is likely that the reductions for diesel equipment would be greater, since diesel has a higher CO_2 emission factor than gasoline).

Analysis Details

GHG Analysis

Utilizing electric power eliminates 100% of direct GHG emissions from fuel combustion. Indirect emissions from electricity are significantly lower than direct emissions from fuel combustion. Electrifying landscaping vehicles therefore results in a reduction in GHG emissions.

<u>2020 BAU Emissions</u>

The GHG Inventory quantified emissions associated with off-road equipment in 2020 under BAU conditions.

<u>Emissions Reductions</u>

Emission reductions associated with State-8 (LCFS for Off-Road Equipment) were subtracted from 2020 BAU landscaping equipment emissions. This was done in order to determine the emissions from off-road landscaping equipment after the implementation of the LCFS, before the application of the Off-Road-3.

The OFFROAD2007 model calculates vehicle operating emissions by fuel type (e.g., diesel, gasoline) and average horsepower. Model emissions outputs by vehicle class were multiplied by the percent of landscaping equipment which is electrified by 2020 (determined by the cities) and then multiplied by CAPCOA's anticipated percent reduction in GHG emissions for switching to electric power (see assumptions above).

Co-Benefit Analysis

The following benefits are expected from implementation of Off-Road-3.

Reduced Air Pollution: Utilizing electricity in place of gasoline and diesel would reduce local air pollution.

Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

Increased Quality of Life: Electric equipment is quieter and typically easier to maneuver than diesel- and gasoline-powered equipment.

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Appendix C

City of Yucaipa

Climate Action Plan

GREENHOUSE GAS EMISSIONS

Screening Tables

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Introduction

The City's Climate Action Plan (CAP) includes reducing greenhouse gas emissions from new development by 2020 as compared to the 2020 unmitigated conditions. Reductions related to transportation, water, solid waste, energy, and renewable energy sources all play a part in gaining the level of efficiency needed within new development.

Mitigation of GHG emissions impacts through the Development Review Process (DRP) provides one of the most substantial reduction strategies for reducing community-wide emissions associated with new development. The DRP procedures for evaluating GHG impacts and determining significance for CEQA purposes will be streamlined by (1) applying an emissions level that is determined to be less than significant for small projects, and (2) utilizing Screening Tables to mitigate project GHG emissions that exceed the threshold level. Projects will have the option of preparing a project-specific technical analysis to quantify and mitigate GHG emissions. A threshold level of 3,000 $MTCO_2e$ per year will be used to identify projects that require the use of Screening Tables or a project-specific technical analysis to quantify and mitigate project emissions.

The California Environmental Quality Act ("CEQA") requires assessment of the environmental impacts of proposed projects including the impacts of greenhouse gas (GHG) emissions. The purpose of this document is to provide guidance on how to analyze GHG emissions and determine the significance of those emissions during CEQA review of proposed development projects within the City. The analysis, methodology, and significance determination (thresholds) are based upon the CAP, the GHG emission inventories within the CAP, and the GHG reduction measures that reduce emissions to the AB-32 compliant reduction target of the CAP. The Screening Tables can be used by the City for review of development projects in order to ensure that the specific reduction strategies in the CAP are implemented as part of the CEQA process for development projects. The Screening Tables provide a menu of options that both–ensures implementation of the reduction strategies and flexibility on how development projects will implement the reduction strategies to achieve an overall reduction of emissions, consistent with the reduction target of the CAP.

California Environmental Quality Act

CEQA MANDATES FOR ANALYSIS OF IMPACTS

CEQA requires that Lead Agencies inform decision makers and the public regarding the following: potential significant environmental effects of proposed projects; feasible ways that environmental damage can be avoided or reduced through the use of feasible mitigation measures and/or project alternatives; and the reasons why the Lead Agency approved a project if significant environmental effects are involved (CEQA Guidelines §15002). CEQA also requires Lead Agencies to evaluate potential

environmental effects based to the fullest extent possible on scientific and factual data (CEQA Guidelines §15064[b]). A determination of whether or not a particular environmental impact will be significant must be based on substantial evidence, which includes facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts (CEQA Guidelines §15064f[5]).

The recently amended CEQA Guidelines (CEQA Guidelines §15064.4[a] [b]) explicitly requires Lead Agencies to evaluate GHG emissions during CEQA review of potential environmental impacts generated by a proposed project. To assist in this effort, two questions were added to Appendix G of the CEQA Guidelines:

- Would the project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?
- Would the project conflict with any applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs?

Finally, under the "rule of reason," an EIR is required to evaluate impacts to the extent that is reasonably feasible ([CEQA Guideline § 15151; *San Francisco Ecology Center v. City and County of San Francisco* (1975) 48 Cal.App.3rd 584]). While CEQA does require Lead Agencies to make a good faith effort to disclose what they reasonably can, CEQA does not demand what is not realistically possible ([*Residents at Hawks Stadium Committee v. Board of Trustees* (1979) 89 Cal.App.3rd 274, 286]).

Greenhouse Gas Impact Determination

STATEWIDE OR REGIONAL THRESHOLDS OF SIGNIFICANCE

There are currently no published statewide thresholds of significance for measuring the impact of GHG emissions generated by a proposed project. CEQA Guidelines §15064.7 indicates only that, "each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects." The County of San Diego has published draft thresholds that, when finalized, jurisdictions within the County can use if they do not have their own thresholds and GHG mitigation plans. However, the CAP for the City addresses cumulative GHG emissions, has a reduction target that reduces the cumulative GHG impacts to less than significant, has a set of reduction measures that achieves the reduction target and provides an implementation plan to implement the reduction measures. This document provides guidance in how to address GHG emissions in CEQA analysis and determine the significance of project generated GHG emissions.

QUANTITATIVE ANALYSIS RELATIVE TO THE CLIMATE ACTION PLAN

METHODOLOGY OVERVIEW

An individual project cannot generate enough GHG emissions to influence global climate change. The project participates in this potential impact by its incremental contribution combined with the cumulative increase of all other sources of GHGs, which when taken together may have a significant impact on global climate change. To address the State's requirement to reduce GHG emissions, the City prepared the CAP with the target of reducing GHG emissions within the City by 15 percent below 2008 baseline emission levels by year 2020. The City's target is consistent with AB 32 and ensures that the City is providing GHG reductions locally that will complement the State and international efforts of stabilizing climate change.

Because the City's CAP addresses GHG emissions reduction, is in concert with AB 32 and international efforts to address global climate change, and includes specific local requirements that will substantially lessen the cumulative problem, compliance with the CAP fulfills the description of mitigation found in CEQA Guidelines §15130(a)(3) and §15183.5.

Because GHG emissions are only important in the context of cumulative emissions, the focus of the analysis is on answering the question of whether incremental contributions of GHGs are a cumulatively considerable contribution to climate change impacts. The CAP includes a set of mitigation measures designed to substantially lessen cumulative impacts associated with GHG emissions as described in CEQA Guidelines §15130(a)(3), in determining if a project's effects will result in significant impacts. The CAP has the following components that fulfill cumulative mitigation for GHG emissions:

1. The CAP provides a community-wide GHG emissions reduction target that will substantially lessen the cumulative impact;
2. The CAP provides measures that new development projects must follow to meet the City's reduction target and substantially lessen the cumulative impact;
3. The CAP provides a set of GHG emission inventories that provides quantitative facts and analysis of how the measures within the CAP meet the reduction target that substantially lessens the cumulative impact:
4. The CAP provides an implementation, monitoring and update program to insure that the reduction target is met.

The CAP satisfies the first condition by adopting a target of reducing GHG emissions within the City by 15 percent below existing levels by 2020. This reduction target is compliant with AB 32; the AB 32 Climate Change Scoping Plan states: "In recognition of the critical role local governments will play in the successful implementation of AB 32, ARB recommended a greenhouse gas reduction goal for local governments of 15 percent below existing levels by 2020 to ensure that their municipal and community-

wide emissions match the State's reduction target" (Scoping Plan page ES-5, CARB, December 2008). In this way, the City is teaming with the State's efforts to reduce GHG emissions globally and substantially lessen the cumulative problem.

The CAP satisfies the second condition through the implementation of the reduction measures for new development. This document supplies the specific criteria that new development must follow to ensure that the reduction measures associated with new development are implemented and the reduction target is met.

The CAP satisfies the third criteria by providing a set of community-wide GHG emissions inventories for existing conditions (2008 baseline), for future 2020 GHG emissions that are anticipated without the reduction measures (Business As Usual; BAU), and reduced levels of 2020 GHG emissions which demonstrates how the implementation of reduction measures achieves the reduction target. These community-wide GHG emission inventories are found in the appendices of the CAP.

THE DEVELOPMENT REVIEW PROCESS

Integrating the reduction measures of the CAP into the CEQA development review process is the first step in determining how a proposed project will implement the GHG reduction measures within the CAP. The GHG emissions development review process is predicated on a couple of questions. Appendix A of this document is a flow chart that diagrams this development review process. The questions are as follows:

Question 1: Is the proposed activity a Project under CEQA? If the activity is not a Project under CEQA no further action is required concerning GHG emissions in the development review process..

Question 2: Is the Project exempt under CEQA? If it is, then SCAQMD has determined that GHG emissions are less than significant and no additional GHG reductions are needed. A list of CEQA Exemptions are found in CEQA Guidelines §15300 through §15332.

There are also exemption opportunities associated with transit oriented development (TOD) associated with the Sustainable Communities Strategy (SCS) for the region developed by the Southern California Association of Governments (SCAG) and first introduced in the 2012 Regional Transportation Plan (RTP). Exemptions associated with TOD are divided into two categories, transit priority projects (TPP), and Sustainable Community Projects (SCP). A TPP and SCP Checklist is provided in Appendix B of this document to assist project applicants in determining if a project qualifies for these Exemptions under CEQA. If the Project does not qualify for a CEQA exemption, then move on to Question 2.

METHODOLOGY FOR THE CALCULATION OF GHG EMISSIONS

Analysis of development projects can either be done through emissions calculations or by using the screening tables beginning on page 6.

Total GHG emissions are the sum of emissions from both direct and indirect sources. Direct sources include mobile sources such as construction equipment, motor vehicles, landscape equipment; and stationary sources such as cooling and heating equipment. Indirect sources are comprised of electrical, and potable water use, and the generation of solid waste, and waste water.

Direct GHG emissions from mobile and stationary sources are determined as the sum of the annual GHG emissions from construction equipment, motor vehicles, landscape equipment, and heating and cooling equipment.

Indirect sources are determined based on source as follows. Electrical usage is reported as annual emissions from electrical usage. Potable water usage is reported as the annual emissions from electricity used for potable water treatment and transportation. Solid waste is reported as the sum of annual emissions from solid waste disposal treatment, transportation, and fugitive emissions of methane at the solid waste facilities. Wastewater usage is reported as the annual emissions from wastewater transport and treatment.

Analysis of development projects not using the screening tables should use the emission factors found in the latest version of the California Climate Action Registry (CCAR) General Reporting Protocol. Quantification of emissions from electricity used for potable water treatment and transportation as well as wastewater transport and treatment can be found in the California Energy Commission (CEC) document titled “Refining Estimates of Water-Related Energy Use in California (CEC December 2006).

Screening Threshold Tables

The purpose of this Screening Table is to provide guidance in measuring the reduction of greenhouse gas emissions attributable to certain design and construction measures incorporated into development projects. The analysis, methodology, and significance determination (thresholds) are based upon the CAP, which includes GHG emission inventories (2008 and 2020 forecasts), a year 2020 emission reduction target, the goals and policies to reach the target, together with the Addendum prepared for the CAP. The methodology for the development and application of the Screening Table is set forth in Appendix C of this document.

Instructions for Residential, Commercial, or Industrial Projects

The Screening Table assigns points for each option incorporated into a project as mitigation or a project design feature (collectively referred to as "feature"). The point values correspond to the minimum emissions reduction expected from each feature. The menu of features allows maximum flexibility and options for how development projects can implement the GHG reduction measures. The point levels are based upon improvements compared to 2008 emission levels of efficiency. Projects that garner at least 100 points will be consistent with the reduction quantities anticipated in the City's CAP. As such, those projects that garner a total of 100 points or greater would not require quantification of project specific GHG emissions. Consistent with CEQA Guidelines, such projects would be determined to have a less than significant individual and cumulative impact for GHG emissions.

Instructions for Mixed Use Projects

Mixed use projects provide additional opportunities to reduce emissions by combining complimentary land uses in a manner that can reduce vehicle trips. Mixed use projects also have the potential to complement energy efficient infrastructure in a way that reduces emissions. For mixed use projects, fill out both Screening Table 1 and Table 2, but proportion the points identical to the proportioning of the mix of uses. As an example, a mixed use project that is 50% commercial uses and 50% residential uses will show ½ point for each assigned point value in Table 1 and Table 2. Add the points from both tables. Mixed use Projects that garner at least 100 points will be consistent with the reduction quantities in the City's CAP and are considered less than significant for GHG emissions.

Those projects that do not garnish 100 points using the screening tables will need to provide additional analysis to determine the significance of GHG emissions. Nothing in this guidance shall be construed as limiting the City's authority to adopt a statement of overriding consideration for projects with significant GHG impacts. The following tables provides a menu of performance standards/options related to GHG mitigation measures and design features that can be used to demonstrate consistency with the reduction measures and GHG reduction quantities in the CAP.

Table 1: Screening Table for Implementation of GHG Reduction Measures for Residential Development

Feature	Description	Assigned Point Values	Project Points
Reduction Measure PS E1: Residential Energy Efficiency			
Building Envelope			
Insulation	2008 Baseline (walls R-13:, roof/attic: R-30)	0 points	
	Modestly Enhanced Insulation (walls R-13:, roof/attic: R-38)	12 points	
	Enhanced Insulation (rigid wall insulation R-13, roof/attic: R-38)	15 points	
	Greatly Enhanced Insulation (spray foam wall insulated walls R-15 or higher, roof/attic R-38 or higher)	18 points	
Windows	2008 Baseline Windows (0.57 U-factor, 0.4 solar heat gain coefficient (SHGC)	0 points	
	Modestly Enhanced Window Insulation (0.4 U-Factor, 0.32 SHGC)	6 points	
	Enhanced Window Insulation (0.32 U-Factor, 0.25 SHGC)	7 points	
	Greatly Enhanced Window Insulation (0.28 or less U-Factor, 0.22 or less SHGC)	9 points	
Cool Roof	Modest Cool Roof (CRRC Rated 0.15 aged solar reflectance, 0.75 thermal emittance)	10 points	
	Enhanced Cool Roof(CRRC Rated 0.2 aged solar reflectance, 0.75 thermal emittance)	12 points	
	Greatly Enhanced Cool Roof (CRRC Rated 0.35 aged solar reflectance, 0.75 thermal emittance)	14 points	
Air Infiltration	Minimizing leaks in the building envelope is as important as the insulation properties of the building. Insulation does not work effectively if there is excess air leakage.		
	Air barrier applied to exterior walls, calking, and visual inspection such as the HERS Verified Quality Insulation Installation (QII or equivalent)	10 points	
	Blower Door HERS Verified Envelope Leakage or equivalent	8 points	
Thermal Storage of Building	Thermal storage is a design characteristic that helps keep a constant temperature in the building. Common thermal storage devices include strategically placed water filled columns, water storage tanks, and thick masonry walls.		
	Modest Thermal Mass (10% of floor or 10% of walls: 12” or more thick exposed concrete or masonry. No permanently installed floor covering such as carpet, linoleum, wood or other insulating materials)	2 points	
	Enhanced Thermal Mass (20% of floor or 20% of walls: 12” or more thick exposed concrete or masonry. No permanently installed floor covering such as carpet, linoleum, wood or other insulating materials)	4 points	

Feature	Description	Assigned Point Values	Project Points
Indoor Space Efficiencies			
Heating/ Cooling Distribution System	Minimum Duct Insulation (R-4.2 required)	0 points	
	Modest Duct insulation (R-6)	7 points	
	Enhanced Duct Insulation (R-8)	8 points	
	Distribution loss reduction with inspection (HERS Verified Duct Leakage or equivalent)	12 points	
Space Heating/ Cooling Equipment	2008 Minimum HVAC Efficiency (SEER 13/75% AFUE or 7.7 HSPF)	0 points	
	Improved Efficiency HVAC (SEER 14/78% AFUE or 8 HSPF)	4 points	
	High Efficiency HVAC (SEER 15/80% AFUE or 8.5 HSPF)	7 points	
	Very High Efficiency HVAC (SEER 16/82% AFUE or 9 HSPF)	9 points	
Water Heaters	2008 Minimum Efficiency (0.57 Energy Factor)	0 points	
	Improved Efficiency Water Heater (0.675 Energy Factor)	12 points	
	High Efficiency Water Heater (0.72 Energy Factor)	15 points	
	Very High Efficiency Water Heater (0.92 Energy Factor)	18 points	
	Solar Pre-heat System (0.2 Net Solar Fraction)	4 points	
	Enhanced Solar Pre-heat System (0.35 Net Solar Fraction)	8 points	
Daylighting	Daylighting is the ability of each room within the building to provide outside light during the day reducing the need for artificial lighting during daylight hours.		
	All peripheral rooms within the living space have at least one window (required)	0 points	
	All rooms within the living space have daylight (through use of windows, solar tubes, skylights, etc.)	1 points	
	All rooms daylighted	2 points	
Artificial Lighting	2008 Minimum (required)	0 points	
	Efficient Lights (25% of in-unit fixtures considered high efficacy. High efficacy is defined as 40 lumens/watt for 15 watt or less fixtures; 50 lumens/watt for 15-40 watt fixtures, 60 lumens/watt for fixtures >40watt)	8 points	
	High Efficiency Lights (50% of in-unit fixtures are high efficacy)	10 points	
	Very High Efficiency Lights (100% of in-unit fixtures are high efficacy)	12 points	
Appliances	Energy Star Refrigerator (new)	1 points	
	Energy Star Dish Washer (new)	1 points	
	Energy Star Washing Machine (new)	1 points	

Feature	Description	Assigned Point Values	Project Points
Miscellaneous Residential Building Efficiencies			
Building Placement	North/South alignment of building or other building placement such that the orientation of the buildings optimizes natural heating, cooling, and lighting.	5 point	
Shading	At least 90% of south-facing glazing will be shaded by vegetation or overhangs at noon on Jun 21st.	4 Points	
Energy Star Homes	EPA Energy Star for Homes (version 3 or above)	25 points	
Independent Energy Efficiency Calculations	Provide point values based upon energy efficiency modeling of the Project. Note that engineering data will be required documenting the energy efficiency and point values based upon the proven efficiency beyond Title 24 Energy Efficiency Standards.	TBD	
Other	This allows innovation by the applicant to provide design features that increases the energy efficiency of the project not provided in the table. Note that engineering data will be required documenting the energy efficiency of innovative designs and point values given based upon the proven efficiency beyond Title 24 Energy Efficiency Standards.	TBD	
Existing Residential Retrofits	The applicant may wish to provide energy efficiency retrofit projects to existing residential dwelling units to further the point value of their project. Retrofitting existing residential dwelling units within the City is a key reduction measure that is needed to reach the reduction goal. The potential for an applicant to take advantage of this program will be decided on a case by case basis and must have the approval of the City Planning Department. The decision to allow applicants to ability to participate in this program will be evaluated based upon, but not limited to the following; Will the energy efficiency retrofit project benefit low income or disadvantaged residents? Does the energy efficiency retrofit project fit within the overall assumptions in reduction measures associated with existing residential retrofits? Does the energy efficiency retrofit project provide co-benefits important to the City? Point value will be determined based upon engineering and design criteria of the energy efficiency retrofit project.	TBD	
Reduction Measure PS E2: Residential Renewable Energy Generation			
Photovoltaic	Solar Photovoltaic panels installed on individual homes or in collective neighborhood arrangements such that the total power provided augments:		
	Solar Ready Homes (sturdy roof and solar ready service panel)	2 points	
	10 percent of the power needs of the project	10 points	
	20 percent of the power needs of the project	15 points	
	30 percent of the power needs of the project	20 points	
	40 percent of the power needs of the project	28 points	
	50 percent of the power needs of the project	35 points	
	60 percent of the power needs of the project	38 points	
	70 percent of the power needs of the project	42 points	
	80 percent of the power needs of the project	46 points	

Feature	Description	Assigned Point Values	Project Points
	90 percent of the power needs of the project	52 points	
	100 percent of the power needs of the project	58 points	
Wind turbines	Some areas of the City lend themselves to wind turbine applications. Analysis of the area's capability to support wind turbines should be evaluated prior to choosing this feature.		
	Individual wind turbines at homes or collective neighborhood arrangements of wind turbines such that the total power provided augments:		
	10 percent of the power needs of the project	10 points	
	20 percent of the power needs of the project	15 points	
	30 percent of the power needs of the project	20 points	
	40 percent of the power needs of the project	28 points	
	50 percent of the power needs of the project	35 points	
	60 percent of the power needs of the project	38 points	
	70 percent of the power needs of the project	42 points	
	80 percent of the power needs of the project	46 points	
	90 percent of the power needs of the project	52 points	
	100 percent of the power needs of the project	58 points	
Off-site renewable energy project	The applicant may submit a proposal to supply an off-site renewable energy project such as renewable energy retrofits of existing homes that will help implement renewable energy within the City. These off-site renewable energy retrofit project proposals will be determined on a case by case basis and must be accompanied by a detailed plan that documents the quantity of renewable energy the proposal will generate. Point values will be determined based upon the energy generated by the proposal.	TBD	
Other Renewable Energy Generation	The applicant may have innovative designs or unique site circumstances (such as geothermal) that allow the project to generate electricity from renewable energy not provided in the table. The ability to supply other renewable energy and the point values allowed will be decided based upon engineering data documenting the ability to generate electricity.	TBD	
Reduction Measure PS W1: Residential Water Conservation			
Irrigation and Landscaping			
Water Efficient Landscaping	Limit conventional turf to < 50% of required landscape area	0 points	
	Limit conventional turf to < 25% of required landscape area	4 points	
	No conventional turf (warm season turf to < 50% of required landscape area and/or low water using plants are allowed)	6 points	
	Only California Native Plants that requires no irrigation or some supplemental irrigation	8 points	

Feature	Description	Assigned Point Values	Project Points
Water Efficient irrigation systems	Low precipitation spray heads < .75”/hr or drip irrigation Weather based irrigation control systems or moisture sensors (demonstrate 20% reduced water use)	2 point 3 points	
Recycled Water	Recycled connections (purple pipe) to irrigation system on site	6 points	
Water Reuse	Gray water Reuse System collects Gray water from clothes washers, showers and faucets for irrigation use,	12 points	
Storm water Reuse Systems	Innovative on-site stormwater collection, filtration and reuse systems are being developed that provide supplemental irrigation water and provide vector control. These systems can greatly reduce the irrigation needs of a project. Point values for these types of systems will be determined based upon design and engineering data documenting the water savings.	TBD	
Potable Water			
Showers	Water Efficient Showerheads (2.0 gpm)	3 points	
Toilets	Water Efficient Toilets (1.5 gpm)	3 points	
Faucets	Water Efficient faucets (1.28 gpm)	3 points	
Dishwasher	Water Efficient Dishwasher (6 gallons per cycle or less)	1	
Washing Machine	Water Efficient Washing Machine (Water factor <5.5)	1	
WaterSense	EPA WaterSense Certification	12 points	
Reduction Measure PS T1: Land Use Based Trips and VMT Reduction			
Mixed Use	Mixes of land uses that complement one another in a way that reduces the need for vehicle trips can greatly reduce GHG emissions. The point value of mixed use projects will be determined based upon a Transportation Impact Analysis (TIA) demonstrating trip reductions and/or reductions in vehicle miles traveled. Suggested ranges: Diversity of land uses complementing each other (2-28 points) Increased destination accessibility other than transit (1-18 points) Increased transit accessibility (1-25 points) Infill location that reduces vehicle trips or VMT beyond the measures described above (points TBD based on traffic data).	TBD	
Residential Near Local Retail (Residential only Projects)	Having residential developments within walking and biking distance of local retail helps to reduce vehicle trips and/or vehicle miles traveled. The point value of residential projects in close proximity to local retail will be determined based upon traffic studies that demonstrate trip reductions and/or reductions in vehicle miles traveled (VMT)	TBD	

Feature	Description	Assigned Point Values	Project Points
Other Trip Reduction Measures	Other trip or VMT reduction measures not listed above with TIA and/or other traffic data supporting the trip and/or VMT for the project.	TBD	
Reduction Measure PS T2: Bicycle Infrastructure			
Bicycle Infrastructure	. Provide bicycle paths within project boundaries. Provide bicycle path linkages between residential and other land uses. Provide bicycle path linkages between residential and transit.	 TBD 2 points 5 points	
Reduction Measure PS T3: Neighborhood Electric Vehicle Infrastructure			
Electric Vehicle Recharging	Provide circuit and capacity in garages of residential units for use by an electric vehicle. Charging stations are for on-road electric vehicles legally able to drive on all roadways including Interstate Highways and freeways. Install electric vehicle charging stations in the garages of residential units	1 point 8 points	
Total Points Earned by Residential Project:			

Table 2: Screening Table for Implementation of GHG Reduction Measures for Commercial Development

Feature	Description	Assigned Point Values	Project Points
Reduction Measure PS E3: Commercial/Industrial Energy Efficiency Development			
Building Envelope			
Insulation	2008 baseline (walls R-13; roof/attic R-30)	0 points	
	Modestly Enhanced Insulation (walls R-13, roof/attic R-38))	15 points	
	Enhanced Insulation (rigid wall insulation R-13, roof/attic R-38)	18 points	
	Greatly Enhanced Insulation (spray foam insulated walls R-15 or higher, roof/attic R-38 or higher)	20 points	
Windows	2008 Baseline Windows (0.57 U-factor, 0.4 solar heat gain coefficient [SHGC})	0 points	
	Modestly Enhanced Window Insulation (0.4 U-factor, 0.32 SHGC)	7 points	
	Enhanced Window Insulation (0.32 U-factor, 0.25 SHGC)	8 points	
	Greatly Enhanced Window Insulation (0.28 or less U-factor, 0.22 or less SHGC)	12 points	
Cool Roof	Modest Cool Roof (CRRC Rated 0.15 aged solar reflectance, 0.75 thermal emittance)	12 points	
	Enhanced Cool Roof (CRRC Rated 0.2 aged solar reflectance, 0.75 thermal emittance)	14 points	
	Greatly Enhanced Cool Roof (CRRC Rated 0.35 aged solar reflectance, 0.75 thermal emittance)	16 points	
Air Infiltration	Minimizing leaks in the building envelope is as important as the insulation properties of the building. Insulation does not work effectively if there is excess air leakage.		
	Air barrier applied to exterior walls, calking, and visual inspection such as the HERS Verified Quality Insulation Installation (QII or equivalent)	12 points	
	Blower Door HERS Verified Envelope Leakage or equivalent	10 points	
Thermal Storage of Building	Thermal storage is a design characteristic that helps keep a constant temperature in the building. Common thermal storage devices include strategically placed water filled columns, water storage tanks, and thick masonry walls.		
	Modest Thermal Mass (10% of floor or 10% of walls 12” or more thick exposed concrete or masonry with no permanently installed floor covering such as carpet, linoleum, wood or other insulating materials)	4 points	
	Enhanced Thermal Mass (20% of floor or 20% of walls 12” or more thick exposed concrete or masonry with no permanently installed floor covering such as carpet, linoleum, wood or other insulating materials)	6 points	

Feature	Description	Assigned Point Values	Project Points
	Enhanced Thermal Mass (80% of floor or 80% of walls 12" or more thick exposed concrete or masonry with no permanently installed floor covering such as carpet, linoleum, wood or other insulating materials)	24 points	
Indoor Space Efficiencies			
Heating/ Cooling Distribution System	Minimum Duct Insulation (R-4.2 required)	0 points	
	Modest Duct insulation (R-6)	8 points	
	Enhanced Duct Insulation (R-8)	10 points	
	Distribution loss reduction with inspection (HERS Verified Duct Leakage or equivalent)	14 points	
Space Heating/ Cooling Equipment	2008 Minimum HVAC Efficiency (EER 13/75% AFUE or 7.7 HSPF)	0 points	
	Improved Efficiency HVAC (EER 14/78% AFUE or 8 HSPF)	7 points	
	High Efficiency HVAC (EER 15/80% AFUE or 8.5 HSPF)	8 points	
	Very High Efficiency HVAC (EER 16/82% AFUE or 9 HSPF)	12 points	
Commercial Heat Recovery Systems	Heat recovery strategies employed with commercial laundry, cooking equipment, and other commercial heat sources for reuse in HVAC air intake or other appropriate heat recovery technology. Point values for these types of systems will be determined based upon design and engineering data documenting the energy savings.	TBD	
Water Heaters	2008 Minimum Efficiency (0.57 Energy Factor)	0 points	
	Improved Efficiency Water Heater (0.675 Energy Factor)	14 points	
	High Efficiency Water Heater (0.72 Energy Factor)	16 points	
	Very High Efficiency Water Heater (0.92 Energy Factor)	19 points	
	Solar Pre-heat System (0.2 Net Solar Fraction)	4 points	
	Enhanced Solar Pre-heat System (0.35 Net Solar Fraction)	8 points	
Daylighting	Daylighting is the ability of each room within the building to provide outside light during the day reducing the need for artificial lighting during daylight hours.		
	All peripheral rooms within building have at least one window or skylight	1 points	
	All rooms within building have daylight (through use of windows, solar tubes, skylights, etc.)	5 points	
	All rooms daylighted	7 points	
Artificial Lighting	2008 Minimum (required)	0 points	
	Efficient Lights (25% of in-unit fixtures considered high efficacy. High efficacy is defined as 40 lumens/watt for 15 watt or less fixtures; 50 lumens/watt for 15-40 watt fixtures, 60 lumens/watt for fixtures >40watt)	9 points	

Feature	Description	Assigned Point Values	Project Points
	High Efficiency Lights (50% of in-unit fixtures are high efficacy) Very High Efficiency Lights (100% of in-unit fixtures are high efficacy)	12 points 14 points	
Appliances	Star Commercial Refrigerator (new) Energy Star Commercial Dish Washer (new) Energy Star Commercial Cloths Washing	4 points 4 points 4 points	
Miscellaneous Commercial/Industrial Building Efficiencies			
Building Placement	North/South alignment of building or other building placement such that the orientation of the buildings optimizes conditions for natural heating, cooling, and lighting.	6 point	
Shading	At least 90% of south-facing glazing will be shaded by vegetation or overhangs at noon on Jun 21st.	6 Points	
Other	This allows innovation by the applicant to provide design features that increases the energy efficiency of the project not provided in the table. Note that engineering data will be required documenting the energy efficiency of innovative designs and point values given based upon the proven efficiency beyond Title 24 Energy Efficiency Standards.	TBD	
Existing Commercial building Retrofits	The applicant may wish to provide energy efficiency retrofit projects to existing commercial buildings to further the point value of their project. Retrofitting existing commercial buildings within the City is a key reduction measure that is needed to reach the reduction goal. The potential for an applicant to take advantage of this program will be decided on a case by case basis and must have the approval of the City Planning Department. The decision to allow applicants to ability to participate in this program will be evaluated based upon, but not limited to the following: Will the energy efficiency retrofit project benefit low income or disadvantaged communities? Does the energy efficiency retrofit project fit within the overall assumptions in the reduction measure associated with commercial building energy efficiency retrofits? Does the energy efficiency retrofit project provide co-benefits important to the City? Point value will be determined based upon engineering and design criteria of the energy efficiency retrofit project.	TBD	

Feature	Description	Assigned Point Values	Project Points
Reduction Measure PS E4: Commercial/Industrial Renewable Energy			
Photovoltaic	Solar Photovoltaic panels installed on commercial buildings or in collective arrangements within a commercial development such that the total power provided augments:		
	Solar Ready Roofs (sturdy roof and electric hookups)	2 points	
	10 percent of the power needs of the project	8 points	
	20 percent of the power needs of the project	14 points	
	30 percent of the power needs of the project	20 points	
	40 percent of the power needs of the project	26 points	
	50 percent of the power needs of the project	32 points	
	60 percent of the power needs of the project	38 points	
	70 percent of the power needs of the project	44 points	
	80 percent of the power needs of the project	50 points	
	90 percent of the power needs of the project	56 points	
	100 percent of the power needs of the project	60 points	
Wind turbines	Some areas of the City lend themselves to wind turbine applications. Analysis of the areas capability to support wind turbines should be evaluated prior to choosing this feature.		
	Wind turbines as part of the commercial development such that the total power provided augments:		
	10 percent of the power needs of the project	8 points	
	20 percent of the power needs of the project	14 points	
	30 percent of the power needs of the project	20 points	
	40 percent of the power needs of the project	26 points	
	50 percent of the power needs of the project	32 points	
	60 percent of the power needs of the project	38 points	
	70 percent of the power needs of the project	44 points	
	80 percent of the power needs of the project	50 points	
	90 percent of the power needs of the project	56 points	
	100 percent of the power needs of the project	60 points	
Off-site renewable energy project	The applicant may submit a proposal to supply an off-site renewable energy project such as renewable energy retrofits of existing commercial/industrial that will help implement reduction measures associated with existing buildings. These off-site renewable energy retrofit project proposals will be determined on a case by case basis accompanied by a detailed plan documenting the quantity of renewable energy the proposal will generate. Point values will be based upon the energy generated by the proposal.	TBD	

Feature	Description	Assigned Point Values	Project Points
Other Renewable Energy Generation	The applicant may have innovative designs or unique site circumstances (such as geothermal) that allow the project to generate electricity from renewable energy not provided in the table. The ability to supply other renewable energy and the point values allowed will be decided based upon engineering data documenting the ability to generate electricity.	TBD	
Reduction Measure PS W2: Commercial/Industrial Water Conservation			
Irrigation and Landscaping			
Water Efficient Landscaping	Eliminate conventional turf from landscaping Only moderate water using plants Only low water using plants Only California Native landscape that requires no or only supplemental irrigation	0 points 3 points 4 points 8 points	
Trees	Increase tree planting in parking areas 50% beyond City Code requirements	TBD	
Water Efficient irrigation systems	Low precipitation spray heads< .75”/hr or drip irrigation Weather based irrigation control systems combined with drip irrigation (demonstrate 20 reduced water use)	1 point 5 points	
Recycled Water	Recycled water connection (purple pipe)to irrigation system on site	5 points	
Storm water Reuse Systems	Innovative on-site stormwater collection, filtration and reuse systems are being developed that provide supplemental irrigation water and provide vector control. These systems can greatly reduce the irrigation needs of a project. Point values for these types of systems will be determined based upon design and engineering data documenting the water savings.	TBD	
Potable Water			
Showers	Water Efficient Showerheads (2.0 gpm)	3 points	
Toilets	Water Efficient Toilets/Urinals (1.5gpm) Waterless Urinals (note that commercial buildings having both waterless urinals and high efficiency toilets will have a combined point value of 6 points)	3 points 4 points	
Faucets	Water Efficient faucets (1.28gpm)	3 points	
Commercial Dishwashers	Water Efficient dishwashers (20% water savings)	4 points	
Commercial Laundry Washers	Water Efficient laundry (15% water savings) High Efficiency laundry Equipment that captures and reuses rinse water (30% water savings)	3 points 6 points	

Feature	Description	Assigned Point Values	Project Points
Commercial Water Operations Program	Establish an operational program to reduce water loss from pools, water features, etc., by covering pools, adjusting fountain operational hours, and using water treatment to reduce draw down and replacement of water. Point values for these types of plans will be determined based upon design and engineering data documenting the water savings.	TBD	
Reduction Measure PS T1: Land Use Based Trips and VMT Reduction			
Mixed Use	Mixes of land uses that complement one another in a way that reduces the need for vehicle trips can greatly reduce GHG emissions. The point value of mixed use projects will be determined based upon traffic studies that demonstrate trip reductions and/or reductions in vehicle miles traveled	TBD	
Local Retail Near Residential (Commercial only Projects)	Having residential developments within walking and biking distance of local retail helps to reduce vehicle trips and/or vehicle miles traveled. The point value of residential projects in close proximity to local retail will be determined based upon traffic studies that demonstrate trip reductions and/or reductions in vehicle miles traveled	TBD	
Reduction Measure PS T2: Bicycle Infrastructure			
Bicycle Infrastructure	Provide bicycle paths within project boundaries. Provide bicycle path linkages between project site and other land uses. Provide bicycle path linkages between project site and transit.	TBD 2 points 5 points	
Reduction Measure PS T3: Electric Vehicle Infrastructure			
Electric Vehicles	Provide public charging station for use by an electric vehicle (ten points for each charging station within the facility).	10 points	
Reduction Measure PS T4: Employee Based Trip &VMT Reduction Policy			
Compressed Work Week	Reduce the number of days per week that employees need to be on site will reduce the number of vehicle trips associated with commercial/industrial development. Compressed work week such that full time employees are on site: 5 days per week 4 days per week on site 3 days per week on site	TBD	
Car/Vanpools	Car/vanpool program Car/vanpool program with preferred parking Car/vanpool with guaranteed ride home program Subsidized employee incentive car/vanpool program Combination of all the above	TBD	
Employee	Complete sidewalk to residential within ½ mile	TBD	

Feature	Description	Assigned Point Values	Project Points
Bicycle/ Pedestrian Programs	Complete bike path to residential within 3 miles Bike lockers and secure racks Showers and changing facilities Subsidized employee walk/bike program (Note combine all applicable points for total value)		
Shuttle/Transit Programs	Local transit within ¼ mile Light rail transit within ½ mile Shuttle service to light rail transit station Guaranteed ride home program Subsidized Transit passes Note combine all applicable points for total value	TBD	
CRT	Employer based Commute Trip Reduction (CRT). CRTs apply to commercial, offices, or industrial projects that include a reduction of vehicle trip or VMT goal using a variety of employee commutes trip reduction methods. The point value will be determined based upon a TIA that demonstrates the trip/VMT reductions. Suggested point ranges: Incentive based CRT Programs (1-8 points) Mandatory CRT programs (5-20 points)	TBD	
Other Trip Reductions	Other trip or VMT reduction measures not listed above with TIA and/or other traffic data supporting the trip and/or VMT for the project.	TBD	
Total Points from Commercial/Industrial Project:			

References

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South Coast Air Quality Management District, Rules and Regulations, 2010

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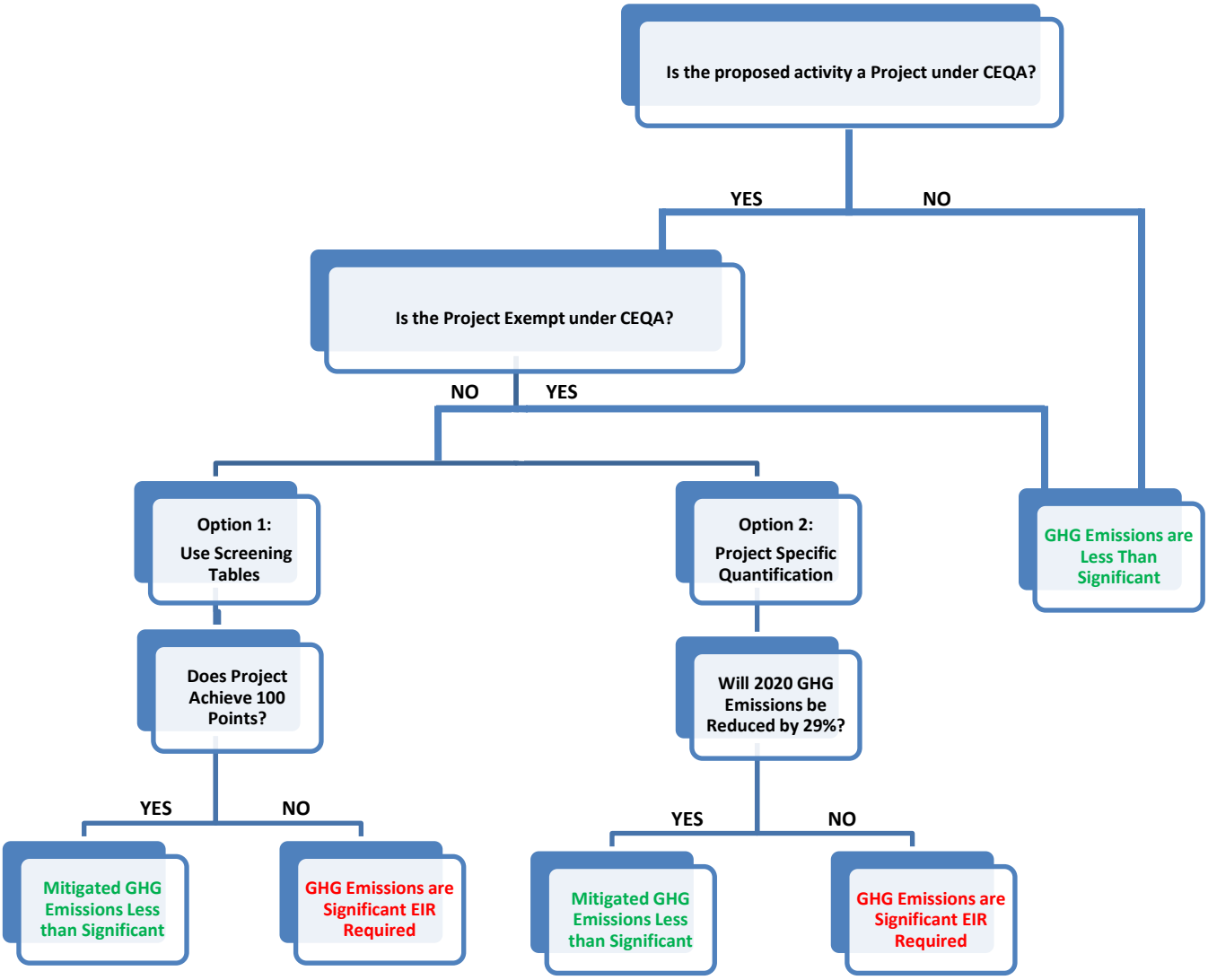
APPENDIX A: THE GHG DEVELOPMENT REVIEW PROCESS FLOW CHART DIAGRAM

Approach to Implementation of GHG Development Review



APPENDIX B: TRANSIT PRIORITY PROJECT AND SUSTAINABLE COMMUNITY PROJECT CHECKLIST

TRANSIT PRIORITY PROJECT CHECKLIST

The following checklist will assist in determining if your Project qualifies as a Transit Priority Project (TPP) and a Sustainable Community Project (SCP) as defined in PRC 21155(a), (b), and PRC 21152.

Yes	No	Is the Project:	
☐	☐	1.	Located within ½ mile from a Metrolink Station, future Metrolink Station, or the San Bernardino Transit Center?
☐	☐	2.	At least 50% residential use based upon total square footage, and non-residential uses within the Project between 26% to 50% of total square footage with FAR of not less than 0.75?
☐	☐	3.	At or above a minimum net density of at least 20 dwelling units per acre?
☐	☐	4.	Is your project consistent with the general land use designations in the SCP (if you answered yes to questions 1 thru 3, then answer yes to this one)?

If you answered **Yes** to questions 1 through 4 then your Project is a Transit Priority Project (TPP) as defined by PRC Section 21155(b). Continue with the next list of environmental questions:

Yes	No	Does the Project:	
☐	☐	5.	Contain sites on the Cortese List?
☐	☐	6.	Site contain any hazardous substances, contaminated soil or hazardous material?
☐	☐	7.	Site include historical resources?
☐	☐	8.	Have an unusually high risk of fire or explosion from material stored or used at properties within ¼ mile of the Project site?
☐	☐	9.	Site currently developed as Open Space (parks, habitat, etc.)?

Continue with the next list of land use questions below:

Yes	No		
☐	☐	10.	Does the Project design have all the buildings at least 15% more efficient than Title 24 energy standards and uses 25% or less water than average households?
☐	☐	11.	Is the Project site eight acres or less in size?
☐	☐	12.	Does the Project not include any single level of a building exceeding 75TSF?
☐	☐	13.	Project does not conflict with nearby industrial uses?
☐	☐	14.	The Project will sell at least 20% of housing to families of moderate income, or 10% of housing will be rented to families of low income, or at least 5% of housing rented to families of very low income, or the Project provides open space equal or greater than 5 acres per 1,000 residents, or the developer will pay in-lieu fees sufficient to result in the development of affordable housing meeting one of the criteria described above?

Determining Eligibility based upon the answers:

Full CEQA Exemption for Sustainable Community Projects (SCPs)

If you answered **Yes** to all the TPP questions 1 through 4, **No** to all the environmental questions 5 through 9, and **Yes** to all the land use questions 10 through 14, then your Project is a SCP and is eligible for a full CEQA Exemption under SB 375.

Transit Priority Projects (TPP)

If you answered **Yes** to all the TPP questions 1 through 4, but did not qualify as a SCP then your project is a TPP. Your TPP needs to incorporate all appropriate mitigation measures required by an applicable CEQA document (such as an adopted EIR for a Specific Plan) for your Project location. If your TPP meets these two criteria then your TPP does not need to analyze the following impacts in the Sustainable Communities Environmental Assessment (SCEA) or CEQA analysis:

- Growth inducing impacts,
- Regional transportation impacts, and
- GHG emissions related to passenger cars and light duty trucks.

The impacts listed above are considered less than significant because the Project is a TPP and the SCEA or CEQA document should reference PRC Section 21155.2(c)

Other Residential and Mixed Use Projects

If you answered Yes to question 4, but did not qualify as an SCP or TPP your project may not need to analyze some of the impacts in the CEQA analysis, if your project is a **residential project or mixed-use project with 75%** of the total building square footage of the Project as residential units. Also, your Project needs to incorporate all appropriate mitigation measures required by an applicable prior CEQA document (such as an adopted EIR for a Specific Plan) for your Project location. If your project meets these criteria, then the CEQA analysis of your Project does not need to analyze the following Impacts:

- Growth inducing impacts,
- Regional transportation impacts, and
- GHG emissions related to passenger cars and light duty trucks.

The impacts listed above are considered less than significant because the Project meets the criteria in PRC Section 21155.2(c)

APPENDIX C: METHODOLOGY FOR THE DEVELOPMENT AND APPLICATION OF THE SCREENING TABLES

METHODS SUMMARY

The point values in the Screening Tables were derived from the projected emissions reductions that would be achieved by each of the reduction measures associated with new development within the CAP. The points within the Screening Tables were proportioned by residential unit or square feet of commercial/industrial uses. This was accomplished by taking the predicted growth in households and commercial uses in 2020 and proportioning the appropriate reduction quantities for new development to the residential, commercial, and industrial land use sectors within the Screening Table. The result is point values that are proportioned by residential unit or commercial/industrial square feet. Because of this, the size of the project is not relevant to the Screening Table. Regardless of size, each project needs to garnish 20 points to demonstrate consistency with the CAP. Efficiency, not size of the project, is critical.

Note that the Screening Table and point values are best used for typical development projects processed by the City. Examples of typical development projects include residential subdivisions, multi-family residential apartments, condominiums and townhouses, retail commercial, big box retail, office buildings, business parks, and typical warehousing. Mixed use projects can use the instructions at the beginning of the Screening Tables. Transit oriented development (TOD), and infill projects are able to use the Screening Tables, but the Screening Tables points are likely to underestimate total emission reductions afforded these types of projects. Note that the Screening Tables include the opportunity to custom develop points (using the formula above) in order to provide points in the sections of the Screening Tables marked TBD and account for the predicted reductions in vehicle trips and vehicle miles traveled within a project specific traffic study and GHG analysis. TOD and infill projects can be more accurately assessed and allocated points using this method.

However, more unusual types of industrial projects such as cement manufacturing, metal foundries, refrigerant manufacturing, electric generating stations—including large alternative energy electric generation, and oil refineries cannot use the Screening Tables because the emission sources for those types of uses were not contemplated in the tables.

DEVELOPMENT OF THE POINT VALUES

Within the City measures 9,878 MT CO_2e will be reduced using the Performance Standard for new development. The Performance Standard is implemented through Screening Tables and the point allocation within the Screening Tables are tied to 9,878 MT CO_2e of reductions.

The first step in allocating point values is to determine the number of new homes and commercial buildings that are anticipated by year 2020. The City predicts that 3,646 new residential units will be needed by 2020 to accommodate the population growth by 2020 and a total of approximately 3,879,000 square feet of new commercial and industrial buildings within the City is needed to accommodate anticipated job growth.

Approximately 3,646 new residential units and 3,879,000 square feet of new commercial and industrial buildings within the City are anticipated to either use the screening tables or provide an independent analysis demonstrating reductions. Evaluating the growth in residential and commercial/industrial land uses, approximately 63% is attributable to residential and 37% attributable to commercial/industrial land uses. Using those ratios, the Performance Standard will reduce 6,208 MT CO_2e from residential development and 3,670 MT CO_2e from commercial/industrial development by 2020.

Dividing the 6,208 MT CO_2e reductions of emissions afforded the Screening Table implementation of the Performance Standard for new residential development by the anticipated 3,646 new residential units that will be built yields 1.70 MT CO_2e per residential unit that needs to be reduced to fulfill the anticipated reductions of the CAP. Using the same process, the Performance Standard for new commercial/industrial development needs to reduce 0.95 MT CO_2e per 1,000 gross square feet of commercial/industrial building area.

Levels of reduction efficiency for typical residential units in this climate zone yields:

0.017 MT CO_2e per Point per Residential Unit

The levels of reduction efficiency for the mix of commercial/industrial uses in this climate zone yields:

0.0095 MTCO2e per Point per 1,000 Sq. Ft. of gross Commercial/Industrial building area

Since each residential unit needs to reduce 1.70 MT CO_2e and each 1,000 square feet of commercial/industrial building area needs to reduce 0.95 MT CO_2e, each project needs to gain 100 points to provide the expected reductions from the Performance standard.