CITY OF COACHELLA
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CLIMATE ACTION PLAN
PUBLIC DRAFT

CITY OF COACHELLA

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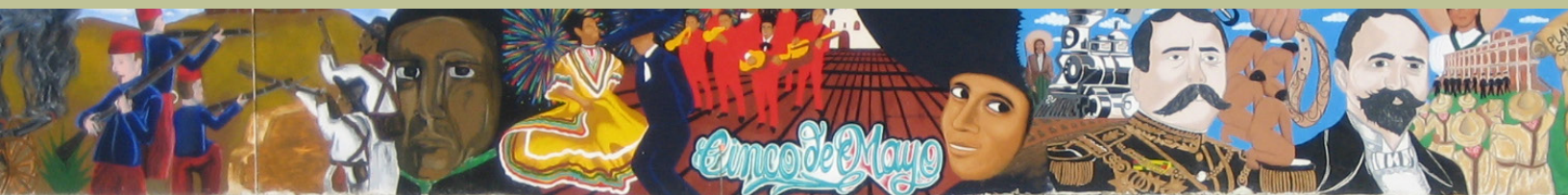
raimi+ associates



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1 | INTRODUCTION

In the next century, climate change will not only impact our natural environment, but also threaten the health and economic vitality of communities across California and the country. The extent to which Coachella is impacted by climate change is dependent on our actions today. By curbing greenhouse gas emissions and adapting our communities to the already changing environment, we can significantly reduce the damages incurred from climate change. Local governments in particular are in a unique position to become climate leaders by initiating city-wide policies, incentives, and education programs to deploy the technologies that we already have to run our economy cleanly and efficiently and make Coachella more resilient to climate change and climate variability.

PURPOSE

Recognizing the important role that cities will play in the transition to a low-carbon economy, Coachella has prepared this Climate Action Plan (CAP) in conjunction with a General Plan Update as a roadmap for achieving community-wide greenhouse gas emissions reductions. Coachella's CAP is a proactive step toward addressing the climate challenge to protect our children and grandchildren before climate change becomes irreversible. The CAP builds on the 2013 General Plan Update, quantifying emissions from the build-out of the proposed plan and includes additional policies and implementation actions to help Coachella further reduce emissions. It also includes strategies to protect public health and make the community more resilient to climate change. The CAP includes the following components:

- **Inventory:** Updates the City's 2005 greenhouse gas inventory to include an inventory of 2010 emissions.
- **Reduction Target/Goal:** Establishes a per service population 2020 emissions reduction target of 15% below 2010 levels and a 2035 emissions reduction target of 49% below 2010 levels.
- **General Plan Policies:** Analyzes policies from the General Plan that reduce energy use, vehicle miles traveled, resource consumption, and greenhouse gas emissions, comparing the emissions to voluntary statewide emissions targets outlined in the California Climate Action Scoping Plan and Executive Order S-03-05.
- **CAP Measures:** Includes an analysis of a more aggressive implementation program for several General Plan policies and additional measures not included in the General Plan, comparing the emissions to voluntary statewide emissions targets.

The Relationship between Energy and GHG Emissions

Energy is used for heating and cooling, transportation, manufacturing, and producing food, and the most common sources of energy are fossil fuels like oil, gasoline, natural gas, and coal. Fossil fuels are burned or oxidized to create energy, and this burning releases waste gases, which includes everything from vehicle tailpipe emissions to smoke rising from a chimney. One of the waste gases produced is carbon dioxide, CO2, a key contributor to the greenhouse effect and global warming (see page 2 for more information). Globally, the use of fossil fuels to produce energy is the main source of greenhouse gas emissions from human activities, contributing two-thirds of the total greenhouse gas emissions. Several categories of reducing energy-related greenhouse gas emissions are explored in this CAP, including improving energy efficiency, switching to emission-free and less carbon intensive sources of energy, and capturing and storing emissions.

- **Implementation Program:** Identifies the timeline for implementing each strategy, relative cost, and any additional analysis and/or legislative action needed.
- **Streamlined CEQA Review:** Serves as a tiering document for the streamlined review of project-level GHG emissions under the California Environmental Quality Act for proposed developers within the City.

Coachella's CAP is designed to provide clear policy guidance to the City staff and decision-makers on how to reduce greenhouse gas emissions. It identifies a pathway to reduce emissions within a range of voluntary, state-level emissions reduction targets. This path includes strategies for improving connectivity and land use patterns, transportation modes and systems, incorporating energy efficiency standards, increasing the City's renewable energy supply, and reducing waste and consumption.

GENERAL PLAN UPDATE

The Coachella General Plan is the primary legal document to guide long-term growth, development, and conservation in the City and the Sphere of Influence. It articulates the City's vision of growth with specific steps to guide development toward that vision between now and 2035. The General Plan identifies the goals, policies, and actions that will enable the City to achieve this vision by identifying long-term goals, providing a basis for decision-making, providing citizens a forum for input on their community's direction, and informing citizens, developers, decision-makers, and other cities of the rules for development within the City. Much of its content was developed through a conversation with the community that has taken place over the last five years.

The General Plan will be implemented over an extended period of time. However, the General Plan is a living document, and presents the outcomes desired by the community based on their current goals and local conditions. As the City grows and changes, it may become necessary to amend specific policies and implementation actions as economic and demographic conditions change while new ideas about growth and conservation are formed.

RELATIONSHIP OF THE GENERAL PLAN AND HOW TO USE THE CAP

The Coachella CAP is an implementation tool of the General Plan to guide development in the City by focusing on attaining the goals and policies of the General Plan. It is a tool that the City will use to lower energy consumption, minimize vehicle miles traveled, lower resource consumption and waste, and reduce the production of greenhouse gas emissions. Chapter 4 summarizes the policies of the General Plan that are related to reducing greenhouse gas emissions and the reduction measures in the CAP that have been developed in coordination with these General Plan policies.

Like the General Plan, implementation of the CAP will require a number of staff work efforts including municipal code amendments, launching and monitoring specific programs, and working with utility companies to increase participation in energy programs. To the extent possible, CAP programs and actions will be incorporated into departmental work plans.

Along with the General Plan, the CAP builds on the City's 2005 greenhouse gas inventory. In 2011, the Coachella Valley Association of Governments completed a 2005 community

inventory of greenhouse gas emissions for each Coachella Valley city. In the CAP, the 2005 inventory was supplemented with additional information about new emissions sources, such as agricultural and water emissions, and more recent data, such as vehicle miles traveled data from the updated regional transportation model. The 2005 inventory was supplemented with an inventory for 2010 greenhouse gas emissions to track emissions trends.

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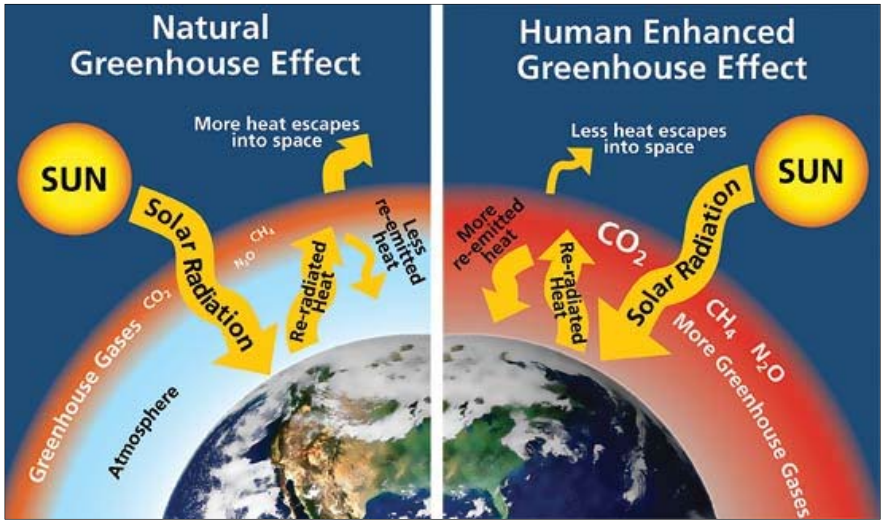
2 | WHAT IS CLIMATE CHANGE?

During the past several decades, an extensive and scrutinized body of scientific evidence has demonstrated that human activity is altering the Earth's climate by increasing the concentration of greenhouse gases in the atmosphere. While there will always be some uncertainty in understanding a system as complex as Earth, the scientific evidence has been carefully examined and withstood serious evaluation and debate. As a result of this inquiry, there is a recognition that climate change poses significant risks for, and may already be affecting, human and natural systems, including infrastructure, human health, energy sources, agriculture, and freshwater resources.[1]

Greenhouse gases, such as carbon dioxide, ozone, methane, and nitrous oxide, have always been present in the Earth's atmosphere, keeping surface temperatures warm enough to sustain human, plant, and animal life. Greenhouse gases absorb heat radiated from the Earth's surface and then radiate the energy back toward the surface, a process called the "greenhouse effect," which is shown in Figure 1. Without the greenhouse effect, it is estimated that the Earth's average surface temperature would be approximately 60° F colder.

FIGURE 1: THE GREENHOUSE EFFECT[2]



Solar radiation or light passes through the atmosphere without being absorbed, strikes the Earth, and is absorbed or re-radiated as heat. Some of the re-radiated heat is absorbed by greenhouse gases and re-emitted toward the surface, while some of the heat escapes into space. Human activities that emit additional greenhouse gases to the atmosphere increase the amount of heat that gets absorbed before escaping to space, enhancing the greenhouse effect, and amplifying the warming of the earth.

[1] National Research Council, 2010. *Advancing the Science of Climate Change*. Washington, DC: The National Academies Press.
[2] National Parks Service, 2013. What is Climate Change? Image by Will Elder, NPS.

Human activities, such as the combustion of fossil fuels, industrial processes, and land use changes, have increased the amount of greenhouse gases in the atmosphere, intensified the greenhouse effect, and caused changes to the Earth's climate. Since the Industrial Revolution, greenhouse gas concentrations have risen forty percent (40%) in the Earth's atmosphere and are at a level unequaled during the last 800,000 years.

The six most important greenhouse gases are carbon dioxide, methane, nitrous oxide (N_2O), sulfur hexafluoride, hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).[3] These gases are regulated under the Kyoto Protocol[4]. Since carbon dioxide is the most abundant of these greenhouse gases, greenhouse gas emissions are converted to metric tons of carbon dioxide equivalent (CO_2e) units. Each greenhouse gas has a different potential for trapping heat in the Earth's atmosphere, which is called the global warming potential (see in Table 1). Gases such as methane and nitrous oxide are more potent than carbon dioxide at trapping heat and have higher global warming potential. For instance, methane has twenty-one times more heat trapping potential than carbon dioxide does.

[3] California Health & Safety Code § 38505(g) recognizes the six listed gases as greenhouse gases.

[4] The Kyoto Protocol was an international agreement to reduce the collective emissions from 160 countries by 5.2%. The United States signed but never ratified the Kyoto Protocol.

TABLE 1: GREENHOUSE GASES[5]

GAS	ACTIVITY	ATMOSPHERIC LIFETIME (YEARS)	GLOBAL WARMING POTENTIAL
Carbon Dioxide	Combustion	50 – 200	1
Methane	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	12	21
Nitrous Oxide	Combustion, Wastewater Treatment	120	310
HFC-23	Leaked Refrigerants, Fire Suppressants	264	11,700
HFC-134a	Leaked Refrigerants, Fire Suppressants	14.6	1,300
HFC-152a	Leaked Refrigerants, Fire Suppressants	1.5	140
PFC: Tetrafluoromethane (CF_4)	Aluminum Production, Semiconductor Manufacturing, HVAC equipment,	50,000	6,500
PFC: Hexafluoroethane (C_2F_6)	Aluminum Production, Semiconductor Manufacturing, HVAC equipment,	10,000	9,200
Sulfur Hexafluoride	Transmission and Distribution of Power	3,200	23,900

Higher concentrations of greenhouse gases trap additional energy in the atmosphere, resulting in more rapid warming. The warming of the climate system can currently be observed in increases in global average air and ocean temperatures, melting of snow and ice, and rising sea levels. During the last century, the global average temperature rose 1.4° F with significant variation across the planet.[6] In California, average temperatures rose 2.1°F between 1915 and 2000.

Although climate change and global warming are often used interchangeably, warmer temperatures are only one component of climate change. Climate is an average of weather over time, and weather includes temperature, rainfall, winds, flooding, heat waves, and other

[5] California Air Resources Board, et al. 2010. Local Government Operations Protocol: For the quantification and reporting of greenhouse gas emission inventories. Version 1.1.

[6] Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson (eds.), 2009. Global Climate Change Impacts in the United States. Cambridge University Press.

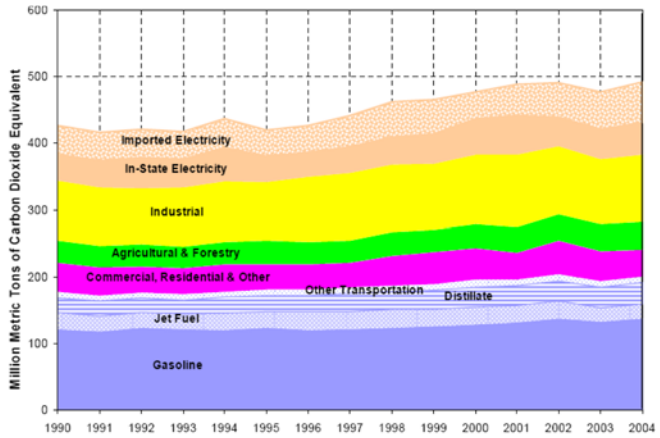
seasonal patterns. A simple way to remember the difference between weather and climate is: weather affects whether you bring an umbrella today, and climate influences whether you own an umbrella.[7]

Climate change describes the long-term shift in global and regional weather patterns. This includes average annual temperatures *and* the timing and amount of local precipitation, the frequency and intensity of extreme weather events, and other aspects of weather. Depending on the extent of these changes, climate change may result in significant social, economic, and environmental consequences for residents and businesses in Coachella.

CALIFORNIA'S CONTRIBUTION TO CLIMATE CHANGE

California contributes significantly to anthropogenic greenhouse gas emissions. As reported by the California Energy Commission (CEC), California contributes 1.4% of global and 6.2% of national GHG emissions.[8] As shown in Figure 2, the transportation sector is the largest source of California's greenhouse gas emissions, responsible for 41% of the State's total emissions.

FIGURE 2: CALIFORNIA'S GROSS GREENHOUSE GAS EMISSIONS TRENDS (1990 TO 2004)[9]



[7] Pew Center on Global Climate Change. 2011. *Climate Change 101: Science and Impacts.*

[8] California Energy Commission (CEC), 2006. I*nventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004.* CEC-600-2006-013, October 2006. Available at http://www.arb.ca.gov/cc/ccei/inventory/tables/rpt_inventory_ipcc_sum_2007-11- 19.pdf).

[9] California Energy Commission. 2006. *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*. Available at http://www.arb.ca.gov/cc/ccei/inventory/tables/rpt_inventory_ipcc_sum_2007-11- 19.pdf

PROJECTIONS OF FUTURE CLIMATE

In California, studies predict that conditions will become hotter and drier, with decreased snow levels and accelerating rates of sea-level rise.[10] California should also expect an increase in the intensity of extreme weather events, such as heat waves, droughts, and floods. California's extreme warm temperatures, which have historically occurred in July and August, will most likely extend into June and September.[11] Coachella will likely experience very similar impacts.

TEMPERATURE

Climate change will continue to increase temperatures across the globe and within California. Scientists predict that over the next century, global temperatures will increase between 2.5° F and 10.4° F, depending upon the amount of future emissions and how the earth responds to those emissions.[12] For California, the average annual temperature is expected to rise 1.8°F to 5.4°F by 2050 and 3.6°F to 9°F by the end of the century.[13] For the Coachella area, scientists expect average temperatures to increase between 2.5°F and 7.5°F as shown in Figure 3.

Climate Change Modeling, Downscaling, and Scenarios

Scientists' understanding of the fundamental processes responsible for global climate change has improved over the past decade, and predictive capabilities are advancing. Scientists use atmosphere-ocean general circulation models to simulate the physical processes in the atmosphere, ocean, and land surface, using general circulation models to understand the response of the global climate system to rising greenhouse gas concentrations. These models produce information about temperature, precipitation, cloud cover, humidity, and other variables at a large-scale. These global models, however, produce data that are not precise at the regional and local scale. Therefore, scientists "downscale" model data by incorporating local historic data and adjusting for specific topographic characteristics to understand how climate variables will change in the future.

General circulation models use scenarios that explore future development and greenhouse gas emissions. These scenarios are grouped into families according to a similar storyline that describe the factors driving greenhouse gas emissions. These factors include population growth, technological dispersion, energy sources, ecological factors, and economic growth.

In general, more than one scenario is used to capture the range of future greenhouse gas emissions and uncertainty in the assumptions about population growth, economic development, and technological deployment. This report uses A2 (higher emissions) and B1 (lower emissions) scenario data in the following discussion. The A2 scenario describes a divided world of independently operating nations, continuously increasing population, and regionally-oriented economic development. The B1 scenario represents a more integrated and ecologically-friendly world. It is characterized by rapid economic growth, increasing populations, reductions in material intensities, the use of more efficient technologies, and an emphasis on global solutions to social, environmental and economic issues. It should be noted that these are not the highest or lowest emissions scenarios.

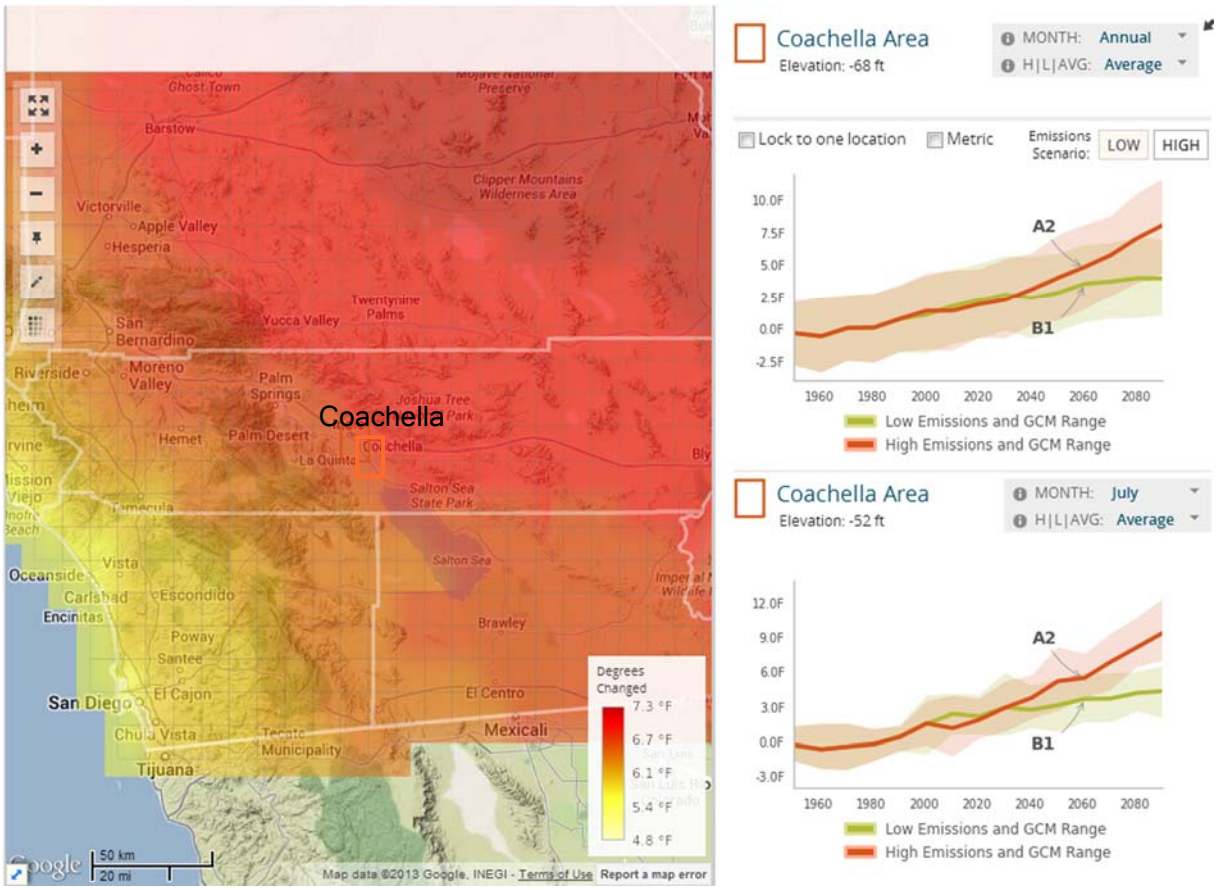
[10] Moser, Susanne, Guido Franco, Sarah Pittiglio, Wendy Chou and Dan Cayan. 2008. The Future is Now: An Update on Climate Change Science Impacts and Response Options for California. 2008 Climate Change Impacts Assessment Project – Second Biennial Science Report to the California Climate Action Team, CEC-500-2008-071.

[11] California Climate Action Team. 2009. *Draft Biennial Climate Action Report*. Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.

[12] Intergovernmental Panel on Climate Change. 2007. *Climate Change 2007: Mitigation of Climate Change*.

[13] California Natural Resources Agency. 2009. *California Climate Adaptation Strategy*.

FIGURE 3: TEMPERATURE DEGREES OF CHANGE MAP (1950 TO 2100) [14]



Along with changes to average annual temperature, climate change will alter seasonal temperatures. Average July temperatures could increase by as much as 9.0° F, resulting in average temperatures above 100° F.[15]

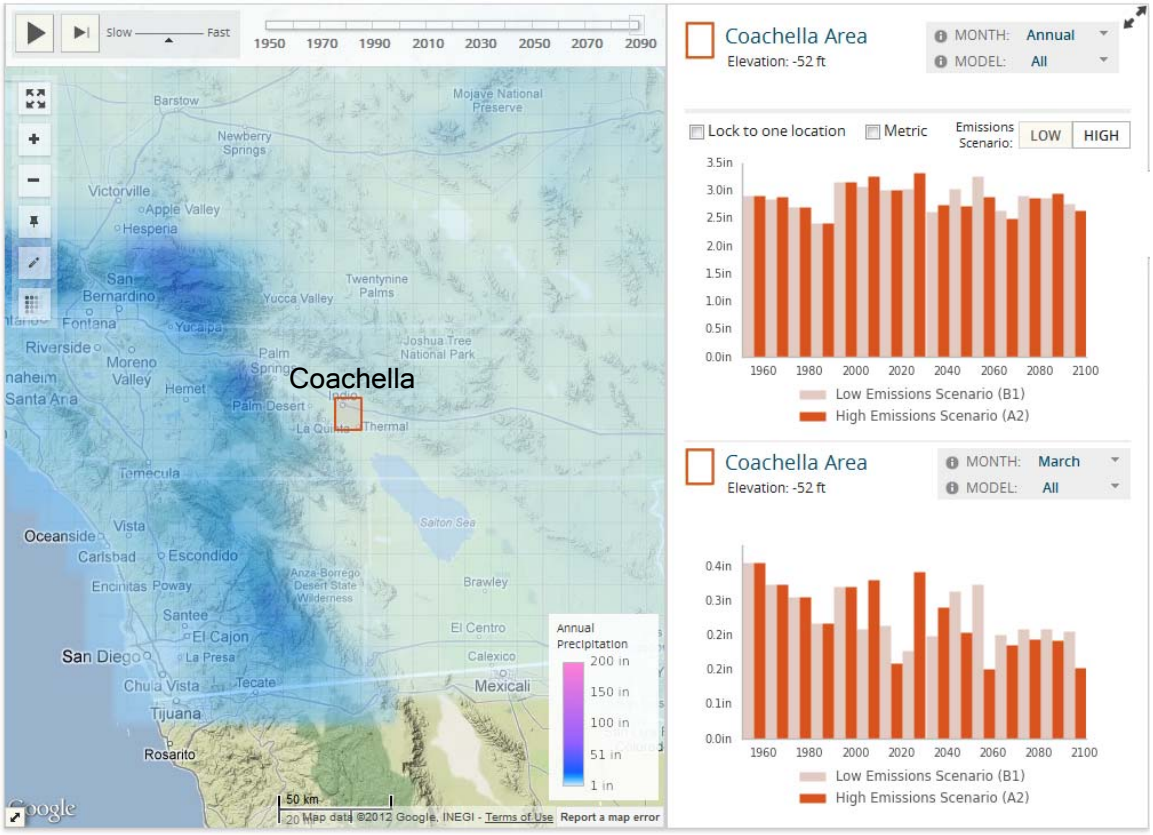
These long-term temperature increases will be experienced along with short-term variation (daily, annual, and multi-year) in temperature related to Earth system changes such as El Niño, La Niña, or volcanic eruptions. As a result, temperatures for a single day or year may be higher or lower than the long-term average.[16]

[14] Scripps Institution of Oceanography. 2009. Projected Temperatures Data Set. Received from http://cal-adapt.org/temperature/century/.
[15] Scripps Institution of Oceanography. 2009. Projected Temperatures Data Set. Received from http://cal-adapt.org/temperature/century/.
[16] National Aeronautics and Space Administration. 2005. What's the difference between weather and climate? Retrieved from http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html.

PRECIPITATION

Research suggests that in California, climate change is likely to decrease annual precipitation amounts by more than 15% by the end of the 21st century.[17] In Coachella, precipitation will remain about the same over the next century, fluctuating around 3 inches per year as shown in Figure 4. Even though average annual precipitation will remain near the same regional total, seasonal precipitation will change more significantly with March and April receiving less rainfall than in the past. As a result of the seasonal change, Coachella will likely experience longer periods of drought, as the summer dry season extends earlier into the spring and later into the fall.[18]

FIGURE 4: PRECIPITATION DECADAL AVERAGES MAP (1960 TO 2100)[19]



EXTREME WEATHER EVENTS AND STORMS

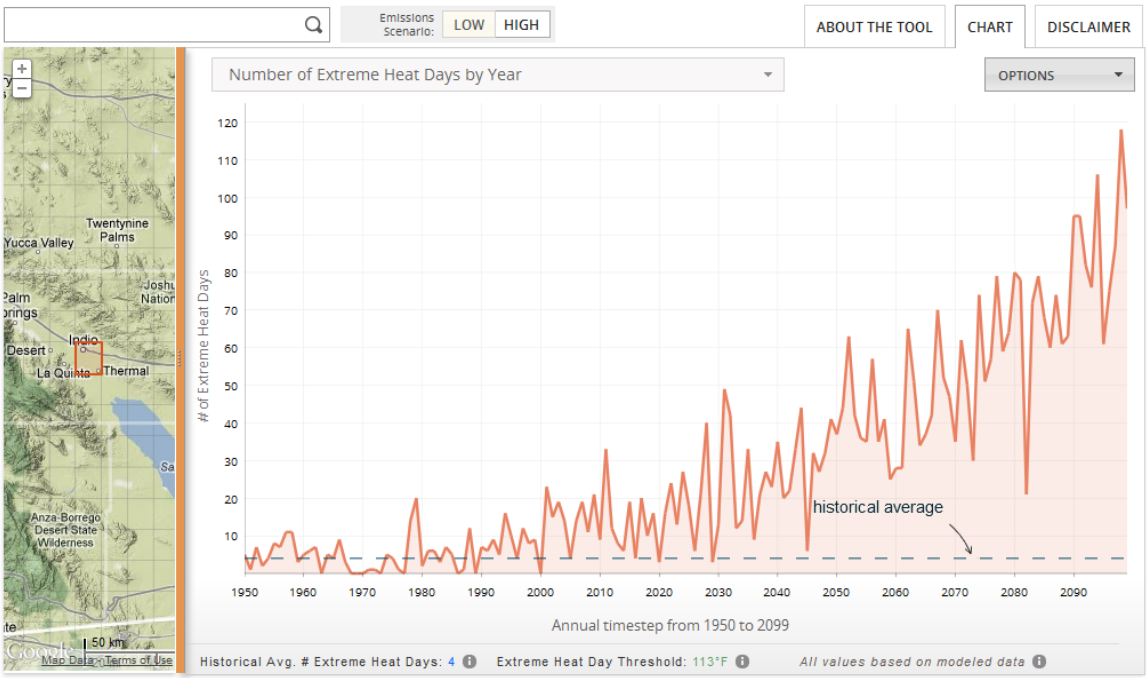
California will likely experience changes in heat waves, storms, and extreme weather events due to climate change. For example, heat waves are likely to become more frequent by the end of the century and storm surges and flooding in coastal storms are likely to impact the coast more severely. In addition, California's wet year and drought year cycles, which are

[17] California Climate Action Team, "Draft Biennial Climate Action Report" March 2009. Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.
[18] Scripps Institution of Oceanography. 2009. Projected Precipitation Data Set. Received from http://cal-adapt.org/precip/decadal/.
[19] Scripps Institution of Oceanography. 2009. Projected Precipitation Data Set. Received from http://cal-adapt.org/precip/decadal/.

connected to the El Niño Southern Oscillation cycles, are likely to become more intense. These changes can have significant impacts on both property and human health and safety as discussed in the following section.

In Coachella, the frequency, intensity, and duration of heat waves and droughts are expected to increase in the future. Coachella is likely to see a significant increase in the number of days when temperature exceeds the extreme heat threshold of 113° F. Between 1950 and 2011, the average number of extreme heat days was four. As shown in Figure 5, by 2050, the number of extreme heat days could raise to as many as fifty per year, and by the end of the century, the number of extreme heat days could exceed one hundred per year. Warmer days will also be accompanied by warmer nights, which could have a significant, negative effect on public health by exacerbating the formation of pollutants such as ground-level ozone.

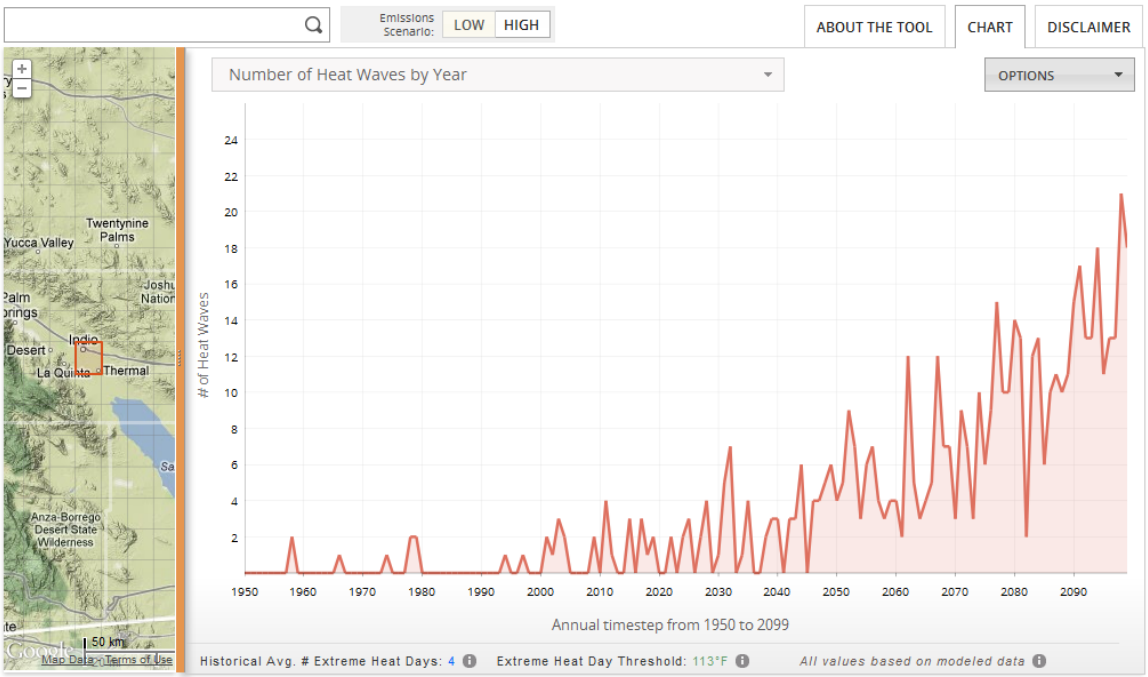
FIGURE 5: NUMBER OF EXTREME HEAT DAYS BY YEAR (1950 TO 2100)[20]



In 2011, Coachella experienced four, five-day heat waves, where temperatures exceeded the extreme heat threshold of 113° F. By mid-century, the number of heat waves could reach approximately ten per year, potentially exceeding twenty by the end of the century as shown in Figure 6.

[20] Scripps Institution of Oceanography. 2009. Projected Daily Temperature Data Set. Received from http://cal-adapt.org/temperature/heat/.

FIGURE 6: NUMBER OF HEAT WAVES BY YEAR (1950 TO 2100)[21]



IMPACTS OF CLIMATE CHANGE IN COACHELLA

Coachella and other communities in Southern California will face significant challenges associated with rising temperatures, changes in precipitation patterns, and extreme weather. As indicated in the prior sections, many of the phenomena and impacts are already being observed. These climate changes will affect a number of sectors within the region, resulting in significant social and economic consequences across the region. This section describes the likely impacts of climate change to the following sectors: public health, water resources, and economic systems.

Table 2 outlines key climate change phenomena described in the previous chapter and their associated impacts and consequences by sector for Coachella. Many of the impacts and consequences will be felt across multiple sectors. This summary focuses on climate change impacts to sectors within the purview of the City and does not include those impacts to all sectors.

[21] Scripps Institution of Oceanography. 2009. Projected Daily Temperature Data Set. Received from http://cal-adapt.org/temperature/heat/.

TABLE 2: SUMMARY OF CLIMATE CHANGE PHENOMENA, IMPACTS, AND CONSEQUENCES BY SECTOR[22]

CLIMATE CHANGE PHENOMENA	SECTOR AFFECTED	ASSOCIATED IMPACTS	ASSOCIATED CONSEQUENCES
Temperature and extreme heat events	Public Health	Heat-related: heat waves and urban heat island Wildfires	Illnesses, injuries, and loss of life Decline in air quality
	Water Resources	Drought	Decline in quantity and quality of freshwater Increased water demand
	Economy	Drought Heat-related	Loss of agricultural productivity Energy disruption Economic gains/losses
Precipitation and extreme precipitation events	Public Health	Flooding Drought	Illnesses, injuries, and loss of life
	Water Resources	Flooding Drought Nonpoint source pollution	Illnesses, injuries, and loss of life Decline in quality of freshwater Economic losses
	Economy	Flooding Drought	Loss of agricultural productivity Destruction and damage to property Economic gains/losses

PUBLIC HEALTH

Climate change is expected to affect the health and welfare of people and communities around California and within Coachella. Climate-related impacts related to heat, drought, and wildfires could have particularly significant health effects. It is expected that climate change will have differential effects on different subpopulations, where biological sensitivity, socioeconomic factors, and geography will contribute to the heightened risk for climate-sensitive health outcomes. Vulnerable populations include children, pregnant women, older adults, low-income communities, people with chronic diseases and mobility/cognitive constraints, and outdoor workers. Other socioeconomic factors include income, the prices of goods and services, access to vaccines, exposure to pesticides, diet, lifestyles, social networks, and other factors.[23]

[22] Adapted from the National Oceanic and Atmospheric Administration's *Adapting to Climate Change: A Planning Guide for State Coastal Managers*. 2010.

[23] U.S. Climate Change Science Program. 2008. *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems*. U.S. Environmental Protection Agency, Washington, DC, USA.

HEAT-RELATED

As discussed earlier, along with seasonal warming, California and Coachella are likely to experience a larger number of extreme heat days, warm nights, and more prolonged periods of hot weather. Periods of increased high temperatures or extended high temperatures can lead to increased heat-related mortality, cardiovascular-cause mortality, respiratory mortality, heart attacks, and other causes of mortality.[24] Emergency medical services and hospital visits also increase during heat waves.[25]

California experienced a similar heat wave during July 2006, which broke temperature records around the state over a ten-day period and caused at least 140 deaths. During the heat wave, hospital and emergency department visits increased statewide from the average conditions, resulting in an estimated 16,166 excess emergency department visits and 1,182 excess hospitalizations. Risk ratios for heat-related illness increased significantly during the heat wave for the Coachella region. In addition, the heat wave also elevated risk ratios for electrolyte imbalance, acute renal failure, and nephritis.[26] In particular, heat-related illnesses impacted people over 65 and Latino/Hispanic persons, which could relate to existing chronic diseases in elderly populations and occupational exposures among outdoor workers.[27]

Along with heat-related illness, changes in temperature are expected to worsen air quality, particularly ozone and particulate matter concentrations. Currently, Riverside County is ranked as the fourth most polluted county by short-term particle pollution (24-hour PM2.5) and year-round particulate pollution (Annual PM2.5) and the second most ozone-polluted county in the country. Riverside County received an F grade for High Ozone Days 2008-2010 with 227 orange days (unhealthy for sensitive populations), 66 red days (unhealthy), and 4 purple days (very unhealthy).[28]

Not only could climate change slow California's progress toward attainment of health-based air quality standards and increase pollution control costs, it will increase the risk of incidences of asthma, allergies, chronic obstructive pulmonary disease, other cardiovascular and respiratory diseases, skin cancer, and cataracts.[29]

WILDFIRES

Many ecosystems in California are naturally fire dependent, and therefore, these same forests are prone to wildfire. As California is likely to experience increased temperatures and reduced precipitation, these factors will likely lead to more frequent and intense wildfires and longer fire seasons.[30] For Coachella, an increase in wildfires will not necessarily increase the direct

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[24] U.S. Climate Change Science Program. 2008. Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems. U.S. Environmental Protection Agency, Washington, DC, USA.

[25] Kovats, R.S, and Ebi, K.L. 2006. Heat waves and Public Health in Europe. European Journal of Public Health 16:592-599.

[26] A risk ratio is a measure of the risk of a certain event happening in one group compared to the risk of the same event happening in another group. National Institutes of Health. 2012.

[27] Knowlton, K., et al. (2009). The 2006 California Heat Wave: Impacts on Hospitalizations and Emergency Department Visits. Environmental Health Perspectives: Volume 117, Number 1.

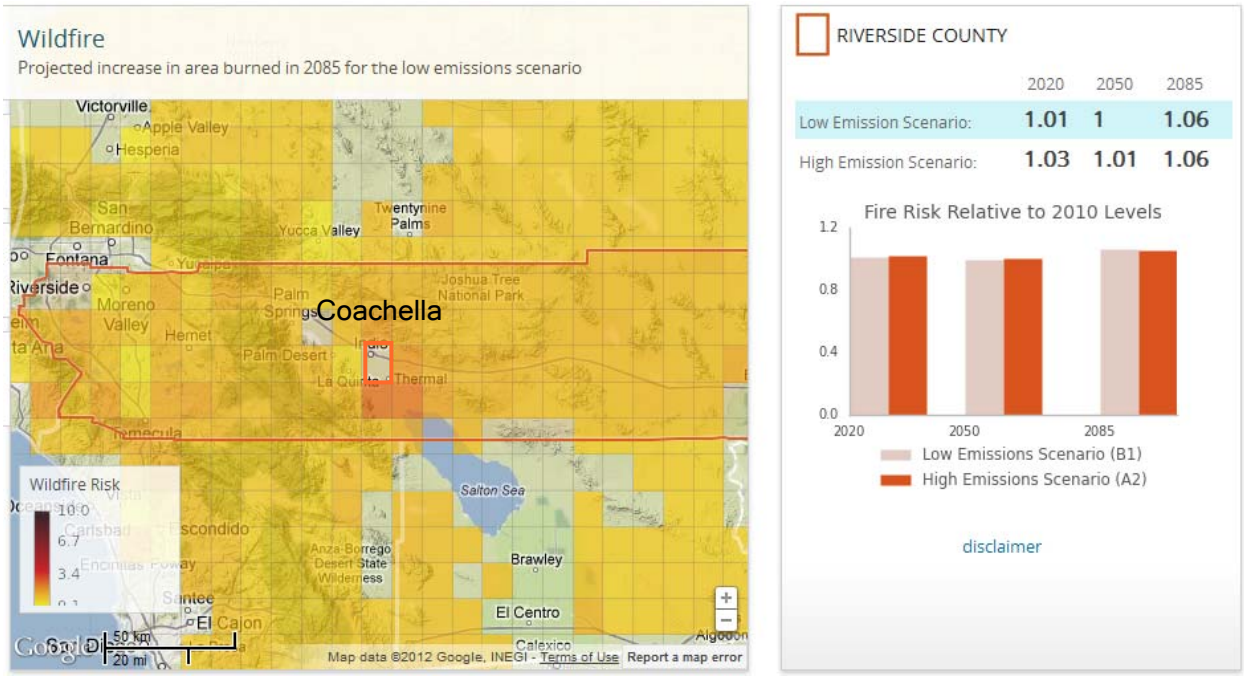
[28] American Lung Association. (2012). State of the Air. Available at http://www.stateoftheair.org/2012/assets/state-of-the-air2012.pdf.

[29] California Climate Action Team, "Draft Biennial Climate Action Report" March 2009. Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.

[30] California Department of Forestry and Fire Protection. 2012. *CAL FIRE Climate Change Program*.

injuries and deaths from fire, but it will likely worsen air quality and negatively impact public health. Figure 7: Projected Increase in Area Burned by Wildfires (2010 to 2085) illustrates the increase in areas burned by wildfire by the end of the century around Coachella. The increase in area burned will likely exacerbate eye and respiratory illness as well as worsening asthma, allergies, chronic obstructive pulmonary disease, and other cardiovascular and respiratory diseases.

FIGURE 7: PROJECTED INCREASE IN AREA BURNED BY WILDFIRES (2010 TO 2085)[31]



WATER RESOURCES

Climate change will affect California's snowpack, precipitation, and, consequently, water supply. There is some uncertainty as to how water supplies will be affected, but even the most conservative models anticipate less stable water supplies and potentially more competition for what are already over-drafted and over-allocated resources. Coachella Valley's two major sources of imported water, the Colorado River and the State Water Project, are likely to be affected by climate change.[32]

An important factor to be considered in water supply planning is the occurrence of drought. During periods of drought, water availability decreases and water demand increases. Climate change is expected to increase the frequency and severity of droughts in the region as temperatures rise and precipitation and stream flow decline during the summer.

Although the majority of the water used by Coachella is groundwater and is less susceptible to climate variability, the groundwater is recharged with allocations from the Colorado River and State Water Project, which will be affected by climate change. An evaluation of climate

[31] Climate Applications Lab at UC Merced. 2008. Fire Risk Data Set. Received from http://cal-adapt.org/fire/
[32] Coachella Valley Water District. (2010). Urban Water Management Plan.

scenarios on the State Water Project found a 7% to 10% reduction in Sacramento Delta water exports by mid-century and up to a 25% reduction by the end of the century. The analysis also found that reservoir storage is likely to decline.[33]

Along with changes in water supply, demands for water will likely increase with warmer temperatures, higher evapotranspiration, and higher per capita income, straining existing water supplies. Average summer temperatures are a significant factor in water use and Coachella's average summer temperature is expected to increase by as much as 9.0° F.[34] This will increase water demand for crop and landscape irrigation and urban water use and result in larger losses from canals and open reservoirs.[35]

Coachella already suffers from seasonal flooding, and climate change is projected to shift peak runoff to winter and early spring, increasing peak runoff volumes and flooding. These factors will be aggravated by the conversion of undeveloped and agricultural land to impervious surfaces. The anticipated increase in flooding will cause more damage to communities and agricultural lands, result in additional illness and loss of life, and diminish water quality.

ECONOMY

Each of the impacts of climate change discussed above is likely to impose substantial monetary costs to California. In fact, the California Climate Action Team estimates that climate change will cost California tens of billions of dollars annually. If greenhouse gas emissions begin to be reduced, however, these costs could be lowered.[36] Several potential impacts in the region include:

- Storms and heat waves can disrupt the supply of and increase the demand for energy.
- As the frequency and severity of droughts and floods increases in the future, it will be more difficult to grow crops and raise animals than in the past.
- Extreme heat events and worsening air quality will disproportionately affect low-income residents, particularly those that labor outside such as farm workers.
- Coachella Valley tourism may be impacted by extreme weather especially a longer warm season affecting Coachella residents that work in the tourism related fields. It will also affect the ability of Coachella to attract the tourism industry to the City in the long-term.

[33] Coachella Valley Water District. (2010). Urban Water Management Plan.
[34] Scripps Institution of Oceanography. 2009. Projected Temperatures Data Set. Received from http://cal-adapt.org/temperature/century/.
[35] Coachella Valley Water District. (2010). Urban Water Management Plan.
[36] California Climate Action Team. 2009. *Draft Biennial Climate Action Report.* Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.

BENEFITS OF CLIMATE ACTION PLANNING

Careful planning is needed to manage the complex issue of climate change. Fortunately, climate action strategies are often associated with many other environmental, social, and economic benefits. While the Coachella General Plan and CAP provides a roadmap for the City to achieve emissions reductions, it will also help the City and its residents in the following areas:

IMPROVED PUBLIC HEALTH AND AIR QUALITY

Minimizing greenhouse gas emissions will reduce other harmful air pollutants, such as ozone, carbon monoxide, sulfur dioxide, and particulate matter. Exposure to these criteria pollutants is associated with numerous effects on human health, including increased respiratory symptoms, hospitalization for heart or lung diseases, and even premature death. Reducing emissions may result in benefits for the health and well-being of the community at large. Enabling alternative modes of transportation, such as walking and biking help people get more exercise and live healthier lives. For example, policies in the General Plan to regulate new development to ensure that new blocks maximize pedestrian connectivity and route choice and create reasonable block lengths will encourage more walking and physical activity.

ENERGY SECURITY AND INDEPENDENCE

Addressing transportation and land use planning by supporting infill development and promoting alternative modes of transportation will reduce demand for imported energy, especially fossil fuels. In addition, smarter building design and construction practices, including passive solar heating and cooling, building orientation, and renewable energy systems, will diminish the need for fossil-fuel based energy.

SAVE MONEY

Reducing energy demand can help lower utility costs for individuals, households, and businesses. Investments in energy efficiency and renewable energy sources yield long-term operations and maintenance savings. Many of these actions have simple payback periods of less than five-years.

STIMULATE ECONOMIC DEVELOPMENT

Reinvestment in local buildings and infrastructure will provide new opportunities for skilled trades and a variety of professional services. Local knowledge institutions are well positioned to be incubators for emerging technologies and training grounds for the next generation's regional workforce.

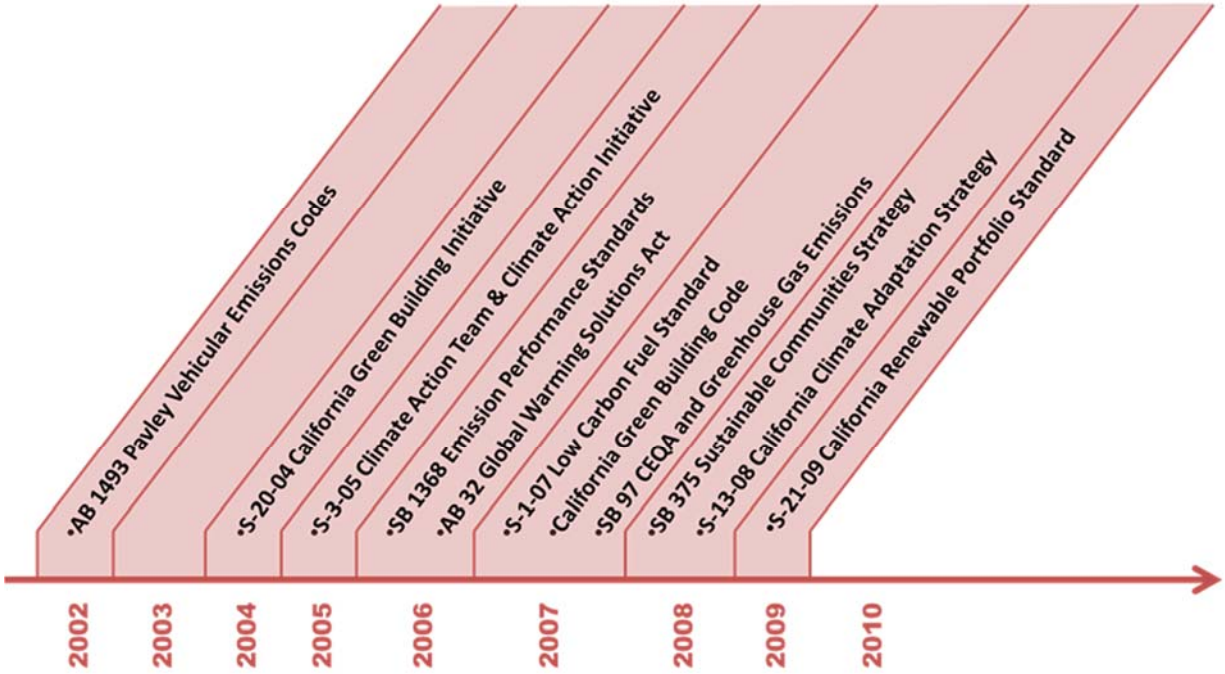
CEQA TIERING

Analyzing and mitigating greenhouse gas at a programmatic level is part of a strategy to address the cumulative impacts of greenhouse gas emissions and to streamline environmental regulatory procedures. The CAP presents a possible framework, which could allow future development projects to reference the CAP in order to tier and streamline the environmental review process.

REGULATORY FRAMEWORK

During the past decade, the State of California made great strides in developing a regulatory framework to curb future greenhouse gas emissions and to adapt to the potential consequence of climate change, as shown by Figure 8. California adopted a series of policies, programs, and regulations that set targets for greenhouse emissions reductions and outlined strategic actions that enable government agencies, public institutions, and businesses to collaborate to achieve these reduction targets. There are several other California regulations and laws that directly affect local government efforts to reduce greenhouse gas emissions and to respond to the potential impacts of climate change. A detailed description of these regulations can be found in Appendix B.

FIGURE 8: TIMELINE OF CALIFORNIA CLIMATE CHANGE REGULATIONS (2002 TO 2010)



For more information on California's regulatory framework for climate change, please see Appendix B.

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3 | GREENHOUSE GAS EMISSIONS ESTIMATES

From 2005 to 2010, greenhouse gas emissions in Coachella rose. Metered electricity and natural gas use, vehicle fuel consumption, and water use all increased. Without policy intervention, these trends, coupled with high residential and commercial growth rates, are expected to continue into the future, increasing Coachella's greenhouse gas emissions significantly. This chapter provides a snapshot of Coachella's current emissions and projects emissions under a business-as-usual scenario. It also includes a comparison of Coachella's business-as-usual emissions with State recommended, voluntary reduction targets.

METHODOLOGY

The Coachella Greenhouse Gas Emissions Inventory provides a snapshot of emissions for the baseline year of 2010[37], building on the earlier efforts of the City to quantify the main sources of emissions from the community as a whole in 2005. The purpose of the greenhouse gas inventory is to:

- identify and understand the sources and quantities of emissions within a local government's jurisdictional boundary, as well as identify and understand activities within a local government's jurisdictional boundary that may generate emissions elsewhere;
- update the emissions baseline by applying new protocols and incorporating better data, allowing the City to set emission reductions targets and measure future progress;
- use the baseline to prioritize and evaluate potential government actions;
- make informed policy decisions related to greenhouse gas emissions reduction; and
- describe the relationship between energy consumption and greenhouse gas emissions.

The community inventory uses national standards for quantifying and reporting emissions from each sector. The inventory was prepared using the direction of the standard greenhouse gas accounting method outlined in the Local Government Operations Protocol, which was adopted by the California Air Resources Board (ARB) in 2008; the AEP White Paper on Community-wide Greenhouse Gas Baseline Inventories; and the ARB's Technical Support Document for California's 2000-2009 Greenhouse Gas Emissions Inventory, and used activities, emissions coefficients, and calculations identified by the Protocol.

The 2010 Greenhouse Gas Emissions Inventory includes data from a variety of sources. For 2005, activity and emissions data were gleaned from the Coachella Valley Greenhouse Gas

[37] This analysis uses 2010 as the baseline year because this is the year of the most reasonably complete data set available for the analysis. Further, the City experienced very little growth between 2010 and 2013 and the data utilized is a proximate estimate of 2013 activity data.

Emissions Inventory. As described in the following section, water emissions were added to the 2005 inventory, which used water consumption data from the 2010 Urban Water Management Plan. For 2010, the following table briefly summarizes the data and data sources used in the community and municipal inventories. Refer to Appendix E for details on Appendix D: Assumptions in Greenhouse Gas Emissions Analysis the data sources and greenhouse gas emissions inventory.

TABLE 3: ACTIVITY DATA SOURCES FOR THE 2010 INVENTORY

ACTIVITY DATA	SOURCE	OBTAINED FROM
Natural Gas	Sempra Utilities	Energy Use Statistics
Electricity	Imperial Irrigation District	Report on Electricity Use
Vehicle Miles Traveled	Riverside County	Regional Transportation Model
Solid Waste	Cal Recycle	Annual Solid Waste Reporting Database
Water Use	City of Coachella	Urban Water Management Plan
Agricultural Land	Riverside County	Parcel Data

The inventory also incorporates an estimate of future community-wide emissions based on a business-as-usual (BAU) forecast. The BAU forecast projects future greenhouse gas emissions that are expected to occur if the City were to build out to the estimated population under the 1996 General Plan and current local development standards and without future state, regional, or local mitigation efforts. This is a useful metric for evaluating the effectiveness of greenhouse gas emissions because it provides an understanding of how much more *efficient* a community will be as it grows. It is extremely difficult to ascertain how effective a greenhouse gas emissions reduction program can actually be in a high-growth city such as Coachella, which is anticipated to more than triple in size by 2035, because the sheer magnitude of growth will overshadow any improvements in *how* the City grows over time. Thus, while the ultimate target is based on a reduction against the 2010 baseline, this Climate Action Plan presents greenhouse gas emissions reductions estimates in terms of gross reductions, reductions relative to the 2010 baseline, and reductions relative to the BAU forecast.

INVENTORY RESULTS

In 2010, total greenhouse gas emissions in Coachella were approximately 382,787 metric tons ($MTCO_2e$), a 22% increase over 2005 emissions of 312,628 $MTCO_2e$. This aggregate number accounts for direct emissions from the on-site combustion of fuels and the combustion of fuel in vehicles. This figure also includes all indirect emissions associated with community electricity consumption, and emissions from solid waste generated, crop management, and water consumed by Coachella. Table 4 summarizes Coachella's community emissions by sector.

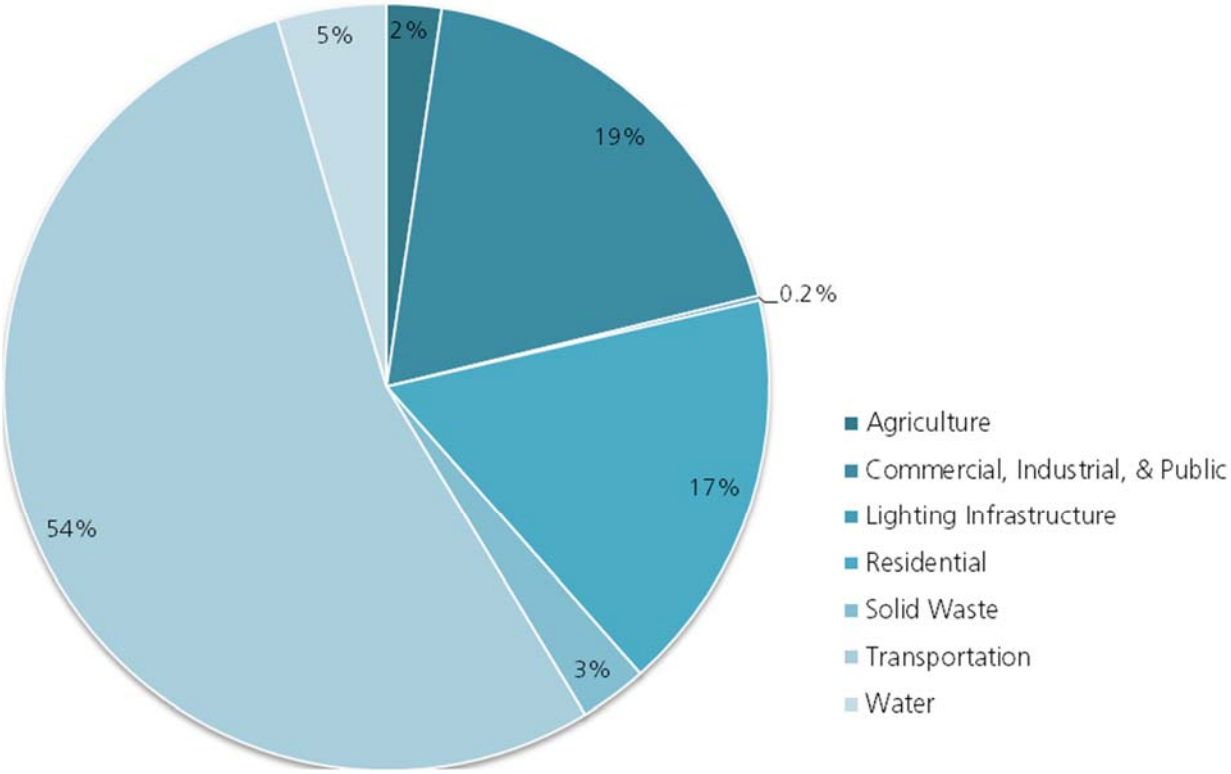
TABLE 4: COMMUNITY GREENHOUSE GAS EMISSIONS (2005 AND 2010)

SECTOR	2005	2010
Agriculture	N/A[38]	8,844
Commercial, Industrial, & Public	78,128	72,294
Lighting Infrastructure	492	730
Residential	51,662	65,357
Solid Waste	15,747	10,960
Transportation	152,528	206,909
Water	11,960	17,693
Total Emissions	**312,628**	**382,787**

The transportation sector emitted the largest quantity of greenhouse gases emissions, 206,909 $MTCO_2e$ or 54% of the community total. The combined commercial, industrial, and public authority sector was the second largest producer of greenhouse gases, contributing 72,294 $MTCO_2e$ of emissions, while the residential sector produced 65,357 MTCO2e. The remainder of the emissions came from agriculture (8,844 $MTCO_2e$), lighting infrastructure (730 $MTCO_2e$), solid waste (10,960 $MTCO_2e$), and water (17,693 $MTCO_2e$) sectors. Figure 9 shows the emissions by sector in 2010.

[38] Information on 2005 agricultural activity was not available at the time of the analysis, nor was it included in the 2005 greenhouse gas inventory for the prepared by the South Coast Air Quality Management District.

FIGURE 9: COMMUNITY EMISSIONS SUMMARY BY SECTOR (2010)



PER CAPITA AND PER SERVICE POPULATION EMISSIONS

Focusing on absolute emissions numbers provides a limited understanding of the greenhouse gas emissions picture. Per capita emissions or per service population emissions can be a useful indicator to measure progress toward City-wide goals.[39] It can also provide a simple metric to compare one jurisdiction to another; however, caution must be used when comparing per capita emissions from Coachella to other cities, since there could be methodological differences between jurisdictions.

Emissions per person in Coachella were 9.4 $MTCO_2e$ in 2010. 2010 per capita emissions were down from the 2005 emissions of 10.5 $MTCO_2e$ per person. Similar to per capita emissions, per service population emissions fell from 8.5 $MTCO_2e$ in 2005 to 8.2 $MTCO_2e$ in 2010.

[39] Service population is defined as population (residents) plus employment (jobs). Service population is used to account for the activities and emissions that are associated with jobs and visitors, as well as residents of a city, in order to show a more complete picture of activity and emissions generation rates.

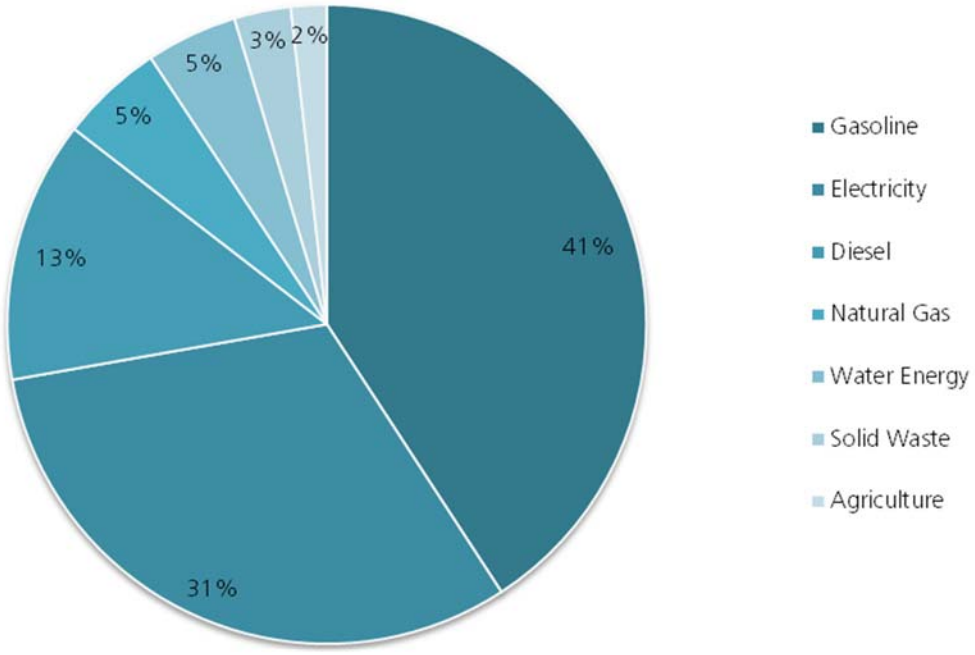
TABLE 5: PER CAPITA AND PER SERVICE POPULATION GREENHOUSE GAS EMISSIONS (2005 AND 2010)

	2005	2010
Total Emissions	312,628	382,787
Population	29,754	40,704
Employment	7,213	5,831
Service Area Population (pop + emp)	36,967	46,535
Emissions per Capita ($MTCO_2E$/Pop)	**10.5**	**9.4**
Emissions per Service Population ($MTCO_2E$/SP)	**8.5**	**8.2**

EMISSIONS BY SOURCE

The combustion of gasoline and diesel fuels by the transportation sector contributed the largest proportion of emissions in Coachella. Between 2005 and 2010, vehicle miles traveled (VMT) and transportation-related emissions in Coachella grew by 36%. Annual VMT rose from 245 million miles in 2005 to 354 million miles in 2010. Transportation gasoline use resulted in 156,173 $MTCO_2e$ of emissions, or 41% of the community total. Diesel use by the transportation sector contributed an additional 50,736 $MTCO_2e$ of greenhouse gas emissions. Figure 10 shows the community emissions by source in 2010.

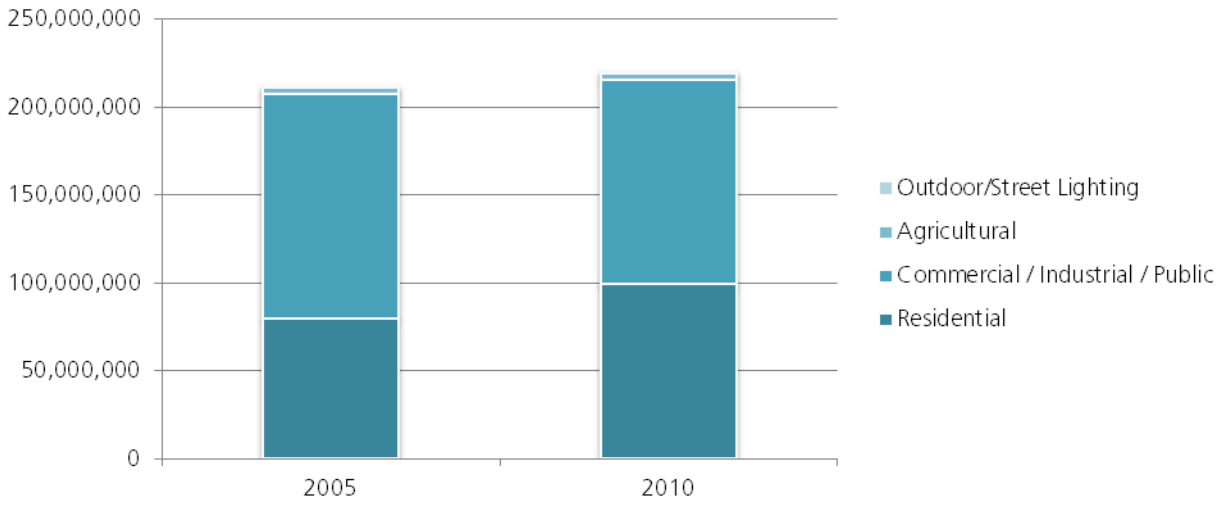
FIGURE 10: COMMUNITY EMISSIONS SUMMARY BY SOURCE (2010)



By source, electricity use resulted in the second largest emissions total community-wide. Electricity use increased from 212 million kWh to 220 million kWh, a 4% increase.

Commercial, industrial, and public authority electricity use declined by approximately 11 million kWh, a 9% reduction, while residential electricity use increased by 20 million kWh (25%) and outdoor and street lighting electricity use rose by approximately 300,000 kWh (48%). Figure 11 shows the change in community electricity use.

FIGURE 11: COMMUNITY ELECTRICITY USE (2005 AND 2010)



Overall natural gas use grew by approximately 600,000 therms between 2005 and 2010, an approximately 20% increase. Single family residential natural gas use grew by over 500,000 therms (35%), multifamily residential natural gas fell by approximately 20,000 therms (16%), and commercial and industrial natural gas use increased by over 50,000 therms (4%).

The water-related uses consume energy to collect, convey, treat, and deliver water to users, and then it uses additional energy to collect, treat, and dispose of the resulting wastewater. This energy use yields both direct and indirect greenhouse gas emissions. Water use also grew significantly from 2005 to 2010. Annual potable water use increased from 1,857 million gallons of water to 2,691 million gallons, resulting in more waste water.

One of the few sources of emissions to decline between 2005 and 2010 was solid waste tonnage. Solid waste tonnage declined by over 10,000, falling from 33,463 tons in 2005 to 23,289 in 2010.

COMMUNITY EMISSIONS FORECAST

How will projected trends in energy use, driving habits, population growth, and employment expansion affect future greenhouse gas emissions in Coachella? To answer this question, a business-as-usual (BAU) forecast was developed for the City that estimates future emissions in 2020 and 2035 from seven sectors: agriculture; commercial, industrial and public; residential; lighting infrastructure; transportation; solid waste; and water. The BAU uses the population and employment forecasts developed for the 2035 General Plan. The BAU projects emissions under the expected population, development patterns, and development standards of the 1996 General Plan and it does not include the effects of California regulatory efforts, such as Title 24 updates, the Renewables Portfolio Standards, and the Pavley Clean Car Standards on future greenhouse gas emissions.[40] Based on these assumptions, emissions are expected to rise under a business-as-usual forecast. Coachella's greenhouse gas emissions are projected to increase from 382,787 $MTCO_2e$ of emissions in 2010 to 1,543672 $MTCO_2e$ of emissions in 2035, a 303% increase. This growth is largely driven by a 232% increase in population and a 442% increase in employment.

TABLE 6: COMMUNITY GREENHOUSE GAS EMISSIONS BY SECTOR (2005, 2010, 2020, AND 2035)

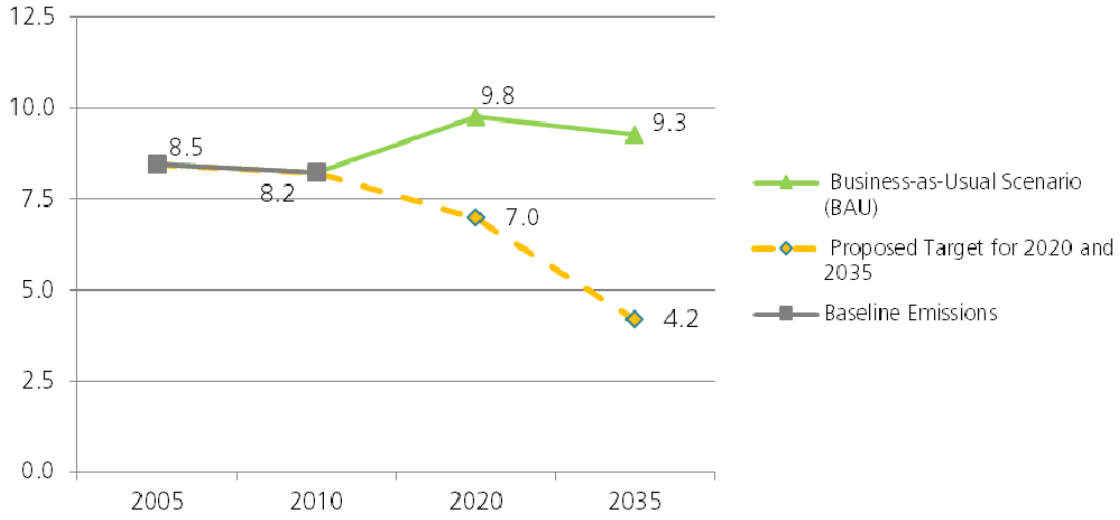
	2005	2010	2020	2035
COMMUNITY-WIDE GREENHOUSE GAS EMISSIONS				
Agriculture	N/A	8,844	7,335	5,661
Commercial, Industrial, & Public	78,128	72,294	199,998	391,554
Lighting Infrastructure	492	730	1,483	2,613
Residential	51,662	65,357	126,302	217,721
Solid Waste	15,747	10,960	22,271	39,238
Transportation	152,528	206,909	529,762	825,015
Water	11,960	17,693	35,940	61,871
Total Emissions	**312,628**	**382,787**	**923,091**	**1,543,672**
POPULATION, EMPLOYMENT, AND PER CAPITA AND PER SERVICE AREA EMISSIONS				
Population	29,754	40,704	78,431	135,021
Employment	7,213	5,831	16,131	31,581
Service Area Population (pop + emp)	36,967	46,535	94,562	166,603
Emissions per Capita (MTCO2e/Pop)	**10.5**	**9.4**	**11.8**	**11.4**
Emissions per Service Population (MTCO2e/SP)	**8.5**	**8.2**	**9.8**	**9.3**

[40] For more information on California's climate change policies, programs, and regulations, see Chapter 2: Regulatory Setting.

GREENHOUSE GAS REDUCTION TARGET

The City of Coachella proposes to set an efficiency-based greenhouse gas reduction target of 15% below 2010 per service population emissions by 2020 and an aggressive, emissions reduction target of 49% below 2010 per service population emissions by 2035. The 2020 target is tied to the recommendation of the California Air Resources Board and the Climate Change Scoping Plan, which suggests that local governments work to reduce emissions by 15% below current levels.[41] Coachella's 2020 target aligns with this state recommendation and places the City on a course towards California's long-term emissions reduction target, which is an ambitious goal to reduce greenhouse emissions by 80% below 1990 levels in 2050.[42] The 2050 goal is the State's policy interpretation of the percent reduction necessary to stabilize global carbon dioxide levels, while still providing for economic growth. The City recognizes the need to continue reducing emissions beyond 2020, but also knows that additional state and federal actions will be needed to achieve an 80% target by 2050. Figure 12 shows the proposed greenhouse gas emissions reduction efficiency target for 2020 and 2035.

FIGURE 12: COACHELLA PROJECTED PER SERVICE POPULATION EMISSIONS (IN $MTCO_2E$) AND PROPOSED EMISSIONS EFFICIENCY TARGETS (2005 TO 2035)



Along with California regulatory framework, the following criteria were used to establish the emissions reduction targets for 2020 and 2035:

- Adequate to place the region on an emissions path that avoids the most significant changes to the regional climate;
- Provide co-benefits that improve the quality of life of the Coachella residents, enhance the local economy, and make municipal operations more efficient;
- Feasible with existing resources and technology; and
- Uncertainty about federal and state actions beyond 2020.

[41] California Air Resources Board. 2008. *Climate Change Scoping Plan*. Retrieved from http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm

[42] Governor of the State of California. 2005. *Executive Order S-3-05*. Retrieved from http://www.dot.ca.gov/hq/energy/ExecOrderS-3-05.htm

The City of Coachella inventory established that 2005 emissions totaled 312,628 $MTCO_2e$ and grew to 382,787 $MTCO_2e$ in 2010. Population and employment growth, increased per capita energy use, and a rebounding economy are expected to increase city-wide emissions to 923,091 $MTCO_2e$ in 2020, or 9.8 $MTCO_2e$ per service population. As shown in Table 7, to achieve the 15% reduction target from the 2010 per service population baseline, the City would need to develop and implement strategies that reduce emissions by 2.8 $MTCO_2e$ per service population in 2020. Given projected trends, this reduction lowers 2020 emissions to approximately 20% below 2020 business-as-usual levels (levels anticipated for 2020 in the absence of any local, state, or federal interventions). To achieve a 49% below 2010 per service population reduction target by 2035, Coachella would need to reduce emissions by 5.1 $MTCO_2e$ (786,993 $MTCO_2e$) from the BAU in 2035. This is 51% below businesses-as-usual levels in 2035.

TABLE 7: GREENHOUSE GAS REDUCTIONS AND PROPOSED TARGETS (2020 AND 2035)

	2020	2035
PROJECTED BUSINESS-AS-USUAL FORECAST		
Projected BAU Emissions ($MTCO_2E$)	923,091	1,543,672
Projected BAU Emissions per Service Population ($MTCO_2E$ / SP)	9.8	9.3
GREENHOUSE GAS EMISSIONS TARGETS		
Greenhouse Gas Emissions Target	15% below 2010 emissions[43]	49% below 2010 emissions[44]
Targeted Greenhouse Gas Emissions per Service Population ($MTCO_2E$ / SP)	7.0	4.2
Targeted Total Greenhouse Gas Emissions ($MTCO_2E$)	735,829	756,679
GREENHOUSE GAS EMISSIONS REDUCTION TO MEET TARGETS		
Targeted Reduction in Greenhouse Gas per Service Population ($MTCO_2E$ / SP)	2.8	5.1
Targeted Reduction in Total Greenhouse Emissions ($MTCO_2E$)	187,262	786,993

[43] The 2020 target is tied to the recommendation of the California Air Resources Board and the Climate Change Scoping Plan, which suggests that local governments work to reduce emissions by 15% below current levels.
[44] Extrapolated based on a linear projection from 2020 target (15% below 2010 levels) to 2050 target (80% below 1990 levels)

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4 | EMISSION REDUCTION STRATEGIES

To balance future growth with its greenhouse gas reduction target and goal, Coachella needs broad-based participation from businesses and residents. Everyone who lives, works, shops, or plays in the City contributes to the community's energy use and emissions, and everyone will need to be part of the solution. The following section describes and assesses a series of greenhouse gas emission reduction strategies for the City. These strategies include state policies and implementation programs, General Plan policies, and additional measures included as part of the CAP. Along with the greenhouse gas mitigation measures, the CAP includes a strategy to help the City begin to adapt to the potential future impacts of climate change. This strategic framework will provide the City with an efficient pathway for implementing emissions reduction policies and increasing the resiliency of people, ecological landscapes, and infrastructure to climate change and climate variability.

Like the General Plan, the reduction strategies focus on actions within the City that can result in a break from business-as-usual emissions. The strategies do not address the ownership of emissions or responsibility for specific emissions reductions. Rather, the CAP is structured around the view that the City as a nexus for many different types of emissions that may ultimately be owned or controlled by a wide-range of stakeholders.

GREENHOUSE GAS REDUCTION APPROACH

To reduce greenhouse gas emissions from existing development and expected, future development and to help meet the City's proposed greenhouse gas emissions targets, the CAP includes an analysis of greenhouse gas emissions reductions from State of California programs, General Plan policies, and additional CAP measures. This chapter begins with a summary of state programs that will help move the City towards its greenhouse gas efficiency targets for 2020 and 2035. These state policies do not require additional actions by the City; rather, state policies and local actions are mutually-supportive, helping both achieve short- and long-term greenhouse gas reductions. After the state policies are described, policies developed as part of the General Plan are compiled, described, and quantified. The CAP also includes a series of more aggressive implementation of General Plan policies and the pursuit of different strategies and actions. This list of measures shows a possible pathway for Coachella to reach the proposed 2035 service population efficiency target.

When feasible, the potential reduction value of each measure has been quantified using industry standard methods developed by the California Air Pollution Control Officers Association (CAPCOA) and outlined in the report Quantifying Greenhouse Gas Mitigation Measures.[45] The report describes approaches for quantifying greenhouse gas emission reductions from a

[45] For additional information about CAPCOA's Quantifying Greenhouse Gas Mitigation Measures report, please visit http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

specified list of mitigation measures. The report also provides guidance on the grouping and combination of measures. These measures, when enacted with a primary strategy, improve its effectiveness.

STATE PROGRAMS

Coachella will benefit from numerous emission reduction strategies implemented by the State of California or federal government. While the City does not play any direct role in implementing these strategies, the resulting reductions will contribute significantly to the City's future emissions profile. For the purposes of this CAP, the following state policies were analyzed: the Renewables Portfolio Standard, Title 24, the Low Carbon Fuel Standard, and Pavley Clean Cars. Other state programs, including the tire pressure program, low friction oils, and the heavy-duty vehicle efficiency standards will further reduce emissions, but have not been quantified based on uncertainty in estimating emissions reductions.

GENERAL PLAN POLICIES

The CAP evaluates General Plan policies that have the potential to reduce greenhouse gas emissions or support emission reduction strategies. The CAP organizes General Plan policies into six strategies to reduce emissions reductions throughout the City: building and infrastructure energy efficiency; renewable energy generation; land use and transportation; vegetation and open space; solid waste; and water use. Each strategy is supported by a number of more specific programs, actions, and measures that will be implemented as part of the City's General Plan. In general, greenhouse gas reductions from any single policy represent a conservative estimate of the potential emissions reductions.

Energy Efficiency

Residential and non-residential buildings produce approximately 39% of Coachella's emissions and are a primary target for the CAP. This strategy quantifies energy efficiency policies in the General Plan for homes, businesses, and private street lighting, including energy performance targets to construct buildings 15% more energy efficient than Title 24, increase passive solar design features, and planting new shade trees.

Energy Generation

This strategy includes General Plan policies that will help homes and businesses in Coachella increase renewable energy production. It includes requirements for solar photovoltaic infrastructure on new homes and businesses and pursuing clean energy through community choice aggregation.

Land Use and Transportation

Coachella's General Plan provides clear guidance for how Coachella will become a city of walkable neighborhoods tied together by multi-modal transportation corridors and interspersed with vibrant districts for shopping, working, entertaining, and commerce. The walkable neighborhoods will have a diverse mix of housing types and will be in close proximity to shopping and neighborhood services so that the majority of one's daily needs are a short walk away. This strategy evaluates the land use and transportation policies in the General Plan that aim to reduce vehicle miles travelled and improve mobility. Specific implementation measures involve changing land uses, adopting a new perspective on community design, promoting alternative modes of travel, and revising antiquated parking standards.

Solid Waste

Solid waste generation produces only a small percentage of Coachella's emissions (3%), but with population and employment growth, the specific actions outlined in the General Plan to increase waste diversion can result in significant emissions reductions. This strategy includes General Plan policies related to increase residential and commercial recycling and construction recycling.

Vegetation and Open Space

Not only do trees and open space enhance the appearance of a community, they reduce ambient air temperature, lower energy use, reduce air and water pollution, and absorb greenhouse gases. Coachella's General Plan includes polices for increasing access to parks and open spaces and planting new trees. This compilation of General Plan polices focuses on the carbon sequestration benefits of new vegetation and trees.

Water Use

Water use represents one of the fastest growing emissions sectors in the Coachella CAP with potable water use growing 45% between 2005 and 2010. The General Plan includes policies to address indoor and outdoor water use and future water supply. This strategy analyzes the effectiveness of these measures at reducing greenhouse gas emissions.

ADDITIONAL CAP MEASURES

Along with General Plan policies, this CAP includes an analysis of a more aggressive implementation program for several General Plan policies and additional measures not included in the General Plan. For example, it consolidates energy efficiency policies for existing buildings into a comprehensive energy conservation ordinance, increases energy efficiency in new buildings to 25% beyond Title 24, and improves traffic flow through signal coordination and retiming efforts.

Although municipal operations are not a focus of this CAP, this section includes an institutional framework for the City to enhance energy and water conservation efforts, to accelerate vehicle replacement, to make green purchases, and to provide the information and technical assistance for residents and businesses to implement energy efficiency measures.

GREENHOUSE GAS REDUCTION POTENTIAL

Through a combination of proposed federal, state, and city-level General Plan policies, Coachella can anticipate emissions reductions of 338,046 $MTCO_2e$ per year from the business-as-usual scenario in 2020. State-level actions, such as the Pavley Clean Cars legislation, the Low Carbon Fuel Standard, the Renewables Portfolio Standard, and Title 24 upgrades are expected to reduce emissions by 211,740 $MTCO_2e$ per year by 2020. General Plan implementation is projected to reduce emissions by 126,306 $MTCO_2e$. This combination of state and local action would place the City 37% below 2020 business-as-usual emission levels, meeting the City's proposed greenhouse gas target for 2020 based on per service population efficiency (6.2 $MTCO_2e$ per service population as compared to 7.0 $MTCO_2e$). Table 8 shows the estimated emissions reductions for state policies and categories of General Plan policies in 2020. As mentioned above, estimated greenhouse gas emissions reductions are also presented here in terms of reductions relative to the 2020 BAU projection because it provides an understanding of how much more *efficient* a community will be as it grows. It is

extremely difficult to ascertain how effective a greenhouse gas emissions reduction program can actually be in a high-growth city such as Coachella, which is anticipated to more than triple in size by 2035, because the sheer magnitude of growth will overshadow any improvements in *how* the City grows over time. Additionally, since the primary regulatory framework for addressing climate change is statewide in nature and directs a transition to a more carbon efficient state, this approach helps ascertain the City's ability to help achieve statewide emissions. Climate change is perhaps the most significant cumulative environmental impact of all and addressing emissions performance on an efficiency basis helps to illustrate how Coachella will continue to grow and develop while reducing the emissions contributions of each of its citizens. Thus, this Climate Action Plan presents greenhouse gas emissions reduction estimates in terms of gross reductions, reductions relative to the 2010 baseline, and reductions relative to the BAU forecast.

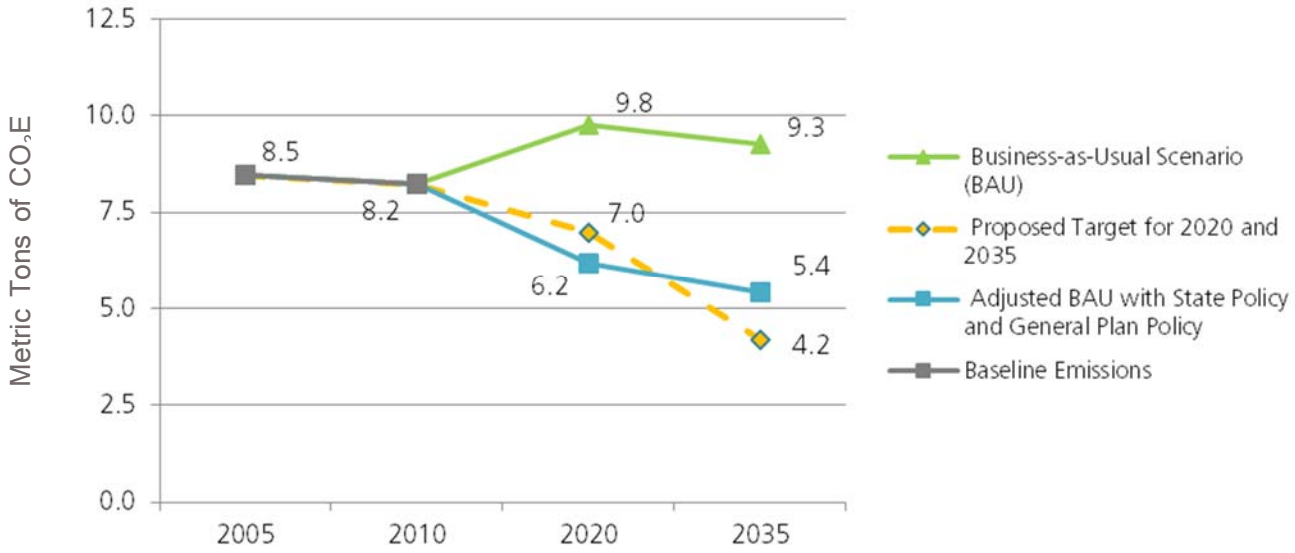
TABLE 8: GREENHOUSE GAS REDUCTION TARGET ANALYSIS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2020 REDUCTION POTENTIAL ($MTCO_2E$/SP)	2035 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL ($MTCO_2E$/SP)
STATE PROGRAMS				
Renewables Portfolio Standard, Title 24, Pavley Clean Cars, and Low Carbon Fuel Standard	211,740	2.2	407,924	2.4
GENERAL PLAN POLICIES				
Energy Efficiency	12,469	0.1	38,790	0.2
Energy Generation	36,703	0.4	68,940	0.4
Land Use and Transportation	61,397	0.6	87,931	0.5
Solid Waste	1,729	0.02	6,605	0.04
Vegetation and Open Space	7,305	0.08	16,941	0.10
Water	6,703	0.07	12,498	0.08
Total Reductions from All State Programs and General Plan Polices	**338,046**	**3.6**	**639,630**	**3.8**
Projected BAU Emissions	923,091	9.8	1,543,672	9.3
Adjusted BAU with State Programs and General Plan Policies	585,045	6.2	904,042	5.4
Proposed Greenhouse Gas Emissions Targets	735,829	7.0	756,679	4.2
Reduction Beyond Target (2020) and Emissions Gap (2035)	150,784	0.8	-147,363	-1.2

By 2035, the combination of state and local greenhouse gas emissions measures is likely to reduce emissions by 639,630 $MTCO_2e$. State measures are expected to account for 407,924 $MTCO_2e$ with General Plan actions resulting in additional emissions reductions of 231,707 $MTCO_2e$. These actions put Coachella 43% below 2035 business-as-usual emission levels and result in per service population emissions of 5.4 $MTCO_2e$. This does not meet the aggressive 4.2 $MTCO_2e$ per service population efficiency target. However, this estimate does not account for additional future actions by the state, e.g. requiring utilities to provide additional renewable energy or more stringent cars standards (e.g. Pavley II) and will require the City to aggressively implement additional actions.

Figure 13 shows the emissions reductions from the climate action strategies.

FIGURE 13: COACHELLA PROJECTED PER SERVICE POPULATION EMISSIONS (IN $MTCO_2E$) WITH GENERAL PLAN POLICIES AND PROPOSED EMISSIONS TARGETS (2005 TO 2035)



Achieving a long-term goal to reduce emissions 49% below current levels by 2035 will require the City to continue evaluating new strategies and implementation actions that take purposeful steps beyond the actions outlined in the General Plan. This could include more aggressive implementation of actions within the General Plan and/or the pursuit of different strategies and actions. The suite of options available to Coachella will continue to evolve over time as more jurisdictions identify cost-effective, community-level solutions to reduce emissions, as businesses deploy less carbon intensive technologies, and as individuals change their behavior. Furthermore, federal and state regulations, such as Pavley II or an increase in the Renewables Portfolio Standard, will move the City closer towards this long-term emissions reduction goal.

The following illustrates one way for the City to reduce emissions 49% below current levels by 2035. This list of implementation strategies shows a possible pathway for Coachella to reach the service population efficiency target. These actions were selected because of the large proportion of emissions within the commercial, residential, and transportation sectors and the proven track record of success for these actions. These measures include:

- Adopting a Commercial Energy Conservation Ordinance
- Adopting a Residential Energy Conservation Ordinance
- Working with commercial businesses to install solar photovoltaic on existing buildings
- Implementing an outdoor water conservation strategy
- Increasing recycled and grey water use
- Increasing commercial and residential recycling

Table 9 shows the estimated greenhouse gas emissions from additional CAP measures, state programs, and General Plan policies.

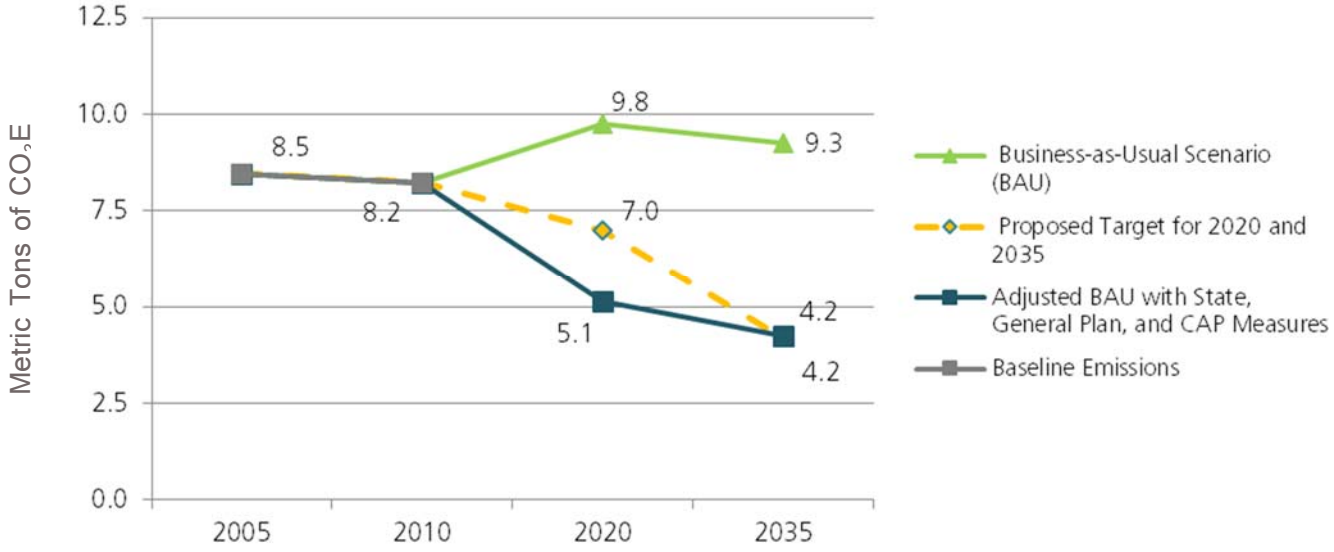
TABLE 9: GREENHOUSE GAS REDUCTION TARGET ANALYSIS WITH THE ADDITIONAL OF CAP MEASURES (2035)

	2035 REDUCTION POTENTIAL MTCO$_2$E	2035 REDUCTION POTENTIAL (MTCO$_2$E/SP)
STATE PROGRAMS		
Renewables Portfolio Standard, Title 24, Pavley Clean Cars, and Low Carbon Fuel Standard	406,423	2.4
GENERAL PLAN POLICIES AND ADDITIONAL CAP MEASURES		
Energy Efficiency	36,813	0.2
Energy Generation	179,540	1.1
Land Use and Transportation	146,552	0.9
Solid Waste	17,831	0.11
Vegetation and Sequestration	28,383	0.17
Water	22,953	0.14
Total Reductions from All State Programs, General Plan Polices, and Additional CAP Measures	**838,494**	**5.0**
Projected BAU Emissions	1,543,672	9.3
Adjusted BAU with State, General Plan, and CAP Policies	705,178	4.2
Proposed Greenhouse Gas Emissions Targets	756,679	4.2
Reduction Beyond Target (2020) and Emissions Gap (2035)	51,501	0.0

By 2035, the combination of greenhouse gas emissions measures is likely to reduce emissions by 838,494 MTCO2e. State measures are expected to account for 406,423 MTCO2e. General Plan policies and additional CAP measures are projected to reduce emissions by 432,072 MTCO2e. These actions put Coachella 54% below 2035 business-as-usual emission levels (49% below current per service pouplation levels) and result in per service population emissions of 4.2 MTCO2e meeting the City's proposed greenhouse gas target for 2035 based on per service population efficiency (4.2 MTCO2e per service population as compared to 4.2 MTCO2e).

FIGURE 14 SHOWS THE EMISSIONS REDUCTIONS FROM THE CLIMATE ACTION STRATEGIES.

FIGURE 14: COACHELLA PROJECTED PER SERVICE POPULATION EMISSIONS (IN $MTCO_2E$) WITH ADDITIONAL CAP MEASURES AND PROPOSED EMISSIONS TARGETS (2005 TO 2035)



STATE PROGRAMS

The California Climate Action Scoping Plan identifies State measures that would reduce greenhouse gas emissions within Coachella. These measures require no additional action from the City, and brief description of each measure is provided below. The emission reduction from each measure is shown in Table 10.

TABLE 10: IMPACT OF STATE MEASURES ON PROJECTED GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
STATE PROGRAMS		
Renewable Portfolio Standard	81,321	142,064
Title 24	9,970	27,054
Low Carbon Fuel Standard	38,143	59,401
Clean Cars Standards – Pavley AB 1493	82,306	179,405
Total Reductions from State Programs	**211,740**	**407,924**

CALIFORNIA RENEWABLE PORTFOLIO STANDARD

EO S-21-09 directed the ARB to adopt regulations increasing California's Renewable Portfolio Standard (RPS) to 33% by 2020. These rules apply to investor-owned utilities, such as Southern California Edison and Pacific Gas & Electricity and publically-owned utilities, such as the Imperial Irrigation District. These standards will reduce greenhouse gas emissions from electricity purchased by local governments by requiring utilities to shift from fossil-carbon based electricity generation, such as from coal-fired power plants, to non-fossil-carbon based electricity generation, such as from wind turbines.[46]

It is expected that the emissions intensity of Imperial Irrigation District electricity will decline by 26.3% by 2020 and the emissions intensity of water agencies will decline by 14% by 2020.[47]

TITLE 24

California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings was adopted in 1978 to reduce energy consumption by requiring improved energy efficiency from new buildings. By lowering energy consumption, the building standards reduced fossil fuel use and associated greenhouse gas emissions. Title 24 standards are updated regularly (approximately every four years) to incorporate new energy-efficient technologies and standards. For example, the California Energy Commission

[46] SCE Renewable Energy. http://www.sce.com/PowerandEnvironment/renewables/
[47] E3. (2010, October). GHG Calculator version 3c. Southern Non-IOU Emissions Factors. http://ethree.com/public_projects/cpuc2.html

estimated that the 2008 update of Title 24 resulted in electricity savings of 22.7% for single family homes, 19.7% from multifamily units, and 4.9% from nonresidential construction.[48]

The Scoping Plan calls for the continuation of ongoing triennial updates to Title 24 that will yield regular increases in the mandatory energy and water savings for new construction. Future updates to Title 24 standards, specifically the 2014 update, for residential and non-residential are taken into consideration. It is assumed that single family electricity and natural gas use will decline by 36% and 13% respectively, multifamily electricity and natural gas use will decline by 22% and 13% respectively, and nonresidential electricity and natural gas use will decline by 12% and 7% respectively.

LOW CARBON FUEL STANDARD

EO S-1-07 established a Low Carbon Fuel Standard (LCFS) for transportation fuels in California, which the ARB included in the Scoping Plan. The EO requires that the carbon intensity of California's transportation fuels be reduced at least 10% by 2020.[49] By reducing the carbon content of our transportation fuels, the GHG emissions associated with the transportation sector can be reduced. ARB expects the LCFS to achieve the minimum 10% reduction goal; however, many of the early action items outlined in the Scoping Plan work in tandem with one another. To avoid the potential for double-counting emissions reductions associated with AB 1493, the modified the aggregate transportation sector reduction expected from the LCFS is 7.2% for 2020.[50]

CLEAN CARS STANDARDS – PAVLEY 1493

AB 1493 directed the ARB to set more stringent vehicle fuel economy standards for cars and light trucks that reduce greenhouse gas emissions. The Pavley bill required approval from the federal government, and in 2009, the U.S. Environmental Protection Agency granted California a waiver that enabled the state to enforce stricter tailpipe emissions limits on new passenger vehicles. In 2010, the U.S. EPA and the Department of Transportation's National Highway Safety Administration announced new vehicle greenhouse gas emissions standards and corporate average fuel economy standards that reinforced California's standard. The standards would reduce emissions from passenger vehicles by 22% in 2012 and 30% in 2016, aiding local government efforts to reduce greenhouse gas emissions.[51]

Greenhouse gas reductions from the Pavley I standard were calculated using the EMFAC2011 model. The standard is expected to reduce emissions by 15% in 2020, rising to 21% in 2035.

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[48] California Energy Commission. (2007). 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings. Retrieved from http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/2007-11-07_Impact_Analysis.pdf

[49] California Low Carbon Fuel Standard. Retrieved from http://www.arb.ca.gov/fuels/lcfs/lcfs.htm

[50] Scoping Plan. http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm

[51] California Air Resources Board. (2013). Clean Car Standards - Pavley, Assembly Bill 1493. Retrieved from http://www.arb.ca.gov/cc/ccms/ccms.htm

GENERAL PLAN POLICIES

The Coachella General Plan includes specific policies that guide the City's approach to reducing greenhouse gas emissions, preparing future inventories and climate action plans, and developing strategies to minimize the potential impacts of climate change and variability. As a cross-cutting issue, climate change is addressed throughout the General Plan. For the CAP, policies were compiled from the Land Use (LU), Mobility (M), Sustainability and Natural Environment (SNE), Safety (S), and Infrastructure and Public Services (IPS) elements. Each policy references the appropriate goal and policy within an element (e.g. Sustainability and Natural Environment Goal 2 Policy 4 – SNE 2.4). A brief description of each policy is provided below along with an estimate of the anticipated reduction in greenhouse gas emissions for 2020 and 2035. Table 11 summarizes the reduction potential by sector for 2020 and 2035 from General Plan policies. The assumptions and calculated assumptions for each measure can be found in Appendix D.

TABLE 11: IMPACT OF GENERAL PLAN POLICIES ON PROJECTED GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
GENERAL PLAN POLICIES		
Energy Efficiency	12,469	38,790
Energy Generation	36,703	68,940
Land Use and Transportation	61,397	87,931
Solid Waste	1,729	6,605
Vegetation and Open Space	7,305	16,941
Water	6,703	12,498
Total Reductions from General Plan Polices	**126,306**	**231,707**

ENERGY EFFICIENCY

Coachella is expected to grow rapidly over the next several decades, so improving the energy performance of new buildings is a key target of the General Plan and this CAP. This strategy requires a concerted effort by government, utility companies, businesses, and individual homeowners to increase the energy efficiency of their homes and businesses beyond Title 24. Increasing the efficiency of these buildings will result in significant energy cost savings for residents, businesses, and the City of Coachella. Additionally, by reducing the amount of energy demanded by Coachella's buildings, the associated GHG emissions resulting from energy production would also be reduced.

TABLE 12: IMPACT OF GENERAL PLAN ENERGY EFFICIENCY POLICIES ON PROJECTED GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
GENERAL PLAN POLICIES		
Energy performance targets – new construction (SNE 2.6)	7,135	24,303
Energy performance targets – existing buildings (SNE 2.7)	444	1,110
Energy efficiency workshops (SNE Action 4)	217	867
Passive solar design (SNE 2.1 and 2.2)	3,136	8,414
Energy reductions from shade trees (SNE 1.11, 4.6)	922	2,501
Energy reductions from cool paving (SNE 4.5)	314	841
Energy-efficient street lighting (SNE 2.9)	301	753
Total Reductions from General Plan Energy Efficiency Measures	**12,469**	**38,790**

Energy Performance

The General Plan calls for energy performance targets for residential and nonresidential development. The set of policies requires both new construction and building retrofits to exceed Title 24 energy efficiency standards by 15% (SNE Policies 2.6 and 2.7). Combined, it is assumed that these policies will reduce emissions by 7,579 $MTCO_2e$ annually in 2020 and 25,413 $MTCO_2e$ annually in 2035.

To implement energy efficiency in existing buildings, the General Plan recommends organizing workshops on how to increase energy efficiency of local homes and businesses through topics such as home weatherization, building envelope design, smart lighting systems, and conducting a self-audit of energy usage (SNE Action 4). Teaching community members how to upgrade their homes is expected to be an important first step in improving energy performance because it will improve awareness of the issue and the solutions, leading to building improvements. This education action is expected to reduce emissions by 217 $MTCO_2e$ annually in 2020 and 867 $MTCO_2e$ annually in 2035.

Passive Solar Design

To reduce energy demand, the General Plan includes policies that require new construction to be oriented along an east-west access to minimize solar heat gain and to incorporate energy efficient building and site design strategies for the desert environment that include appropriate solar orientation, thermal mass, use of natural daylight and ventilation, and shading (SNE Policies 2.1 and 2.2). It is expected that these policies will lead to more efficient buildings and will reduce electricity use in new buildings by 10%, a conservative estimate of the energy reductions associated with passive solar strategies. As a result, these General Plan policies are expected to reduce emissions by 3,136 $MTCO_2e$ annually in 2020 and 8,414 $MTCO_2e$ annually in 2035.

Heat Island Measures

Conventional pavement can transfer exceed heat to the air and increase urban air temperatures. Cool paving can lower air temperatures and lower cooling energy. The General Plan requires heat island reduction strategies in new developments such as light-colored cool roofs, light-colored paving, permeable paving, right-sized parking requirements, vegetative cover and planting, substantial tree canopy coverage, and south and west side tree planting (SNE 1.11, 4.6). These strategies can reduce ambient air temperatures, and as a result, lower cooling demand and slow the rate of ozone formation. While cool roofs are already covered under Title 24, light-colored paving and shade tree planting were evaluated as greenhouse gas mitigation measures.

In addition to sequestering carbon (quantified in the Vegetation Strategy), several studies have found that a single, properly-sited tree can reduce electricity use by between 200 and 300 kWh per year. It is estimated that a shade tree policy for areas of new development in Coachella will reduce greenhouse gas emissions by 922 $MTCO_2e$ annually in 2020 and 2,501 $MTCO_2e$ annually in 2035.

It is estimated that cool pavement will reduce greenhouse gas emissions 314 $MTCO_2e$ annually in 2020 and 590 $MTCO_2e$ annually in 2035.

Energy Efficient Street Lighting

In 2010, street lighting accounted for 1% of the electricity use in Coachella. As part of Coachella's General Plan polices that address energy efficiency, changing light bulbs on streetlights and outdoor could save up to 40% of this electricity without making any changes to the operations of the lighting. This action would reduce greenhouse gas emissions by 301 $MTCO_2e$ annually in 2020 and 753 $MTCO_2e$ annually in 2035.

ENERGY GENERATION

Even after increasing energy efficiency in new construction and existing buildings, energy needs to become cleaner and less carbon intensive in the future. California adopted a Renewables Portfolio Standard that requires utilities, such as the Imperial Irrigation District, to increase procurement from renewable energy resources to 33% of total procurement by 2020. Coachella intends to go beyond this goal by facilitating low- or zero-carbon electricity generation within the City. This strategy includes General Plan policies that will help homes and businesses in the community increase renewable energy production by allowing renewable energy systems in areas zoned for open space, promoting the City as a place for renewable energy companies to locate, facilitating adequate solar access, and incorporating solar installations in new construction.

TABLE 13: IMPACT OF GENERAL PLAN RENEWABLE ENERGY POLICIES ON PROJECTED GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
GENERAL PLAN POLICIES		
Energy performance targets – new construction (SNE 2.6)	35,839	66,792
Energy performance targets – existing buildings (SNE 2.7)	864	2,148
Community choice aggregation (SNE 2.4)	13,064	22,526
Alternative energy (SNE 2.3)	Supportive measure, not quantified	Supportive measure, not quantified
Renewable energy–open space areas (SNE 2.8)	Supportive measure, not quantified	Supportive measure, not quantified
New industries (SNE 2.10)	Supportive measure, not quantified	Supportive measure, not quantified
Solar access (SNE 2.12)	Supportive measure, not quantified	Supportive measure, not quantified
Use of passive open space (SNE 2.13)	Supportive measure, not quantified	Supportive measure, not quantified
Total Reductions from General Plan Energy Generation Policies	**49,767**	**91,466**

Energy Performance

The General Plan calls for solar energy performance targets for residential and nonresidential development. The policies require new construction to incorporate solar and encourages solar in existing building retrofits (SNE Policies 2.6 and 2.7). The quantification of greenhouse gas emissions for these polices uses the following assumptions:

- In 2035, 2.5% electricity for new residential structures and 2.5% of the electricity for existing commercial buildings will be generated by on-site renewable sources of energy

- In 2035, 10% of the electricity for new residential structures and 20% of the electricity for new commercial construction will be generated by on-site renewable sources of energy

It is assumed that these policies will reduce emissions by 35,839 $MTCO_2e$ annually in 2020 and 66,792 $MTCO_2e$ annually in 2035.

Community Choice Aggregation

Along with energy performance targets, the General Plan calls for the City to work with nearby local and regional agencies to develop a community choice aggregation system in order to secure alternative energy supply contracts for the community (SNE 2.4). It is assumed that 50% of the homes and businesses will participate in the program that purchases a portfolio of cleaner energy sources (17% above the 33% RPS). This policy is expected to reduce emissions by 13,064 $MTCO_2e$ annually in 2020 and 22,526 $MTCO_2e$ annually in 2035.

Supportive General Plan Policies

In addition to the incorporating solar installations on new construction and existing building, the General Plan outlines additional policies to encourage renewable energy generation. These include:

- Promoting the incorporation of alternative (non-fossil carbon-based) energy generation (e.g., solar, wind, biomass) in public and private development (SNE 2.3).
- Actively promoting the City as a place for renewable energy generation, and a place for energy conservation businesses to locate (SNE 2.10)
- Prohibiting new development and renovations that impair adjacent buildings' solar access, unless it can be demonstrated that the shading benefits substantially offset the impacts of solar energy generation potential (SNE 2.12). State law requires that solar access be protected through solar easements.
- Allowing the installation of renewable energy systems in areas zoned for open space (SNE 2.12 and 2.13).

LAND USE AND TRANSPORTATION

Coachella residents make trips to a variety of places each day. They commute to work, make a shopping trip, visit the doctor, or meet a friend for dinner. Each trip adds up, with over 900,000 vehicle miles traveled (VMT) in the City each day, producing 180,078 $MTCO_2e$ from transportation-related emissions in 2010. As a percentage, this was 51% of the City's greenhouse gas emissions.

Lowering transportation emissions requires making vehicles and their fuels cleaner, reducing the length of driving trips, managing the demand for travel, and providing alternatives such as walking, biking, and transit for travel. Addressing transportation emissions will have the added benefits of increasing walking and bicycling and improving the health of Coachella residents.

TABLE 14: IMPACT OF GENERAL PLAN LAND USE AND TRANSPORTATION POLICIES ON PROJECTED GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
CATEGORIES OF GENERAL PLAN POLICIES		
Land Use and Location (LU-1 [Sub-Area 1], LU-1 [Sub-Area 6], LU-2 [Sub-Area 1], LU-3 [Sub-Area 1], LU-1 [Sub-Area 2], LU-3 [Sub-Area 6], LU-3 [Sub-Area 10], LU-4 [Sub-Area 1], LU-6 [Sub-Area 14], LU-8 [Sub Area 2], LU-7 [Sub-Area 1], LU-11 [Sub-Area 11], LU-1, LU-2.9, LU 2.10, LU-3.2, LU-3.3, LU 5.1, LU 5.2, LU 5.4, LU 5.7, LU 5.9, LU 5.10, LU 5.15, LU 6.6, LU 9.1, LU 9.3, LU 9.6, LU 11.2, S 1.2, S 11.2, M 3.4, M 3.5, M 3.7, M 4.3)	30,698	43,966
Neighborhood and Site Enhancements (LU-2 [Sub-Area 1], LU-3 [Sub-Area 1], LU-4 [Sub-Area 1], LU-4 [Sub-Area 3], LU-5 [Sub-Area 2], LU-5 [Sub-Area 3], LU-1 [Sub-Area 6], LU-7 [Sub-Area 9], LU-5 [Sub-Area 14], LU-10 [Sub-Area 9], LU 5.8, LU 5.11, LU 5.10, M 1.1, M 1.2, M 1.5, M 2.1, M 2.2, M 3.1, M 3.2, M 3.3, M 3.9, M 4.1, M 4.2, M 4.3, M 4.4, M 4.5, M 8.3)	16,373	23,448
Parking Management (M 3.8)	10,233	14,655
Transit Service (LU-12 [Sub Area 2], LU-13 [Sub-Area 2], M 5.1, M 5.2, M 5.4, M 5.5, M 5.6, M 8.1)	4,093	5,862
Total Reductions from General Plan Land Use and Transportation Policies	**61,397**	**87,931**

Land Use and Location

Increasing density, mixing land use types, and improving the design of development can decrease tips and trip length, reducing vehicle miles traveled. Higher density development produces fewer trips than development configured with typical suburban densities, while higher

density sites are also more conducive to transit, bicycle use, and walking. Providing a mix of uses ensures that jobs, shopping, and housing are located proximate to each other, which allows many trips to be made through either walking or biking or through short-distance vehicular trips.

The design of new development, including the provision of pedestrian and bicycle connections can have a significant influence on travel behavior. As an example, providing sidewalks and crosswalks can encourage high levels of walking. As a converse, when sidewalks are absent, people will often choose to drive even for short distance trips.

The General Plan includes numerous policies to encourage land use densification, mix of use, and integrated community design. Examples include LU-1, LU-2.9, LU 2.10, LU-3.2, LU-3.3, LU 5.1, LU 5.2, LU 5.4, LU 5.7, and other sub-area-specific policies. These measures are estimated to reduce greenhouse gas emissions by 30,698 $MTCO_2e$ in 2020 and 43,966 $MTCO_2e$ annually in 2035.

Neighborhood and Site Enhancements

Complete streets ensure more convenient options for people to travel from one place to another, reducing dependence on automobiles, and can increase physical activity, reduce congestion and greenhouse gas emissions, and enhance the safety of travelers. The City of Coachella will continue to support multi-modal transportation by constructing streets for pedestrians, bicyclists, motorists and public transportation users of all ages and abilities. The General Plan policies and actions include focusing on pedestrian safety, improving the connections between neighborhoods and commercial areas for pedestrians and cyclists, and providing traffic calming measures. Examples of these General Plan policies include M 1.1, M 1.2, M 1.5, M 2.1, M 2.2, M 3.1, M 3.2, and M 3.3.

These policies are expected to reduce emissions by 16,373 $MTCO_2e$ annually in 2020 and 23,448 $MTCO_2e$ annually in 2035

Parking Management

The Coachella General Plan explores a suite of actions aimed at managing on-street parking, reducing off-street parking requirements, and unbundling parking. These strategies encourage the use of alternate transportation modes, such as walking, bicycling, and transit, all of which are less carbon-intensive than automobiles. Taken together, these measures are expected to lower greenhouse gas emissions by 10,233 $MTCO_2e$ annually in 2020 and 14,655 $MTCO_2e$ annually in 2035.

Transit Service

A key aspect of any well-rounded transportation system is transit. Providing access to transit for City residents and employees can reduce automotive use. There are currently five Sunline Transit Bus Routes that provide access to the City. As part of this measure, the City would coordinate with Sunline Transit to increase transit service throughout the City. The VMT reduction is estimated to be 1%, based on a 100% increase in transit service coverage over the City. This is expected to reduce greenhouse gas emissions by 4,093 $MTCO_2e$ annually in 2020 and 5,862 $MTCO_2e$ annually in 2035.

SOLID WASTE

At its most basic level, climate change and greenhouse gas emissions are the result of the production, transportation, and consumption of goods and services. The increase in the generation of solid waste contributes to emissions by Coachella businesses and residents through the transport of goods and materials, the transport of solid waste, and the decomposition of organic materials in landfills. Similarly, the use of virgin materials for manufacturing tends to require a greater energy input than the use of recycled materials. Thus, reducing landfill-deposited solid waste can reduce a community's GHG emissions. To reduce consumption and waste, the City will require efforts from businesses and residents to divert more waste, including construction waste.

TABLE 15: IMPACT OF GENERAL PLAN SOLID WASTE POLICIES ON PROJECTED GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
GENERAL PLAN POLICIES		
Solid waste diversion and recycling (IPS 5.3)	1,212	5,696
Construction and demolition debris (IPS 5.13)	516	909
Zero waste (IPS 5.4)	Supportive measure, not quantified	Supportive measure, not quantified
Greener waste management practices (IPS 5.9)	Supportive measure, not quantified	Supportive measure, not quantified
Electronic waste (IPS 5.10)	Supportive measure, not quantified	Supportive measure, not quantified
On-site collection and storage of recyclables (IPS 5.15)	Supportive measure, not quantified	Supportive measure, not quantified
Public education (IPS 5.16)	Supportive measure, not quantified	Supportive measure, not quantified
Total Reductions from General Plan Solid Waste Policies	**1,729**	**6,605**

Solid Waste Diversion and Recycling

Between 1990 and 2010, the amount of solid waste generated by Coachella businesses and residents fell by 30%, declining from over 33,000 tons of solid waste in 2005 to just over 23,000 tons of waste in 2010. Recycling rates for homes and businesses have increased to 44%, while the construction recycling rate now exceeds 50%. To further reduce waste, the City proposes several General Plan policies to continue solid waste reductions and higher waste diversion rates (IPS 5.3). Increasing the commercial and residential recycling rate to 60% would reduce greenhouse gas emissions by 5,696 $MTCO_2e$, in 2035.

Construction and Demolition Debris

The General Plan requires a recycling and reuse of construction wastes, including recycling materials generated by the demolition and remodeling of buildings, with a minimum diversion of 75% by weight (IPS 5.13). This policy is expected to reduce greenhouse gas emissions by 516 $MTCO_2e$ annually in 2020 and 909 $MTCO_2e$ annually in 2035.

Supportive General Plan Policies

In addition to the incorporating higher waste diversion rates, the General Plan outlines additional policies to encourage lower greenhouse gas emissions from the solid waste sector. These include:

- Striving for zero waste to landfills by 2040 through reusing, reducing and recycling solid waste and using conversion technology if appropriate (IPS 5.4).
- Supporting on-going green waste recycling efforts and facilitate composting opportunities for Coachella residents and businesses in order to reduce surface ozone pollution and offset greenhouse gas emissions and provide soil nutrients (IPS 5.9).
- Coordinating with businesses that recycle electronic waste to provide convenient collection/drop off locations for city residents (IPS 5.10).
- Sponsoring solid waste educational programs on backyard waste composting and grasscycling (i.e., mulching grass clippings back into the lawn) (IPS 5.11).
- Requiring new public and private buildings to be designed with on-site storage facilities for recycled materials (IPS 5.15).
- Expanding public education programs about waste reduction and diversion strategies (IPS 5.16).

VEGETATION AND OPEN SPACE

Parks and trees not only enhance the appearance of a community, they raise property values for an entire neighborhood, lower home energy use and cost, reduce air and water pollution, minimize the heat island effect, and absorb greenhouse gases like carbon dioxide. As part of the vision for the City, the General Plan calls for increasing access to parks and open spaces and protecting healthy trees and planting new ones to provide shade, increase carbon sequestration, and purify the air. This strategy compiles General Plan polices which create newly vegetated land and sequesters carbon dioxide from the atmosphere.

TABLE 16: IMPACT OF GENERAL PLAN VEGETATION AND OPEN SPACE POLICIES ON PROJECTED GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
GENERAL PLAN POLICIES		
Urban forest (SNE 4.6, SNE 1.11)	5,984	14,961
Parks and open space (SNE 13.2, SNE 13.3, SNE 13.4, SNE 13.5, SNE 13.9, SNE 13.10, SNE 13.12, SNE 13.14, SNE 13.15)	1,320	1,981
Total Reductions from General Plan Water Use and Supply Policies	**7,305**	**16,941**

Urban Forest

The General Plan includes policies to protect the City's healthy trees and plant new ones to provide shade, increase carbon sequestration, and purify the air (SNE 1.11 and SNE 4.6). Trees sequester carbon when they are actively growing for approximately 20 years. Trimming and pruning trees offset carbon accumulation in trees.

Conservatively, it is estimated that over 21,000 new trees will be planted in Coachella by 2035. A single, mature tree can sequester 0.7 $MTCO_2e$, and it is estimated that 21,000 trees will sequester 14,961 $MTCO_2e$ in 2035.

Parks and Open Space

Parks and open space serve a range of diverse purposes, and in turn, these produce different types of greenhouse gas benefits. Parks can help groundwater recharge, reduce vehicle trips, promote active transportation, mitigate the heat island effect, and sequester carbon. Policies that promote trip reduction, active transportation, and energy use are captured by quantifications of other General Plan policies.

Using a conservative estimate of 10 trees per acre of new parkland, it is estimated that 1,981 $MTCO_2e$ in 2035 will be sequestered by new parks and open space.

WATER USE AND SUPPLY

The water sector uses energy to collect, convey, treat, and deliver water to users, and then it uses additional energy to collect, treat, and dispose of the resulting wastewater. This energy use yields both direct and indirect greenhouse gas emissions. Installing water-saving appliances and fixtures in buildings, irrigation controllers in irrigated land, and increasing the use of reclaimed water can significantly reduce emissions by reducing the associated energy demand.

TABLE 17: IMPACT OF GENERAL PLAN WATER USE AND SUPPLY POLICIES ON GREENHOUSE GAS EMISSIONS (2020 AND 2035)

	2020 REDUCTION POTENTIAL $MTCO_2E$	2035 REDUCTION POTENTIAL $MTCO_2E$
GENERAL PLAN POLICIES		
Conservation performance targets – new construction (SNE 3.1)	5,018	7,190
Greywater (SNE 3.3)	251	446
Recycled water (SNE 3.5)	204	2,745
Landscape design (SNE 3.7, SNE 13.14)	1,230	2,117
Public education (SNE 3.6)	Supportive measure, not quantified	Supportive measure, not quantified
Total Reductions from General Plan Water Use and Supply Policies	**6,703**	**12,498**

Water Use

In 2010, businesses and residents in Coachella used approximately 2,691 million gallons of potable water. It is estimated that energy use for water processes resulted in 17,693 $MTCO_2e$ in 2010. Assuming per capita water use of 181 gallons per day in 2035, water use is projected to grow into the future, reaching 9,465 million gallons in 2035 and increasing greenhouse gas emissions.

To address growing water demands, the City's General Plan proposes a series of policies to conserve water and reduce the energy used to process water and wastewater. SNE policy 3.1 requires new construction to exceed the state's Green Building Code (GBC) for water conservation by an additional 10%. The GBC already requires indoor water use reductions of 20% and better irrigation system design. It is estimated that this General Plan policy will reduce greenhouse gas emissions from water use by 5,018 $MTCO_2e$ annually in 2020 and 7,190 $MTCO_2e$ annually in 2035.

The General Plan also includes a separate policy for landscape design to encourage the reduction of water use through plant selection and irrigation technology (SNE 3.7). It is estimated that the policy will reduce greenhouse gas emissions by 1,230 $MTCO_2e$ annually in 2020 and 2,117 $MTCO_2e$ annually in 2035. The General Plan also calls for expanding programs that educate and incentivize water conservation landscaping (SNE 3.6). This measure will support other General Plan policies to reduce water use.

Water Supply

In addition to lowering water use, the General Plan includes policies to transition a small amount of potable water to recycled and greywater. Reusing water reduces the amount of energy used to supply the water, by as much as 100% in the case of grey water. It is estimated that using recycled water will reduce emissions by 2,745 $MTCO_2e$ annually in 2035, and by using gray water, approximately 446 $MTCO_2e$ fewer would be produced.

ADDITIONAL CAP MEASURES

While the General Plan is effective in helping the City meet its 2020 target, the City will need to do more in the years beyond 2020. In order for Coachella to achieve a long-term goal to reduce emissions 49% below current levels by 2035, the City needs to continue evaluating new strategies and implementation actions that take purposeful steps beyond the actions outlined in the General Plan. This section includes a discussion of an aggressive implementation program of policies within the General Plan and the pursuit of additional CAP measures. The suite of options available to Coachella will continue to evolve over time as more jurisdictions identify cost-effective, community-level solutions to reduce emissions, as businesses deploy less carbon intensive technologies, and as individuals change their behavior. Furthermore, federal and state regulations, such as Pavley II or an increase in the Renewables Portfolio Standard, will move the City closer towards this long-term emissions reduction goal. Table 18 shows a selection of General Plan policies and additional CAP measures that would help Coachella to meet the 2035 greenhouse gas emissions target.

Community Choice Aggregation

The General Plan calls for the City to develop a community choice aggregation system in order to secure alternative energy supply contracts for the community (SNE 2.4). For enhanced performance, the City should strive to achieve a participatory rate of 100% of the homes and businesses will participate in the program that purchases a portfolio of cleaner energy sources (17% above the 33% RPS). This enhancement is expected to reduce emissions by 26,586 $MTCO_2e$ annually in 2035.

Solid Waste Reduction

The City proposes striving for zero waste to landfills by 2040 through reusing, reducing and recycling solid waste (IPS 5.4). Under an enhanced approach, the City should strive for 90% of the community's commercial and residential waste to be diverted from the landfill. This enhancement is expected to reduce emissions by 16,376 $MTCO_2e$ annually in 2035.

Along with commercial and residential waste, 90% of the construction and demolition debris should also be recycled. This enhanced policy is expected to reduce greenhouse gas emissions by 1,455 $MTCO_2e$ annually in 2035.

Water Use and Supply

The City's General Plan proposes a series of policies to conserve water. SNE policy 3.1 requires new construction to exceed the state's GBC for water conservation. Under the enhanced policy approach, the City should strive for reducing outdoor water use in new construction by 15%, which would lower greenhouse gas emissions from water use by 4,235 $MTCO_2e$ annually in 2035. Along with the water performance standard, the General Plan encourages the reduction of water use through plant selection and irrigation technology (SNE 3.7). It is estimated that the enhanced policy approach will reduce outdoor water use by an additional 12.5% and lower greenhouse gas emissions by 3,529 $MTCO_2e$ annually in 2035.

Additionally, under an enhanced policy approach it is estimated that approximately 50% of outdoor water use will be from recycled water, reducing emissions by 7,295 $MTCO_2e$ annually in 2035, and by using gray water, approximately 2,426 $MTCO_2e$ fewer would be produced.

TABLE 18: IMPACT OF ADDITIONAL CAP MEASURES ON PROJECTED GREENHOUSE GAS EMISSIONS (2035)

	2035 REDUCTION POTENTIAL $MTCO_2E$
MORE AGGRESSIVE IMPLEMENTATION OF GENERAL PLAN POLICIES	
Energy performance targets – new construction (SNE 2.6)	179,540
Energy performance targets – existing buildings (SNE 2.7)	24,303
Community choice aggregation (SNE 2.4)	26,586
Parks and open space (SNE 13.2, SNE 13.3, SNE 13.4, SNE 13.5, SNE 13.9, SNE 13.10, SNE 13.12, SNE 13.14, SNE 13.15)	5,942
Zero waste (IPS 5.4)	16,376
Construction and demolition debris (IPS 5.13)	1,455
Conservation performance targets – new construction (SNE 3.1)	9,703
Greywater (SNE 3.3)	2,426
Recycled water (SNE 3.5)	7,295
Landscape design (SNE 3.7, SNE 13.14)	3,529
CAP MEASURES	
Commercial Energy Conservation Ordinance	3,610
Residential Energy Conservation Ordinance	3,760
Water Conservation Ordinance for Existing Homes and Businesses	1,130
Transportation Demand Management (TDM)	29,310
Intelligent Transportation Systems (ITS) / Traffic Flow	29,310

Energy Performance

The General Plan policies require new construction to incorporate solar and encourages solar in existing building retrofits (SNE Policies 2.6 and 2.7). For the enhanced measure, the quantification of greenhouse gas emission reductions for these polices uses the following assumptions:

- By 2035, 2.5% electricity for new residential structures and 25% of the electricity for existing commercial buildings will be generated by on-site renewable sources of energy
- By 2035, 25% of the electricity for new residential structures and 50% of the electricity for new commercial construction will be generated by on-site renewable sources of energy

These policies will reduce emissions by 179,540 $MTCO_2e$ annually in 2035.

Commercial Energy Conservation Ordinance

To further reduce emissions, the City could explore enacting a commercial and industrial energy conservation ordinance that requires certain businesses to reduce energy use by 20% when a property is sold. Reducing energy consumption and associated emissions by 20% could produce greenhouse gas savings of 3,610 $MTCO_2e$ by 2035 as more businesses take advantage of the cost savings associated with reducing energy use. This package of actions includes exploration of point of sale energy use disclosures, energy audits, and energy efficiency upgrades.

Residential Energy Conservation Ordinance

Along with a commercial energy conservation ordinance, the City could adopt an ordinance that requires cost-effective energy efficiency upgrades in existing buildings be implemented at point of sale or during major renovation of residential units. A maximum cost ceiling would be established to protect owners from excessive fees. This program is expected to reduce greenhouse gas emissions by 3,760 $MTCO_2e$ annually in 2035.

Travel Demand Management

Travel demand management (TDM) refers to strategies which reduce the need for people to travel in automobiles, particularly for work trips. Example TDM applications could include:

- Alternative work schedules
- Vanpooling
- Carpooling
- Telecommuting

The potential level of reduction associated with this measure could be as high as 25% of all work trips. The level of reduction for the City is likely to be approximately 5%, which assumes a relatively high level of TDM measure deployment across most of the employment areas of the City. This program is expected to reduce greenhouse gas emissions by 29,310 $MTCO_2e$ annually in 2035.

Intelligent Transportation System / Traffic Flow Improvements

One method available to the City to further reduce greenhouse gas emissions is the deployment of Intelligent Transportation Systems (ITS) which provide for more efficient traffic flow. These strategies are often implemented through signal coordination and retiming efforts. The City has received a grant and will be preparing an ITS Master Plan to implement ITS strategies along its major corridors. The level of reduction on a City-wide basis is likely to be approximately 5%, which assumes that a majority of the roadways within the City receive ITS improvements. These actions are expected to reduce greenhouse gas emissions by 29,310 $MTCO_2e$ annually in 2035.

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5 | MUNICIPAL LEADERSHIP IN GREENHOUSE GAS REDUCTIONS

The General Plan outlines clear steps for future development in Coachella to minimize its impact on the local and global environment. Policies that promote green building, reduce energy use, conserve water, and produce less waste will lead residents and businesses towards a more sustainable future. While the focus of the General Plan policies is on future development, the Plan also provides guidance to the City on leading the community in reducing greenhouse gas emissions. While many of these actions will result in greenhouse gas emission reductions, these actions have not been quantified as part of the CAP since a municipal inventory was not created during the General Plan process. Table 19 describes specific General Plan policies that guide the City's approach to reducing greenhouse gas emissions from municipal operations.

MUNCIPAL EMISSIONS INVENTORY

General Plan policy SNE 1.2 recommends that the City maintain, implement, and periodically update a climate action plan and greenhouse gas inventory. During the next greenhouse gas inventory update, the City should develop an inventory of emissions from government. Municipal inventory typically estimate emissions from local government buildings and other facilities, streetlights and traffic signals, employee commuting, waste, and water delivery facilities. After completing a government operations inventory, the local government can pursue greenhouse gas reduction efforts.

CLIMATE ACTION PLAN

The General Plan calls for the City to maintain, implement, and periodically update a climate action plan and greenhouse gas inventory (SNE 1.5). At a minimum, the City should update the climate action every 5 years to ensure continued progress towards the emission reduction goal. The City should adjust CAP measures to reflect best practices, new technologies, and other behavioral changes.

TABLE 19: GENERAL PLAN POLICIES FOR MUNICIPAL OPERATIONS

LOCAL ACTIONS	DESCRIPTION
Municipal operations (SNE 1.1)	Conduct city operations and institutionalize practices that reduce municipal greenhouse gas emissions.
Climate action plan (SNE 1.5)	Maintain, implement, and periodically update a climate action plan and greenhouse gas inventory.
Building and facility energy efficiency upgrades (SNE 2.11)	Require energy conservation as the primary strategy to reduce energy demand in new and renovation projects using public funds.
Public buildings (SNE 2.14 and SNE 4.1)	Require that any new building constructed in whole or in part with City funds incorporate passive solar design features and require all new and substantially renovated City-owned and operated buildings in excess of 5,000 square feet achieve a LEED Silver Certification standard.
Alternative energy (SNE 2.3)	Promote the incorporation of alternative energy generation (e.g., solar, wind, biomass) in public and private development.
Energy-efficient street lighting (SNE 2.9)	Implement a program to install the latest energy-efficient technologies for street and parking lot lights to meet City and state standards.
City fleet vehicles (SNE 11.18)	Replace City fleet vehicles with low emission vehicles, wherever possible.
Reclaimed water use (IPS 2.17)	To promote water conservation and increase the use of reclaimed water, use reclaimed water in City-owned parks, plazas, landscaped medians and other public spaces and in privately-owned open spaces wherever feasible.
Sustainable landscaping (SNE 13.14)	Promote sustainability for residences through desert-friendly water-efficient landscaping for parks. Establish public demonstration gardens using native desert planting.
Lead by example (IPS 5.1)	Serve as a role model to businesses and institutions regarding purchasing decisions that minimize the generation of solid waste in addition to encouraging all City staff to recycle at City facilities.
Reduce use of toxics (IPS 5.2)	Reduce the use of disposable, toxic, or nonrenewable products in City operations.
Recyclable materials (IPS 5.14)	Encourage the use of recycled paper and other materials in all City operations.
On-site collection and storage of recyclables (IPS 5.15)	Require new public and private buildings to be designed with on-site storage facilities for recycled materials.

BUILDING AND FACILITY ENERGY CONSERVATION

After assessing building and facility energy use and the associated greenhouse gas emissions, the City will improve building and facility efficiency by monitoring building performance and identifying cost-effective actions to reduce energy use. The City will require energy conservation as the primary strategy to reduce energy demand in new and renovation projects using public funds (SNE 2.11). These actions should be continually updated and incorporated into the department sustainability work plans. Along with energy efficiency upgrades, City of Coachella will strive to reduce energy use and cost by improving operating standards in order to conserve energy and water use. Programs such as Energy Star provide guidelines for facility management, while LEED for Operations and Maintenance provides a checklist to assess the operation and maintenance of a building.

Along with building renovations, the City will lead the community in developing buildings and facilities that will use less energy than a standard building design. The General Plan calls for the City to require all new and substantially renovated City-owned and operated buildings in excess of 5,000 square feet achieve a LEED Silver Certification standard, as determined by the U.S. Green Building Council (SNE 4.1). Beyond LEED Certification, the City will require that any new building constructed in whole or in part with City funds incorporate passive solar design features, such as daylighting and passive solar heating (SNE 2.14).

SOLAR AND WIND ENERGY PRODUCTION ON COMMUNITY FACILITIES

After reduce energy demand through conservation measures, the City will promote and pursue alternative energy on City buildings and community facilities (SNE 2.3). The Coachella Valley is a hotspot for solar and wind energy production, and the City will seek creative ways to incorporate renewable energy generation into design for new publically-owned facilities and existing building during a major retrofit.

REPLACE CITY-OWNED LIGHTS AND TRAFFIC SIGNALS

In the last several years, the City has replaced City streetlights with more efficient lighting and traffic signals with LED lights, reducing energy use and associated greenhouse gas emissions (SNE 2.9). As funds become available, the City will continue to replace lighting across the City. Using LED lights can reduce energy use by up to ninety percent (90%), and many lighting projects have simple payback periods of less than five years.

FLEET VEHICLE REPLACEMENT

Whenever possible, the Coachella will place City fleet vehicles with low emission vehicles (SNE 11.18). The City proposes to add greenhouse gas and criteria pollutant emissions rates to the factors used in determining replacement of City vehicles. The new criteria will help the City prioritize vehicle purchases that lower petroleum use and curb greenhouse gas emissions from fuel combustion.

REDUCE WATER USE

The water sector uses energy to collect, convey, treat, and deliver water to users, and then it uses additional energy to collect, treat, and dispose of the resulting wastewater. This energy use yields both direct and indirect greenhouse gas emissions. To lower emissions from water use, the City will promote reclaimed water (IPS 2.17) and sustainable landscaping (SNE 13.14) in City-owned parks, plazas, landscaped medians and other public spaces wherever feasible. The City could also replace older, less-efficient irrigation equipment with more efficient versions, while planting more native and drought-resistant vegetation.

SOLID WASTE

The General Plan calls for the City to serve as role model to businesses and institution in the community by making purchasing decisions that minimize the generation of solid waste and encouraging City staff to recycle (IPS 5.1). The City will use less disposable, toxic, or nonrenewable products (IPS 5.2) and recycled paper and recycled materials (IPS 5.14). The City will also require all new public buildings to be designed with on-site storage facilities for recycled materials (IPS 5.15).

To facilitate socially- and environmentally-conscious purchasing decisions, Coachella can use their purchasing power to encourage businesses to offer goods and services with better environmental performance, and to purchase products from distributors and manufacturers with a high-level of social and environmental responsibility. The City could explore adopting an environmentally-preferable purchasing policy that guides the City's efforts to improve environmental performance for purchasing and contracting for municipal operations. At a minimum, the policy could require the City to buy environmentally-preferable products with little additional costs, phasing in a price leeway over time to enable the City to spend a set percentage over the cost of conventional products.

6 | ADAPT TO THE POTENTIAL IMPACTS OF CLIMATE CHANGE

While many governments like Coachella are taking steps to reduce greenhouse gas emissions, there is recognition that mitigation efforts will not reduce emissions levels in the atmosphere quickly enough to avoid some of the projected impacts of climate change. With this understanding, many state, regional, and local governments have initiated efforts to adapt their communities to the impacts of climate change. This is considered adaptation. Climate change and variability will aggravate existing vulnerabilities and add to the complexity of improving health outcomes. Many states and communities have recognized this fact and undertaken steps to incorporate climate change and associated impacts into planning and policy initiatives. This strategy begins to outline steps that the City can take now to reduce the potential impacts of climate change on the community.

The General Plan describes a vision for a sustainable community that minimizes the risks of climate change. Mounting evidence indicates human activities are affecting global climate, which is expected to result in increasing warming in the Coachella Valley. As environmental stewards, the community has a strong desire to grow while minimizing the risks of hazards related to a warming climate. With appropriate planning and forethought, the community intends to grow while anticipating climate change related risks.

Table 20 lists General Plan Policies that directly address the potential impacts of climate change in Coachella. Dozens of other General Plan policies also have adaptive benefits. These include policies to reduce energy and water use, minimize vehicle trips, increase transit service, plant more trees, and improve health outcomes will increase the resilience of businesses and residents in Coachella.

TABLE 20: GENERAL PLAN POLICIES FOR CLIMATE ADAPTATION

LOCAL ACTIONS	DESCRIPTION
Climate-appropriate building types (SNE 1.6)	Seek out and promote alternative building types that are more sensitive to the arid environment found in the Coachella Valley. Courtyard housing and commercial buildings can be designed to provide micro-climates that are usable year round, reducing the need for mechanically cooled spaces and reducing energy consumption.
Climate change and health (SNE 1.9)	Acknowledge the on-going and future impacts of climate change and extreme events on Coachella's residents, taking action to minimize the effects among vulnerable populations and help implement California's executive order (EO) s-13-08 and the 2009 California Climate Adaptation Strategy.
Adaptation strategy (SNE 1.10)	Proactively develop strategies to reduce the community's vulnerability to climate change impacts.
Urban Forest (SNE 1.11)	Protect the City's healthy trees and plant new ones to provide shade, increase carbon sequestration, and purify the air.
Reduced water supplies (SNE 1.12)	When reviewing development proposals, consider the possibility of constrained future water supplies and require enhanced water conservation measures.
Designing for warming temperatures (SNE 1.13)	When reviewing development proposals, encourage applicants and designers to consider warming temperatures in the design of cooling systems.
Designing for changing precipitation patterns (SNE 1.14)	Periodically evaluate stormwater control strategies and systems for sensitivity to changes in precipitation regimes and consider adjusting those strategies to accommodate future precipitation regimes.
Communications and outreach (SNE 1.15)	Continue to work with the Riverside County Public Health Department to establish social networks and website updates to distribute information on climate change impacts to vulnerable populations including actions they can take to reduce exposure to unhealthy conditions.
Climate and health indicators (S 7.1)	Monitor local changes in temperature, extreme heat days, heat waves, drought and precipitation patterns to inform policy and planning decisions.

LOCAL ACTIONS	DESCRIPTION
Monitor severe weather losses and climate change-related hazards (S 7.6)	Monitor and regularly assess climate vulnerabilities. Create a database to track incidents of windstorms, dust storms and other severe weather events to develop a better understanding of the frequency, magnitude and costs associated with severe weather.
Populations at risk (S 7.7)	Identify populations that, due to economic or other circumstances, do not have the resources to cool or heat their living environment during hot summers, or cold winters, and thus may be at risk for temperature-related illnesses or death. During high heat or extreme cold events, check on these individuals, and if necessary, transport them to cooling centers or heated shelters.
Cooling centers and air conditioning (S 7.8)	Work with the City's emergency response team and community action partnership of Riverside County to expand access to the drop-in cooling centers for people vulnerable to high heat days. This should also include organizing a transportation-assistance program for individuals without access to vehicles, develop a robust heat warning system and provide up-to-date information to residents about cooling center locations and the health risks of extreme heat.
Workers' safety (S 7.9)	Enforce Cal-OSHA's Heat Illness Prevention Program, especially in the agricultural and construction sectors where employees are exposed to extreme heat conditions at outdoor worksites.
Local Hazard Mitigation Plan (S 8.1)	Maintain and update on a regular basis, as mandated by FEMA, a Local Hazard Mitigation Plan. Incorporate an assessment of climate change-related hazards in all future Local Hazard Mitigation Plan updates.
Emergency response organization (S 8.2)	Maintain and update the emergency response organization consisting of representatives from all City departments, the Riverside County Fire and Sheriff Departments, local quasi-governmental agencies, private businesses, citizens, and other community partners involved in emergency relief and/or community-wide emergency-response services.
Ask the climate question (8.3)	Consider and plan for climate change-related hazards when conducting disaster preparedness exercises.

CLIMATE ADAPTATION STRATEGY

The first step to increasing the resilience of Coachella businesses and residents is to develop a climate change adaptation strategy (SNE 1.10). While the process to develop a climate change adaptation strategy can vary, the basic steps are:

- **Exposure:** identify the exposure to climate change effects that will affect Coachella
- **Vulnerability:** identify the community assets that will be susceptible to climate change and evaluate the ability of those assets to adapt to climate change and variability
- **Risk:** evaluate the risk to climate change by combining the exposure analysis with the vulnerability analysis
- **Prioritize needs:** prioritize the adaptive needs of the community
- **Develop adaptive actions:** identify strategies to address the highest priority adaptive needs, evaluate the strategies, and prioritize the adaptive actions
- **Implement:** create an implementation plan, which includes phasing, funding, and monitoring

INCORPORATE CLIMATE CHANGE CONSIDERATIONS IN EXISTING PLANNING

The City proposes to explore incorporating increases in extreme heat days, heat waves, and other climate-related events into existing planning documents and decision-making frameworks. The City will coordinate with County and other local governments to refine the Local Hazard Mitigation Plan (S 8.1), organize emergency response (S 8.2), and expand cooling centers (S 7.8) for climate events likely to increase with climate change, such as increases in extreme heat days, prolonged heat waves, and higher intensity precipitation events

For each project, program, infrastructure investment, and land use decision, City staff and leaders should also "ask the climate question" to incorporate a climate dimension into planning and decision-making (S 8.3). What climate change impacts could affect the project and what steps can be taken to minimize these impacts?

INCREASE RESILIENCY TO IMPACTS OF CLIMATE CHANGE

The impacts of climate change will not be evenly distributed across Coachella as infants and children, the elderly, outdoor workers, asthmatics, individuals with limited English proficiency, special needs residents, and others will be more sensitive to climatic changes. The City proposes a series of actions that identifies populations vulnerable to climate change (S 7.7), monitors changes in the population overtime (S 7.1 and S 7.6), and establishes communication networks and an outreach program for these groups (SNE 1.15). Since neighborhoods and populations that already experience social, economic, and environmental injustice will likely bear a larger proportion of the public health impacts of climate change, Coachella could explore directing resources to these communities to address current inequities and build the adaptive capacity of these groups.

MAKE BUSINESSES AND WORKERS MORE RESILIENT TO CLIMATE CHANGE

Extreme heat events will disproportionately affect low-income residents, particularly those that labor outside. To help protect these workers, Coachella will explore ways to work with employers to educate outdoor workers about how to stay cool during extreme heat events (SNE 1.15) and Enforce Cal-OSHA's Heat Illness Prevention Program, especially in the agricultural and construction sectors where employees are exposed to extreme heat conditions at outdoor worksites (S 7.8)

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7 | IMPLEMENTATION

Meeting the proposed greenhouse gas emissions targets for 2020 and 2035 will require concerted efforts by many different parties. The City will need to implement projects to improve municipal infrastructure and buildings. The City will also need to revise or create new incentives for resource conservation, retrofits to existing buildings, and other aspects of the built environment controlled by private citizens and corporations. Finally, the City will need to revise or create new regulations that require development projects to achieve higher levels of environmental performance. Many of these revisions are already outlined in the General Plan Update. With these new and revised regulations and incentives, the private sector will implement the physical changes to the non-publically-owned components of the built environment. As a result, the City's emissions reduction targets will be achieved through three broad efforts:

- City actions and programs;
- Upgrades and retrofits to existing buildings; and
- Enhanced performance and efficiency from new development projects.

This chapter of the Coachella provides the framework for addressing these efforts. The community-wide actions section provides an implementation program for City programs that will help mitigate greenhouse gas emissions and prepare for a changing climate. Additionally, this section includes those measures the City will undertake in order to help facilitate upgrades and retrofits to existing buildings.

MUNICIPAL OPERATIONS

The General Plan calls on the City of Coachella to institutionalized practices that reduce municipal greenhouse gas emissions (SNE 1.1). The following list outlines a series of actions that the City could take to incorporate these actions into the day-to-day operations of the City:

- Identify a Senior Official from each City department or agency to carry out energy conservation and greenhouse gas reduction actions.
- By 2015, require all City departments or agencies to develop their own energy reduction and climate action work programs that define three to five actions that the agency will implement by 2016.
- Coordinate energy conservation and greenhouse gas conservation efforts through participation in quarterly, interdepartmental meetings.
- Define numeric goals for reductions in fuel consumption, energy and water use, and solid waste generation for municipal operations and set non-numeric goals for renewable energy generation.
- Update the community-wide greenhouse gas inventory and create a municipal greenhouse gas inventory by 2016.
- Review progress towards the greenhouse gas emission target;

- Review and update CAP by 2020 to reflect best practices, new technologies, and other behavioral changes.

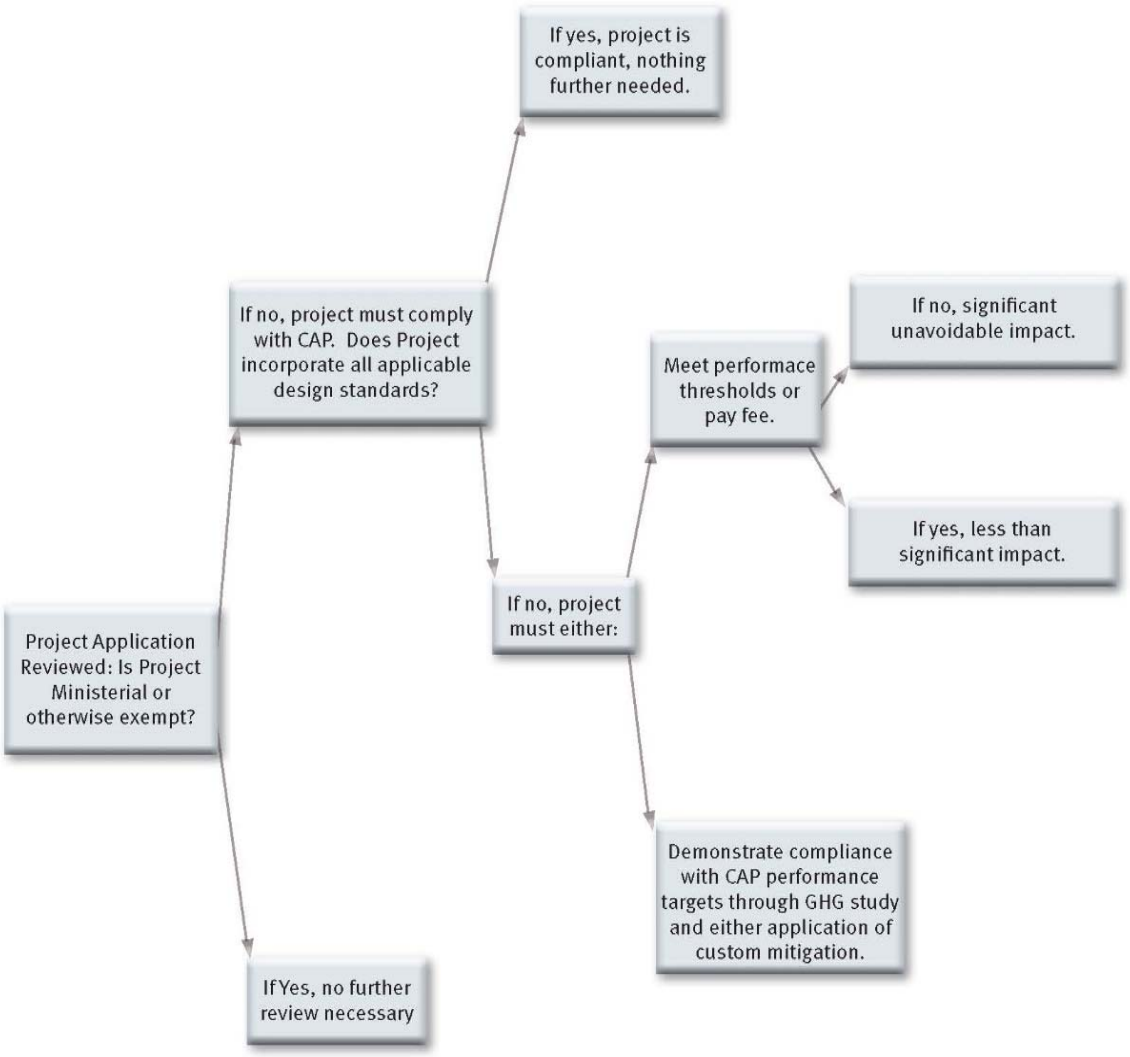
To demonstrate the City's commitment to lead by example, each Department and Agency should develop and carry out an integrated Work Plan that includes specific actions to reduce energy use and costs, conserve water, divert waste, and lower fleet petroleum fuel consumption. Each Work Plan will define three to five actions that the agency will implement by 2016. Each agency will identify a senior official who will oversee the work plan, coordinating activities with other City agencies through participation in quarterly, interagency meetings. As part of the interagency coordination, the City could define numeric goals for reductions in fuel consumption, energy and water use, and solid waste generation for municipal operations and set non-numeric goals for renewable energy generation.

DEVELOPMENT REVIEW

One of the benefits of having a local CAP is the ability to streamline the environmental review of projects. By providing an emissions inventory, emissions targets, and strategies for reducing greenhouse gas emissions, Coachella has established a framework evaluating and mitigating greenhouse gas emissions. Part of these emissions reductions will need to be achieved through better environmental performance of new development. The following discussion and review process (following figure) explains the steps the City will take to evaluate and streamline new development proposals under this CAP. This review process has four primary compliance paths, which are described below:

- Ministerial and CEQA exempt projects;
- Projects that demonstrate application of the City's Climate-Ready Development Standards;
- Projects that apply a set of custom GHG mitigation measures and meet the City's performance targets; or
- Projects that pay an in lieu fee.

FIGURE 15: DEVELOPMENT REVIEW PROCESS



MINISTERIAL AND STATUTORILY EXEMPT PROJECTS

Many of the land use and building permit applications that come before the City are ministerial permits, or permits that can be approved without input from the Planning Commission or City Council. Similarly, many projects, such as building tenant improvements, are exempt from CEQA review because of the scale and nature of the projects. These projects must be compliant with applicable state regulations, such as Title 24 and CALGreen, and City regulations, and compliance determination does not require any discretionary input. As such, these projects are assumed to be compliant with the goals of the CAP or so small that the increased greenhouse gas emissions would be miniscule. Note, under CEQA, projects that are categorically exempt still need to be reviewed to assure that there are no unusual circumstances that negate the use of the exemption. It is possible that an unusual circumstance could involve significant GHG emissions. Categorically exempt projects would have to be considered for such consequences.

APPLY CLIMATE-READY DEVELOPMENT STANDARDS

If a project is not a ministerial approval, then it must apply the City's Climate-Ready Development Standards. These measures were chosen because they have directly implemeneted the policies of the enhanced plan that have GHG reduction benefits. (Refer to Appendix B for the Climate-Ready Development Standards).

This Climate Ready Development Review Checklist was created to aid developers, community members, and City officials evaluate new projects for their effectiveness at reducing greenhouse gas emissions and for how well the projects comply with the City's greenhouse gas emissions reduction targets. The Checklist is an extension of the strategies analyzed by the Climate Action Plan and the Project Design Features within are the realization of those strategies as they should be applied to new development. The Project Design Features are presented with two tiers: Development Standards and Design Guidelines. Development Standards are required Project Design Features. Design Guidelines are suggested Project Design Features. Further, as the City's greenhouse gas reduction targets are set to increase reductions over time, some of the Project Design Features require greater levels of performance for construction completed after 2020.

For a project to be determined as complying with the CAP and eligible for streamlining, the project must comply with all applicable development standards presented in the Checklist. A "No" response to an applicable Project Design Feature will require a project be adjusted to comply or the project will have to demonstrate compliance with the CAP via an alternative path, as discussed in the CAP Implementation Chapter.

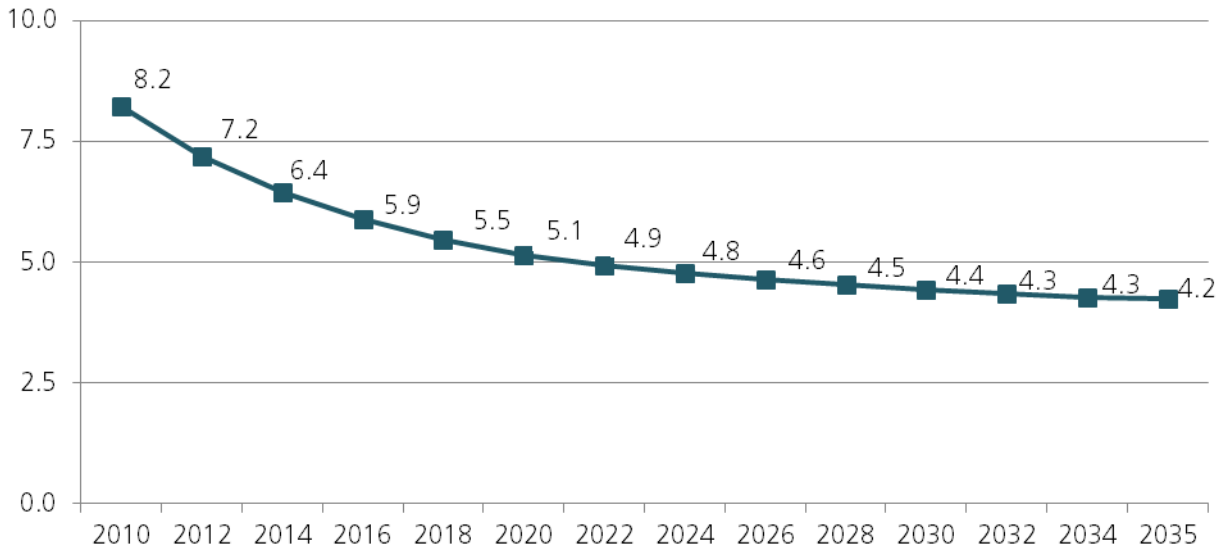
PERFORMANCE-BASED COMPLIANCE

In some cases, a project applicant may seek approval for a unique project type to which the Climate-Ready Development Standards are not readily applied. To provide additional flexibility in evaluating projects, the CAP provides performance targets that allow each project to be evaluated based on its actual greenhouse gas emissions. The CAP establishes an annual greenhouse gas emissions per service area population schedule that maps out the City's per service area population emissions (see Figure 21). Figure 21 shows the incremental annual increase in efficiency that the City must achieve each year in order to achieve its target. By achieving it's GHG target, which is aligned with the statewide GHG reduction goals, the City will be doing its part to reduce its contributions to California's GHG emissions. These statewide goals are the California Legislature's policy interpretation of the best recommendations for how drastically GHG emissions must be reduced to prevent widespread catastrophic climate change. Thus, Coachella's GHG target and associated GHG reductions represent the associated community-wide GHG emissions reductions that must be achieved to avoid a cummatively considerable contribution to climate change. When evaluating a non-standard project, the City will require the project applicant to commission the preparation of a Greenhouse Gas Emissions Study that estimates the project's per service area population greenhouse gas emissions. If the operational year per service area population emissions are less than or equal to the City's per service area population target as shown in the following figure, the project is assumed to be compliant with the CAP.

If the project is non-compliant, mitigation actions will be required to the extent feasible. If a project's per service area population emissions are greater than the City's per service area target for its operational year, the project will be required to apply all feasible mitigation

measures in order to bring projected emissions in line with this schedule. If there are no feasible mitigation measures available, and if the emissions are greater than the target, the project is assumed to be non-compliant with the CAP, and it will likely result in a significant environmental impact.

TABLE 21: GREENHOUSE GAS EMISSIONS PER SERVICE AREA POPULATION (IN $MTCO_2E$)



PAYMENT OF AN IN LIEU FEE

To provide applicants with additional flexibility, the City may establish an in lieu fee program that will allow applicants to pay into a new, to-be-established fee program that will be used to offset greenhouse gas emissions through energy efficiency retrofits of the City's existing building stock, new transportation infrastructure, or other greenhouse gas reducing measure. At this time, the City anticipates setting up this fee so that applicants would pay an abatement fee for each ton of CO_2e that needed to be reduced to meet the City's Per Service Are Population targets. This option can also provide high-emitting projects with an additional compliance option if no feasible mitigation is available. Implementing this fee would be contingent on the City conducting a separate nexus study and implementing the fee program in accordance with pertinent state law, subsequent to the adoption of the CAP.

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APPENDICES

APPENDIX A: GLOSSARY

APPENDIX B: DEVELOPMENT REVIEW CHECKLIST

APPENDIX C: REGULATORY FRAMEWORK

APPENDIX D: ASSUMPTIONS IN GREENHOUSE GAS EMISSIONS ANALYSIS

APPENDIX E: BASELINE GREENHOUSE GAS INVENTORY

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APPENDIX A: GLOSSARY

AB – Assembly Bill

Absolute Emissions – The total quantity of emissions, not expressed in relative terms or as a ratio – in contrast to measures such as Emissions Intensity and CO_2e.

Air Resources Board (ARB) – California's Legislature established the Air Resources Board (ARB) in 1967 to attain and maintain healthy air quality, conduct research into the causes of and solutions to air pollution, and to systematically attack the serious problems caused by motor vehicles.

Alternative Planning Strategies (APS) – If California's ARB determines that a region's Sustainable Communities Strategy will not achieve the GHG emissions reduction targets (related to SB 375), a Metropolitan Planning Organization (MPO) must prepare an Alternative Planning Strategy (APS), separate from the RTP, identifying alternative development patterns, transportation projects or transportation policies needed to achieve the targets.

Baseline – An imaginary line or standard by which things are measured or compared, e.g., "the established baseline for the budget." For the reduction targets, Coachella's baseline year is 2010.

Business-as-usual (BAU) – The scenario in which policies to reduce emissions are not enacted. The business-as-usual scenario assumes growth will occur following existing policies and regulations in place as of the baseline year of 2010.

Break from BAU – The difference between the business-as-usual and the outcome of a proposed development scenario.

California Climate Action Registry (CCAR) - A private non-profit organization originally formed by the State of California. The California Registry serves as a voluntary greenhouse gas (GHG) registry to protect and promote early actions to reduce GHG emissions by organizations.

California Energy Commission (CEC) – The CEC is California's primary energy policy and planning agency. It is responsible for promoting energy efficiency and renewable energy.

California Environmental Quality Act (CEQA) – Adopted in 1970 and incorporated in the Public Resources Code § 21000 et seq.. Its basic purposes are to: inform governmental decision makers and the public about the potential significant environmental effects of proposed activities; identify ways that environmental damage can be avoided or significantly reduced; require changes in projects through the use of alternatives or mitigation measures when feasible; and disclose to the public the reasons why a project was approved if significant environmental effects are involved.

Carbon Budget – Is the sum of the total quantity of GHGs that can be emitted by a sector or organization

Carbon Intensity – Carbon intensity of a given activity sector (or energy supply) defined as the amount of carbon emitted per unit.

Climate Action Plan (CAP) – A planning document developed for or by a governmental body aimed to reduce greenhouse gas emissions within its jurisdiction. A CAP typically provides an inventory, sets benchmark goals, and provides policymakers with a set of recommendations.

Corporate Average Fuel Economy (CAFE) – CAFE are a set of federal regulations intended to improve the fuel economy of cars and light trucks in the US. It sets a minimum sales-weighted average fuel economy, in miles-per-gallon, of cars and trucks with a gross vehicle weight rating of 8,500 pounds or less.

CH_4 - Methane, a greenhouse gas.

City – "City" refers to buildings, land, and other such items within the geographic boundary of the City of Coachella. City is comprised of the "community" and "municipal" portions.

CO_2 – Carbon Dioxide, a greenhouse gas.

CO_2e – The universal unit of measurement used to indicate the global warming potential (GWP) of each, or a combination of greenhouse gases. It is used to evaluate the impacts of releasing (or avoiding the release of) different greenhouse gases.

CO_2e per-capita – The ratio of carbon-equivalent emissions to population.

Community – "Community" refers to buildings, land, or other such items not owned or operated by the City of Coachella.

DU – Dwelling Unit

EIR – Environmental Impact Report

Embodied Energy – The amount of energy consumed over the lifecycle of a material – including energy used in the manufacturing or extraction, delivery, and the disposal or recycling of the material.

Emissions Intensity – The ratio of greenhouse gas emissions to a unit of relevant measurement. It measures the polluting level of a given activity.

Environmental Protection Agency (EPA) – An agency of the federal government with the mission to protect human health and the environment by writing and enforcing regulations.

General Reporting Protocol (GRP) – A collection of procedures and guidelines for calculating and reporting GHG emissions from a number of general and industry-specific categories. It was developed and is maintained by CCAR.

GHG – Greenhouse gas.

GHG Intensity – See "Emissions Intensity."

Greenhouse Gas Inventory – An accounting of the amount of greenhouse gases discharged into that atmosphere, usually within a given jurisdiction.

Global Warming Potential (GWP) – The index used to translate the level of emissions of various gases into a common measure in order to compare the relative radiative forcing of different gases without directly calculating the changes in atmospheric concentrations. GWPs are calculated as the ratio of the radiative forcing that would result from the emissions of one kilogram of a greenhouse gas to that from emission of one kilogram of carbon dioxide over a period of time (usually 100 years).

ICLEI (Local Governments for Sustainability) – An international association of local governments and local government organizations that have made a commitment to sustainable development.

IPCC – Intergovernmental Panel on Climate Change

Kilowatt (kW) – One thousand watts.

Kilowatt-hour (kWh) – One thousand watt-hours.

Leadership in Energy and Environmental Design (LEED) – a family of green building rating systems maintained by the US Green Building Council (USGBC). This includes (among others) LEED-NC, or LEED for New Construction; LEED-EB, LEED for Existing Buildings; and LEED-CS, LEED for Core and Shell.

Low Carbon Fuel Standard (LCFS) – The LCFS is a rule enacted by California in 2007 to reduce the carbon intensity of transportation fuels, as compared with traditional gasoline and diesel. Criteria were set by the Air Resources Board in April 2009, but the rule will not take effect until 2011.

Megawatt-hour (MWh) – One million watt-hours.

Metropolitan Planning Organization (MPO) – The body that carries out and puts forth Regional Transportation Plans. They were created by the 1962 Federal-Aid Highway Act and are required for any urban area with a population greater than 50,000.

$MTCO_2e$ – Metric Tons Carbon Dioxide Equivalent

$MMTCO_2e$ – Million Metric Tons Carbon Dioxide Equivalent

Municipal – "Municipal" refers to buildings, land, or other such items owned and operated by the City of Coachella.

N_20 – Nitrous Oxide, a greenhouse gas.

Office of Planning and Research (OPR) – Encompassing five main units, (The State Clearinghouse, The Legislative Unit, The Policy and Research Unit, The Office of Small Business Advocate, Advisory for Military Affairs, the OPR is tasked to develop draft CEQA guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas

emissions. The OPR plays a critical role in the Governor's Administration, providing legislative and policy research support for the Governor's office.

PV – A photovoltaic is an array of cells containing material that converts solar radiation into electricity.

Reclaimed/Recycled Water – Wastewater that has been treated to remove impurities, and then allowed to recharge an aquifer. This is typically done by using the reclaimed water for irrigation. Typically, reclaimed water is intended only for non-potable uses such as landscaping maintenance.

Regional Transportation Plan (RTP) – A Regional Transportation Plan is a long-term blueprint of a region's transportation system (related to SB 375).

Renewables Portfolio Standard (RPS) – State of California regulation requiring that publicly-owned utilities produce thirty-three percent (33%) of their electricity using renewable energy sources. Three California publicly-owned utilities are Southern California Edison (SCE), San Diego Gas & Electric (SDG&E), and Pacific Gas & Electric (PG&E)

SB – Senate Bill

Service Population – A measure of the total number of residents and employees (jobs) in a jurisdiction.

SF – Square feet.

Sustainable Communities Strategy (SCS) – As part of their Regional Transportation Plans (RTPs), Metropolitan Planning Organizations (MPOs) will have to prepare an SCS that demonstrates how regional GHG targets will be met (related to SB 375).

TCRP – Transportation Cooperative Research Program

TDM – Transportation Demand Management

Therm – A unit of heat equivalent to 100,000 British thermal units or 1.055 × 108 joules

Title-24 – Title-24 is the portion of the California Energy Code that regulates building envelopes and building energy efficiency.

TMA – Transportation Management Agency

TOD – Transit Oriented Development

TRB – Transportation Research Board

ULI – Urban Land Institute

United States Green Building Council (USGBC) – A non-profit trade organization headquartered in Washington, DC, dedicated to promoting green building practices.

VMT – Vehicle Miles Traveled

Watt – A unit of power, or a rate of electrical flow; it is equal to one joule of energy per second. It is used typically to describe electricity capacity or peak consumption. When expressed over a length of time (as in a watt-hour), it is a unit of energy.

Zero Net Energy (ZNE) – An entity that produces as much energy as it consumes. This often refers to a building, or group of buildings.

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APPENDIX B: DEVELOPMENT REVIEW CHECKLIST

CLIMATE-READY DEVELOPMENT REVIEW CHECKLIST

PROJECT SUMMARY

Project title: _____

Project sponsor's name and address: _____

Contact person and phone number: _____

Project location: _____

General plan designation: _____

General plan Subarea: _____

Zoning: _____

Summary project description: _____

_____

_____

_____

_____

HOW TO USE THIS CHECKLIST

This Climate-Ready Development Review Checklist was created to aid developers, community members, and City officials evaluate new projects for their effectiveness at reducing greenhouse gas emissions and for how well the projects comply with the City's greenhouse gas emissions reduction targets.

The Checklist is organized by General Plan Designation and by Project Attribute. The Checklist is an extension of the strategies analyzed by the Climate Action Plan and the Project Design Features within are the realization of those strategies as they should be applied to new development. The Project Design Features are presented with two tiers: Development Standards and Design Guidelines. Development Standards are required Project Design Features. Design Guidelines are suggested Project Design Features. Further, as the City's greenhouse gas reduction targets are set to increase reductions over time, some of the Project Design Features require greater levels of performance for construction completed after 2020.

The Checklist contains the following fields:

- *Base General Plan Designation* – Identifies the General Plan Designations to which the Project Design Feature shall be applied.
- *Project Attribute* – Identifies which aspect of the project the Project Design Feature applies to.
- *Project Design Feature* - Provides the name and intent of the Project Design Feature
- *Performance Standard* – Provides the performance criteria and defines whether the Project Design Feature is a require development standard or suggested design guideline.
- *Description* – Provides a work space to identify whether the Project Design Feature is included in the project proposal (yes or no) and an area for explanation as to how the project complies.

Compliance with the CAP will be determined based on the responses provided. For a project to be determined as complying with the CAP and eligible for streamlining, the project must comply with all applicable development standards presented in the Checklist. A "No" response to an applicable Project Design Feature will require a project be adjusted to comply or the project will have to demonstrate compliance with the CAP via an alternative path, as discussed in the CAP Implementation Chapter.

FOR ALL NEW DEVELOPMENT

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	PROJECT DESIGN FEATURE AND INTENT	PROJECT DESIGN FEATURE	DESCRIPTION	
				YES/NO	EXPLANATION
All	Buildings	**Recycling.** Ensure recyclables can be separated for collection.	**Development Standard:** For non-residential and multifamily residential buildings, provide dedicated on-site storage areas for recyclable solid waste.		
All	Community Design	**Density.** Apply the density envisioned by the General Plan.	**Development Standard:** Demonstrate the project complies with the General Plan Designations and development intensity envisioned by the General Plan and the applicable Subarea descriptions.		
All	Community Design	**Subarea Character.** Meet the vision and intent of the applicable General Plan Subarea.	**Development Standard:** Demonstrate the project complies with the policy direction set forth in the applicable Subarea description and reasonably meets the intent of the Subarea vision.		
All	Community Design	**Urban Forest.** Protect the City's healthy trees and plant new ones to provide shade, increase carbon sequestration and purify the air.	**Development Standard:** Unless the Zoning Code, General Plan, Complete Streets Manual or other City standard requires more stringent performance, plant shade trees at the equivalent of one tree per 50 feet along all street frontages, open space frontages, and public walkways.		
All	Community Design	**Urban Form.** Apply the urban form and character envisioned by the General Plan.	**Development Standard:** Demonstrate the project complies with the urban form guidelines described in the applicable General Plan designations.		
All	Construction	**Construction Emissions.** Reduce GHG emissions associated with construction activities.	**Development Standard:** Prepare a Construction Emissions Reduction plan that demonstrates the utilization of current best practices in construction operations that will realize a 10 percent reduction in GHG emissions. Best practices might include: • Alternative fuels for construction equipment; • Use of electric or hybrid electric construction equipment; • Further limiting construction equipment idling beyond regulatory requirements; and • Transportation demand management strategies for construction workers.		
All	Construction Activity	**Recycled Content Building Materials.** Encourage use of recycled materials in new construction.	**Development Standard:** Demonstrate that at least15 percent of a project's construction materials, preferably as a percentage of value of construction materials, be comprised of recycled content.		

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	PROJECT DESIGN FEATURE AND INTENT	PROJECT DESIGN FEATURE	DESCRIPTION	
				YES/NO	EXPLANATION
All	Construction and Demolition Waste Management	**Recycled CD&D Waste.** Increase the rate of recycle construction waste.	**Development Standard:** Demonstrate that at least 75 percent of construction waste by weight will be recycled. **Design Guideline:** Demonstrate at least 5 percent of a project's materials, by value, are salvaged, refurbished, or reused materials.		
All	Energy Use	**Energy Efficiency.** Design or retrofit buildings to exceed Title 24 energy efficiency standards by 15 percent.	**Development Standard:** For projects constructed prior to 2020, exceed Title 24 energy efficiency standards by 15 percent. For projects constructed between 2020 and 2035, exceed Title 24 by 25 percent.		
All	Energy Use	**Passive Solar Design.** Design new buildings to incorporate passive energy efficiency strategies.	**Development Standard:** Design new buildings to incorporate energy efficient building and site design strategies for the desert environment that include appropriate solar orientation, thermal mass, use of natural daylight and ventilation, and shading. Projects shall demonstrate a 10 percent reduction in energy use through passive solar design strategies.		
All	Energy Use	**Solar Orientation.** Design all residences to maximize energy efficiency and minimize solar heat gain.	**Development Standard:** Design new neighborhood streets and lot layouts so at least 80 percent of new homes are oriented with the primary building axis within 20 degrees of an east-west orientation.		
All	Green Building	**Green Design.** Design affordable housing developments to prioritize green building features that reduce monthly utility costs, enhance occupant health and lower the overall cost of housing.	**Design Guideline:** For affordable housing projects, demonstrate the inclusion of green building features that reduce monthly utility costs, enhance occupant health and lower the overall cost of housing, such as highly energy-efficient appliances, nontoxic materials, and features such as green roofs and solar panels.		
All	Green Building	**Shaded Public Spaces.** Improve shading in public spaces such as bus stops, sidewalks and public parks and plazas through the use of trees, shelters, awnings, gazebos, fabric shading and other creative cooling strategies.	**Design Guideline:** Through the use of trees, shelters, awnings, gazebos, fabric shading and other creative cooling strategies, shade at least 50 percent of all public spaces within five years of project operation.		
All	Infrastructure	**Electric Vehicles.** Support Electric Vehicle and Neighborhood Electric Vehicle use by developing appropriate infrastructure.	**Development Standard:** Demonstrate that the project contains measures that support the CVAG Electric Vehicle Plan, if applicable.		
All	Lighting	**Energy Efficient Street Lighting.** Install the latest energy-efficient technologies for street and parking lot.	**Development Standard:** Reduce electricity demand from outdoor lighting by 40 percent.		

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	PROJECT DESIGN FEATURE AND INTENT	PROJECT DESIGN FEATURE	DESCRIPTION	
				YES/NO	EXPLANATION
All	Multimodal Transportation	**Adequate Pedestrian Facilities.** Provide wide sidewalks along all roadways.	**Development Standard:** Provide sidewalks on both sides of the street for those frontages controlled by the project proponent. Widths may vary as specified by the General Plan designations.		
All	Multimodal Transportation	**Bicycle Facilities.** Fully developed bicycle network.	**Development Standard:** Provide bicycle facilities along all new roadways.		
All	Multimodal Transportation	**Bicycle Parking.** Provide sufficient bicycle parking in all new public and private development.	**Development Standard:** Provide 1 space for every 2 residential dwelling units. Provide 1 space per 10,000 square feet of new non-residential, and provide 1 space per 5,000 square feet of retail square feet but not fewer than 4 spaces per building. For non-residential development, provide at least one on-site shower with changing facility for any development with 100 or more new workers and at least one additional on-site shower with changing facility for every 150 new workers thereafter. Provide visitor bicycle parking in a highly visible and easily accessible locations.		
All	Multimodal Transportation	**Bus Shelters.** Protect bus riders waiting for buses.	**Development Standard:** Provide bus shelters in new development if a stop is determined necessary by SunLine.		
All	Multimodal Transportation	**Complete Streets.** Create complete streets, considering the needs of pedestrians, bicyclists, motorists and public transit users of all ages and abilities.	**Development Standard:** Unless the Zoning Code or Complete Streets Manual specifies different standards, new streets shall be designed and constructed as follows: • Crosswalks at every intersection. • Sidewalk amenities like benches, trash receptacles, drinking fountains, and/or public are for every 50 feet of sidewalk frontage in mixed use, commercial, and multifamily residential areas. • Frequent on-street parking (available along at least 70 percent of streets). • Sidewalks along 100 percent of street length (both sides of the street). • Street trees placed between the roadway and sidewalks. • Low design speeds for most streets (20 mph for residential, 25 mph for non-residential). • Driveway crossings along no more than 10 percent of sidewalk length.		
All	Multimodal Transportation	**Low-water streetscape landscaping.** Use of sustainable landscape and streetscape elements along roadways.	**Development Standard:** Use water efficient plant materials for at least 50 percent of the landscaping and install outdoor water fixtures that achieve a 50 percent reduction in irrigation water use for roadway landscaping elements.		

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	PROJECT DESIGN FEATURE AND INTENT	PROJECT DESIGN FEATURE	DESCRIPTION	
				YES/NO	EXPLANATION
All	Multimodal Transportation	**Pedestrian Connectivity.** Provide pedestrian connections to the external pedestrian network.	**Development Standard:** Provide pedestrian and bicycle connections to the community surrounding the project every 800 feet along the project perimeter.		
All	Multimodal Transportation	**Traffic Calming.** Apply traffic calming techniques to residential streets to limit cut-through traffic and speeding on roadway streets.	**Development Standard:** New streets shall include appropriate traffic calming techniques to neighborhood streets to limit cut-through traffic and speeding on roadway streets.		
All	Parks and Open Space	**Parkland.** Provide parkland and greenspaces.	**Development Standard:** Provide at least 5 acres of parkland per 1,000 residents.		
All	Renewable Energy	**Solar Access.** Prohibit new development and renovations that impair adjacent buildings' solar access.	**Development Standard:** Prohibit new development and renovations that impair adjacent buildings' solar access, unless it can be demonstrated that the shading benefits substantially offset the impacts of solar energy generation potential and comply with California Public Resources Code, Sections 25980 through 25986.		
All	Renewable Energy	**Solar Energy.** Design new construction to incorporate solar photovoltaics.	**Development Standard:** Incorporate solar PV into all new construction. Residential: For single family homes built prior to 2020, provide 10 percent of the projected electricity demand via onsite solar photovoltaics. For single family homes built between 2020 and 2035, provide 25 percent of the projected electricity demand via onsite solar photovoltaics. Non-residential and multi-family residential: buildings: For non-residential and multi-family residential buildings built prior to 2020, provide 20 percent of the project electricity demand via onsite solar photovoltaics. For non-residential and multi-family residential buildings built between 2020 and 2035, provide 50 percent of the project electricity demand via onsite solar photovoltaics.		
All	Stormwater	**Low-Impact Development Strategies.** Use low-impact development strategies to minimize urban run-off, increase site infiltration, manage stormwater and recharge groundwater supplies.	**Development Standard:** Require all new development greater than 5,000 square feet of new construction to utilize low-impact design strategies to manage stormwater on-site. Where impervious cover exceeds 50 percent, a 25 percent decrease in the volume of stormwater must be obtained.		
All	Trip Generation	**Parking.** Utilize parking to balance transportation options.	**Development Standard:** Only the minimum parking requirements required by the Zoning Code should be provided. If providing more than the minimum parking required under the Zoning Code, additional spaces should be dedicated for priority parking spaces for carpooling, for spaces dedicated to car-sharing, or for spaces for electric vehicles. If new development is within ½ mile of a transit stop and requires off-street parking, unbundle parking from the rental or for-sale cost.		

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	PROJECT DESIGN FEATURE AND INTENT	PROJECT DESIGN FEATURE	DESCRIPTION	
				YES/NO	EXPLANATION
All	Trip Generation	**Transportation Demand Management.** Reduce automobile trip generation related to employment.	**Design Guideline:** For non-residential projects with 20 or more employees, provide at least one of these programs: • Pre-tax election program to allow employees to exclude wages for commuting costs for transit or vanpools; • An employer supplied transit pass; • Employer provided transit; or • Other, similar demand management programs.		
All	Urban Heat Island	**Urban Heat Island.** Incorporate heat island reduction strategies in new developments.	**Development Standard:** Use 50 percent high-albedo surface materials for the site's hardscape or, within five years of project operation, shade at least 50 percent of the site's hardscape or use a combination of high-albedo surface materials and shades trees for at least 50 percent of the site's hardscape within five years of project operation. For non-residential and multifamily residential surface parking, plant shade trees at a minimum ratio of one tree per 4 spaces or demonstrate that 50 percent of the parking area will be shaded within five years of operation.		
All	Water Supply	**Grey water.** Promote grey water use to reduce potable water consumption.	**Design Guideline:** Incorporate grey water systems into new construction.		
All	Water Supply	**Recycled water.** Use recycled water for all agricultural, irrigation and industrial uses in order to reserve the City's highest quality potable water for drinking.	**Development Standard:** Install "purple pipe" water systems to utilize recycled water for non-potable uses such as irrigation and industrial uses.		
All	Water Use	**Reduce landscaping water consumption.** Reduce landscaping water consumption through plant selection and irrigation technology.	**Development Standard:** For buildings constructed prior to 2020, use water efficient plant materials for the landscaping and install outdoor water fixtures and demonstrate an overall reduction in irrigation water use of 25 percent. For buildings constructed between 2020 and 2035, use water efficient plant materials for the landscaping and install outdoor water fixtures that achieve an overall reduction in irrigation water use of 42 percent.		
All	Water Use	**Water Conservation.** Design new buildings to use less water.	**Development Standard:** For buildings constructed prior to 2020, demonstrate that new buildings will exceed the state's Green Building Code standard for water conservation by an additional 10 percent. For buildings constructed between 2020 and 2035, demonstrate that new buildings will exceed the state's Green Building Code standard for water conservation by an additional 15 percent.		

FOR NEW DEVELOPMENT WITH A GENERAL PLAN NEIGHBORHOOD DESIGNATION.

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	STRATEGY AND INTENT	DESIGN PARAMETER	DESCRIPTION (HOW IS THIS POLICY BEING MET?)	
				YES/NO	EXPLANATION
Neighborhood	Street Design	**Adequate Sidewalks.** Provide side sidewalks on both sides of streets in neighborhoods.	**Development Standard:** Provide sidewalks of at least six feet in width on both sides of streets in neighborhoods.		
Neighborhood	Street Design	**Neighborhood Scale Streets.** Residential streets should be as narrow as practical to encourage slow, safe driving speeds, with curbside parking on both sides	**Development Standard:** Unless the Zoning Code, General Plan, or Complete Streets Manual specifies a different standard, curb-to-curb dimensions for residential streets should range from 34 to 36 feet.		
Neighborhood	Street Design	**Shaded Sidewalks.** Plant street tress to shade neighborhood sidewalks.	**Development Standard:** For projects constructed prior to 2020, plant street trees so the street trees will provide at least 30 percent shading of the sidewalk within five years of project operation, unless the Zoning Code or General Plan specifies a more stringent standard. For projects constructed prior to between 2020 and 2035, plant street trees so the street trees will provide at least 50 percent shading of the sidewalk within five years of project operation, unless the Zoning Code or General Plan specifies a more stringent standard. Palm trees shall not be considered towards meeting this standard.		
Neighborhood	Street Design	**Shaded Streets.** Plant street trees to shade neighborhood streets.	**Development Standard:** For projects constructed prior to 2020, plant street trees at intervals of no more than 50 feet and demonstrate that the street trees will provide at least 60 percent shading of the street within five years of project operation, unless the Zoning Code or General Plan specifies a more stringent standard. For projects constructed between 2020 and 2035, plant street trees at intervals of no more than 25 feet and demonstrate that the street trees will provide at least 75 percent shading within five years of project operation, unless the Zoning Code or General Plan specifies a more stringent standard. Palm trees shall not be considered towards meeting this standard.		
Neighborhood	Street Network and Connectivity	**Neighborhood Connectivity.** Construct new neighborhoods without cul-de-sacs.	**Development Standard:** Continue the street network between adjacent development projects. Cul-de-sacs are prohibited except where necessary because connections cannot be made due to existing development, topographic conditions or limited access transportation systems, such as a highway. If cul-de-sacs are constructed, at least 90 percent of them must have a pedestrian or bicycle through connection.		
Neighborhood	Street Network and Connectivity	**Pedestrian Connectivity.** Provide pedestrian connections to the external pedestrian network.	**Development Standard: P**rovide pedestrian connections to the community surrounding the project every 400 to 600 feet along the project perimeter.		

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	STRATEGY AND INTENT	DESIGN PARAMETER	DESCRIPTION (HOW IS THIS POLICY BEING MET?)	
				YES/NO	EXPLANATION
Neighborhood	Street Network and Connectivity	**Walkable Blocks.** Design streets with well-connected walkable blocks.	**Development Standard:** Unless the Zoning Code or General Plan requires smaller block sizes, blocks must be between 400 and 800 feet. The maximum block perimeter should be 3,200 feet in suburban neighborhood, and 2,400 in other neighborhood designations.		
Neighborhood	Urban Form	**Building Orientation.** Locate the main entrance to the residence within the front façade, accessed directly from the street, and designed to welcome visitors.	**Development Standard:** Design buildings as follows: • Public-facing building entries (onto any public space except a parking lot) on 90 percent of building frontage; • Frequent building entries (at least every 75 feet); and • Unshuttered windows along the sidewalk for nonresidential buildings.		
Neighborhood	Urban Form	**Limited vehicle-pedestrian conflicts.** Accommodate vehicle access through alleys at the rear of lots or driveways connecting to the street.	**Design Guideline:** Limit driveway crossings to no more than 10 percent of the sidewalk length.		
Neighborhood	Urban Form	**Neighborhood Connectivity.** Prohibit the construction of new gated communities.	**Development Standard:** Prohibit the construction of new gated communities, but allow small groups of homes up to one block to be gated as an alternative to gated communities so long as it does not impact community connectivity.		
Neighborhood	Urban Form	**Sound walls.** Limit the use of soundwalls so as to reduce impacts to connectivity and walkability.	**Development Standard:** Limit the use of soundwalls to buffer new neighborhoods from existing sources of noise pollution such as railroads and limited access roadways. Prohibit the use of soundwalls in all other cases. When sound wall or other architectural features are used to mitigate sound impacts, discourage blank walls greater than 50 feet long along sidewalks.		

FOR NEW DEVELOPMENT WITH A GENERAL PLAN CENTER DESIGNATION.

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	STRATEGY AND INTENT	DESIGN PARAMETER	DESCRIPTION (HOW IS THIS POLICY BEING MET?)	
				YES/NO	EXPLANATION
Center	Street Design	**Adequate Sidewalks.** Provide side sidewalks on both sides of streets in neighborhoods.	**Development Standard:** Unless the Zoning Code, General Plan, or Complete Streets Manual specifies different parameters, design sidewalks as follows: • Neighborhood Center: sidewalks 10-18 feet wide on both sides of streets in neighborhoods. • Downtown Center: sidewalks 14-20 feet wide on both sides of streets in neighborhoods. • Urban Employment Center: sidewalks 10-16 feet wide on both sides of streets in neighborhoods.		
Center	Street Design	**Shaded Sidewalks.** Provide shade over the length of sidewalks on streets within the project.	**Development Standard:** Provide at least 50 percent shading within five years of project operation. Palm trees shall not be considered towards meeting this standard.		
Center	Street Design	**Shaded Streets.** Plant street trees.	**Development Standard:** Provide at least 75 percent shading within five years of project operation, at intervals no more than 25 feet. Palm trees shall not be considered towards meeting this standard.		
Center	Street Design	**Streets for all users.** Design streets to equally accommodate pedestrians and vehicles.	**Development Standard:** Unless the Zoning Code, General Plan, or Complete Streets Manual specifies different parameters, design streets so that vehicle lanes are 10 feet in most cases and up to 12 feet to accommodate back-out movements from angled parking. Parallel parking lanes should be eight feet wide, although seven feet is sufficient along residential frontages.		
Center	Street Network and Connectivity	**Walkable Blocks.** Design streets with well-connected walkable blocks.	**Development Standard:** Unless the Zoning Code or General Plan requires smaller block sizes, design blocks as followed: • Neighborhood Center: blocks shall be a maximum of feet 800 by 800 feet, subdivided into smaller blocks with dimensions of 400 to 500 feet. The maximum block perimeter should be 3,200 feet, but the center must be connected to the adjacent neighborhood at least every 600 feet. • Downtown Center: blocks shall be 300 by 400 feet. Mid-block paseos are recommended. • Urban Employment Center: blocks should be between 400 and 500 feet long. The maximum block perimeter should be 2,400 feet. Mid-block paseos are recommended.		

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	STRATEGY AND INTENT	DESIGN PARAMETER	DESCRIPTION (HOW IS THIS POLICY BEING MET?)	
				YES/NO	EXPLANATION
Center	Urban Form	**Building Orientation.** Locate the main entrance to the building within the front façade, accessed directly from the street, and designed to welcome visitors.	**Design Guideline:** Design buildings as follows: • Public-facing building entries (onto any public space except a parking lot) on 90 percent of building frontage. • Minimal distance between the sidewalk and most buildings, with mixed-use and nonresidential buildings particularly close to the sidewalk. • Frequent building entries (at least every 75 feet). • Unshuttered windows along the sidewalk for nonresidential buildings. • No blank walls more than 50 feet along sidewalks.		
Center	Urban Form	**Vehicle Access.** Accommodate vehicle access to parking lots via common drives and by alley and locate parking lots internally to blocks.	**Design Guideline:** Locate parking lots behind buildings, and allow driveway crossings along no more than 10 percent of sidewalk length.		

FOR NEW DEVELOPMENT WITH A GENERAL PLAN DISTRICT DESIGNATION.

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	STRATEGY AND INTENT	DESIGN PARAMETER	DESCRIPTION (HOW IS THIS POLICY BEING MET?)	
				YES/NO	EXPLANATION
District	Street Design	**Adequate Pedestrian Facilities.** Provide wide sidewalks along all roadways.	**Development Standard:** Provide sidewalks on both sides of the street for those frontages controlled by the project proponent. Widths may vary as specified by the General Plan designations, the Zoning Code, or the Complete Streets Manual.		
District	Street Design	**Shaded Sidewalks.** Provide shade over the length of sidewalks on streets within the project.	**Development Standard:** Provide at least 50 percent shading of project sidewalks within five years of project operation. Palm trees shall not be considered towards meeting this standard.		
District	Street Design	**Shaded Streets.** Plant street trees.	**Development Standard:** Provide at least 60 percent shading of project streets, at intervals no more than 40 feet, within five years of project operation. Palm trees shall not be considered towards meeting this standard.		

BASE GENERAL PLAN DESIGATION	PROJECT ATTRIBUTE	STRATEGY AND INTENT	DESIGN PARAMETER	DESCRIPTION (HOW IS THIS POLICY BEING MET?)	
				YES/NO	EXPLANATION
District	Street Design	**Streets for all users.** Design streets to equally accommodate pedestrians and vehicles.	**Development Standard: :** Demonstrate the project complies with the street design direct set forth by the General Plan for the applicable General Plan designations.		
District	Street Network and Connectivity	**Pedestrian Connectivity.** Provide connections between projects.	**Development Standard:** Provide pedestrian connections to the community surrounding the project every 800 feet along the project perimeter in the Suburban Retail District. If possible, strive to provide pedestrian connections every 400 feet along the project perimeter. External connections from the Industrial District should occur every 1,000 feet and 1,320 feet for Resort District.		
District	Street Network and Connectivity	**Walkable Blocks.** Design streets with well-connected walkable blocks.	**Development Standard:** Design blocks as follows: • Suburban Retail District and Regional Retail District: maximum of 1,000 by 1,000, subdivided into smaller blocks with dimensions of 400 to 500 feet. The maximum block perimeter should be 3,200 feet for Suburban Retail and 4,000 for Regional Retail. • Industrial District: provide blocks that are 1,200 by 1,200 feet, subdivided into smaller blocks with dimensions of 400 to 600 feet. • Resort District: Not defined.		
District	Urban Form	**Building Orientation.** Locate the main entrance to the building within the front façade, accessed directly from the street, and designed to welcome visitors.	**Design Guideline:** Design buildings as follows: • Public-facing building entries (onto any public space except a parking lot) on 90 percent of building frontage. • Minimal distance between the sidewalk and most buildings, with mixed-use and nonresidential buildings particularly close to the sidewalk. • Frequent building entries (at least every 75 feet). • Unshuttered windows along the sidewalk for nonresidential buildings. • No blank walls more than 50 feet along sidewalks.		
District	Urban Form	**Vehicle Access.** Accommodate vehicle access to parking lots via common drives and by alley. Locate parking lots internally to blocks.	**Design Guideline:** Locate parking lots behind buildings, and allow driveway crossings along no more than 10 percent of sidewalk length.		

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APPENDIX C: REGULATORY FRAMEWORK

During the past decade, the State of California made great strides in developing a regulatory framework to curb future greenhouse gas emissions and to adapt to the consequences of climate change. California adopted a series of policies, programs, and regulations that set targets for greenhouse emissions reductions and outlined strategic actions that enable government agencies, public institutions, and businesses to collaborate to achieve these reduction targets. The following section describes a number of the key state-level initiatives.

GLOBAL WARMING SOLUTIONS ACT – AB 32 (2006)

In 2005 the governor signed Executive Order S-3-05, which set targets for the state to reduce its greenhouse gas emissions to 1990 levels by 2020 and eighty percent (80%) below 1990 levels by 2050. The state assembly followed by passing Assembly Bill 32 (AB 32), the Global Warming Solutions Act. AB 32 directs the California Air Resources Board (ARB) to develop the rules and regulations necessary to achieve the greenhouse gas emissions reduction targets. In 2008, the ARB approved the California Climate Change Scoping Plan (Scoping Plan), which contains the primary strategies California will use to reduce the greenhouse gas emissions that cause climate change. The Scoping Plan outlines a combination of policies, programs, and practices needed to reduce statewide emissions by 15 percent below current levels (the equivalent of 1990 levels) by 2020. Given projected trends, this would be approximately 30 percent below business-as-usual levels anticipated for 2020. Effectively, the Scoping Plan establishes a statewide carbon budget that will allow the State to grow while still meeting its emissions reduction targets. The Scoping Plan strategies include energy efficiency measures, regional transportation-related greenhouse gas emissions targets, a renewable portfolio standard, a cap-and-trade program, a light duty vehicle greenhouse gas standard, and a low carbon fuel standard.

The Scoping Plan recognizes the essential partnership between state, regional, and local governments to reduce greenhouse gas emissions. Local governments have authority over activities that produce both direct and indirect greenhouse gas emissions through land use planning and zoning, general permitting, local ordinances, and municipal operations. Therefore, many of the strategies outlined in the Scoping Plan need local governments to take action. The Scoping Plan also encourages local governments to inventory greenhouse gas emissions, adopt greenhouse gas emissions reduction targets, and develop local action plans to lower emissions. The continued re-inventory of Coachella's greenhouse gas emissions will continue to serve these purposes.

SUSTAINABLE COMMUNITIES STRATEGY – SB 375 (2008)

In California, the transportation sector produces between thirty-five percent (35%) and forty percent (40%) of the state's greenhouse gas emissions, and the Scoping Plan includes a

number of measures for the sector. In 2008 California adopted Senate Bill 375 (SB 375), the Sustainable Communities Strategy. SB 375 attempts to integrate regional land use, transportation, and housing planning in order to reduce greenhouse gas emissions from cars and trucks. SB 375 directs the ARB to set regional greenhouse gas reductions targets for cars and trucks, to assign each metropolitan planning organization (MPO) a target, and to require each MPO to create a plan (a Sustainable Community Strategy) to achieve that target. The law provides relief from specific California Environmental Quality Act (CEQA) requirements for infill development projects that are consistent with the Sustainable Community Strategy. SB 375 provides one method for local governments to achieve regional transportation-related greenhouse gas emissions targets described in the Scoping Plan.

The Southern California Association of Governments (SCAG) is the largest MPO in California, representing six counties and over 180 cities, including Coachella. SCAG completed their SCS in 2012, tailoring the strategies to meet the needs of individual communities. The regional SCS describes the goals and benefits of the SCS, the process used to create the SCS, SCS requirements, and next steps. SCS strategies are organized into land use strategies, transportation supply management, transportation demand management, vehicle technology, and other areas. The SCS builds on local strategies that communities have pursued over the past decade. This portfolio of strategies was combined with regional and subregional transportation projects to provide a roadmap for local governments to reduce emissions. If implemented, the SCS estimates that strategies and transportation projects would reduce greenhouse gas emissions per capita from the 2005 benchmark.

PAVLEY VEHICULAR EMISSIONS CODES – AB 1493 (2002)

AB 1493 directed the ARB to set more stringent vehicle fuel economy standards for cars and light trucks that reduce greenhouse gas emissions. The Pavley bill required approval from the federal government, and in 2009, the U.S. Environmental Protection Agency granted California a waiver that enabled the state to enforce stricter tailpipe emissions limits on new passenger vehicles. In 2010, the U.S. EPA and the Department of Transportation's National Highway Safety Administration announced new vehicle greenhouse gas emissions standards and corporate average fuel economy standards that reinforced California's standard. The standards would reduce emissions from passenger vehicles by approximately thirty percent (30%) in 2016, aiding local government efforts to reduce greenhouse gas emissions.

CALIFORNIA RENEWABLE PORTFOLIO STANDARD – SENATE BILLS 1078 (2002) AND 107 (2006) AND EXECUTIVE ORDER S-21-09

EO S-21-09 directed the ARB to adopt regulations increasing California's Renewable Portfolio Standard (RPS) to thirty-three percent (33%) by 2020. These rules apply to investor-owned utilities, such as Southern California Edison. These standards will reduce greenhouse gas emissions from electricity purchased by local governments.[52] The California Air Resources Board's (CARB) Adopted Scoping Plan makes it clear that implementation of the Renewable Portfolio Standard (RPS) is a foundational element of California's emissions reduction plan. In 2002, Senate Bill 1078 established the California RPS program, requiring twenty percent (20%) renewable energy by 2017. In 2006, Senate Bill 107 advanced the twenty percent

[52] SCE Renewable Energy. http://www.sce.com/PowerandEnvironment/renewables/

(20%) deadline to 2010, a goal which was expanded to thirty-three percent (33%) by 2020 in the 2005 Energy Action Plan II. On September 15, 2009, Governor Arnold Schwarzenegger signed Executive Order S-21-09 directing the California Air Resources Board (CARB) to adopt regulations increasing RPS to thirty-three percent (33%) by 2020.

EMISSION PERFORMANCE STANDARDS – SENATE BILL 1368 (2006)

Signed in 2006, SB 1368 limits the ability of California's utilities to make long-term investments in carbon-intensive electricity generation. The bill enables utilities to make capital investments in baseload power plants if their emissions are as low as or lower than emissions from a new, combined-cycle natural gas power plant. The bill makes certain that the standards will not degrade the reliability of California's energy services.

CALIFORNIA GREEN BUILDING CODE – (2007)

The California Building Standards Commission and other state agencies developed green building standards for residential, commercial, and public building construction. The "CALGreen Code" is the first statewide green building standards code in the United States. The code attempts to achieve reductions in greenhouse gas emissions and water and energy use.[53]

LOW CARBON FUEL STANDARD – EXECUTIVE ORDER S-1-07 (2007)

EO S-1-07 established a Low Carbon Fuel Standard (LCFS) for transportation fuels in California, which the ARB included in the Scoping Plan. The EO requires that the carbon intensity of California's transportation fuels be reduced at least ten percent (10%) by 2020.[54] ARB expects the LCFS to achieve the minimum ten percent (10%) reduction goal; however, many of the early action items outlined in the Scoping Plan work in tandem with one another. To avoid the potential for double-counting emissions reductions associated with AB 1493, the Scoping Plan has modified the aggregate transportation sector reduction expected from the LCFS to six and seven-tenths percent (6.7%) for 2020.[55]

CEQA AND GREENHOUSE GAS EMISSIONS – SB 97 (2007)

SB 97 provides that greenhouse gas emissions and their effects are subject to CEQA. Local governments are required to determine whether a project's climate-related impacts are significant, and if so, to mitigate those effects. The Office of Planning and Research (OPR) created CEQA guidelines to help local governments reduce greenhouse gas emissions and address their impacts.

PROPERTY ASSESSED CLEAN ENERGY – AB 811

AB 811 allows local governments to define areas where property owners can receive long-term, low-interest loans for energy and water efficiency improvements. Improvements financed

[53] California Building Standards Commission. "CALGreen." Retrieved on May 21, 2010 from http://www.bsc.ca.gov/CALGreen/default.htm.
[54] California Low Carbon Fuel Standard. Retrieved from http://www.arb.ca.gov/fuels/lcfs/lcfs.htm.
[55] Scoping Plan. http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm

through AB 811 are fixed to the property and repaid through property tax bills. Local governments can participate in a state-wide program called CaliforniaFIRST, or they can establish their own AB 811 programs, called Property Assessed Clean Energy (PACE) programs.

CALIFORNIA CLIMATE ADAPTATION STRATEGY – EXECUTIVE ORDER S-13-08 (2008)

The EO directed the California Natural Resources Agency to lead a statewide effort to develop a climate adaptation strategy. Published in 2009, the statewide plan describes climate trends and the potential impacts of climate change on key sectors, and it outlines short- and long-term actions that state and local governments can take to address future climate impacts.[56]

[56] California Department of Natural Resources, 2009. *California Climate Adaptation Strategy.* http://resources.ca.gov/climate_adaptation/statewide_adaptation/californias_adaptation_strategy.html

APPENDIX D: ASSUMPTIONS IN GREENHOUSE GAS EMISSIONS ANALYSIS

The following section describes the key assumptions used to calculate greenhouse gas reductions. When feasible, the potential reduction value of each measure has been quantified using industry standard methods developed by the California Air Pollution Control Officers Association (CAPCOA) and outlined in the report Quantifying Greenhouse Gas Mitigation Measures.[57] The report describes approaches for quantifying greenhouse gas reductions from a specified list of mitigation measures. This list does not include measures that were not quantified.

STATE PROGRAMS

TITLE 24 UPDATES

Description: California's Title 24 Building Energy Code is updated every three years, continually increasing energy standards. The 2013 Building Energy Efficiency Standards, which take effect on January 1, 2014, are twenty-five percent (25%) more efficient than previous standards for single family residential construction, fourteen percent (14%) more efficient for multifamily construction, and thirty percent (30%) more efficient for non-residential construction.[58]

[57] For additional information about CAPCOA's Quantifying Greenhouse Gas Mitigation Measures report, please visit http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

[58] California Energy Commission. 2013. 2013 Energy Efficiency Standards. Available at http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/2012-05-31_2013_standards_adoption_hearing_presentation.pdf

Sector & Subsector		Residential – new residential energy use			
Reduction Percent		Varies by year	Source: California Energy Commission		
Currently Implemented by the Sector in 2010		0%	Source: N/A		
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
100%	100%	3,905	10,316		

Sector & Subsector		Non-residential – new non-residential energy use			
Reduction Percent		Varies by year	Source: California Energy Commission		
Currently Implemented by the Sector in 2010		0%	Source: N/A		
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
100%	100%	6,066	16,738		

RENEWABLES PORTFOLIO STANDARD

Description: Requires publically-owned utilities, such as Imperial Irrigation District, to increase procurement from renewable energy resources to thirty-three percent (33%) of total procurement by 2020. This action also includes assumptions about the transition from more carbon intense fossil fuels like coal to less-carbon intense natural gas. These assumptions are reflected in the E3 calculator.

Sector & Subsector		Residential – all electricity			
Reduction Percent		26%	Source: E3 GHG Calculator[59]		
Currently Implemented by the Sector in 2010		8.3%	Source: California Public Utilities Commission		
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
100%	100%	26,599	45,110		

[59] Energy and Environmental Economics. 2010. CPUC GHG Calculator. http://ethree.com/public_projects/cpuc2.php

Sector & Subsector		Non-residential – all electricity			
Reduction Percent		26%	Source: E3 GHG Calculator[60]		
Currently Implemented by the Sector in 2010		8.3%	Source: California Public Utilities Commission		
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
100%	100%	50,186	93,439		

Sector & Subsector		Water – all electricity			
Reduction Percent		14%	Source: E3 GHG Calculator[61]		
Currently Implemented by the Sector in 2010		N/A	Source: N/A		
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
100%	100%	4,198	3,366		

PAVLEY CLEAN CARS STANDARDS

Description: Sets more stringent vehicle fuel economy standards for cars and light trucks that reduce greenhouse gas emissions

Sector & Subsector		Transportation			
Reduction Percent		16%, 22%	Source: 2011 EMFAC Pavley + LCFS Post-Processor Tool[62]		
Currently Implemented by the Sector in 2010		N/A	Source: N/A		
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
100%	100%	82,306	179,405		

[60] Energy and Environmental Economics. 2010. CPUC GHG Calculator. http://ethree.com/public_projects/cpuc2.php

[61] Energy and Environmental Economics. 2010. CPUC GHG Calculator. http://ethree.com/public_projects/cpuc2.php

[62] California Air Resources Board. 2012. EMFAC. http://www.arb.ca.gov/jpub/webapp//EMFAC2011WebApp/emsSelectionPage_1.jsp

LOW CARBON FUEL STANDARD

Description: Requires that the carbon intensity of California's transportation fuels are reduced by 2020

Sector & Subsector		Transportation			
Reduction Percent		7.2%	Source: Bay Area Air Quality Management District[63]		
Currently Implemented by the Sector in 2010		N/A	Source: N/A		
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
100%	100%	38,143	59,401		

GENERAL PLAN POLICIES

BUILDING AND INFRASTRUCTURE ENERGY EFFICIENCY

Description: Requires new construction and building upgrades to exceed Title 24 building energy efficiency standards by 15%. This reduction calculation corresponds with policies S 2.5 and S 2.6.

[63] Bay Area Air Quality Management District. 2011. California Environmental Quality Act Air Quality Guidelines. http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BGM%20Users%20Manual.ashx?la=en

Sector	Building Energy			
Reduction Percent	15%	Source: CAPCOA BE-1		
Currently Implemented by the Sector in 2010	0%	Source: N/A		
Key Assumptions[64] Nonresidential: 64% of electricity and 70% of natural gas covered by Title 24 Single family residential: 33% of electricity and 86% of natural gas covered by Title 24 Multifamily residential: 17% of electricity and 86% of natural gas covered by Title 24				
Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
New commercial buildings	100% of new commercial buildings	100% of new commercial buildings	4,820	17,115
New residential buildings	100% of new residential buildings	100% of new residential buildings	2,315	7.189
Upgraded commercial buildings	250,000 square feet	625,000 square feet	308	770
Upgraded residential buildings	350 single family units, 120 multifamily units	875 single family units, 300 multifamily units	136	339

[64] ICLEI. (2011, October). Greenhouse Gas Forecasting Assistant: Documentation and Background Information

ENERGY EFFICIENCY IN HOMES AND BUSINESSES

Description: Organize workshops on how to increase energy efficiency in the home or business, addressing topics such as how to weatherize a home or building envelope, install smart lighting systems, and conduct a self-audit for energy use and efficiency. This reduction calculation corresponds with policy S 2.7.

Sector	Building Energy – existing buildings			
Reduction Percent	5%	Source: Berkeley[65] and Oakland programs[66], LBNL assessment of retro-commissioning[67], City of Berkeley,[68] City of San Francisco,[69] and Boulder, CO assessment[70]		
Currently Implemented by the Sector in 2010	0%	Source: N/A		
Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
Upgraded commercial buildings	5%	20%	117	469
Upgraded residential buildings	5%	20%	100	398

[65] City of Berkeley. 2012. Commercial Energy Conservation Ordinance. http://www.ci.berkeley.ca.us/ceco/

[66] City of Oakland. 2012. Oakland Shines. http://oaklandshines.com/index.php

[67] Lawrence Berkeley National Laboratory. 2004. Cost-Effectiveness of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States (page 1). www.ga.wa.gov/eas/bcx/Cx_Cost Effectiveness.pdf

[68] City of Berkeley. 2012. Residential Energy Conservation Ordinance. http://www.ci.berkeley.ca.us/reco/

[69] Eco Leader – Residential Energy Conservation Ordinance Factsheet http://ecoleader.org/assets/downloads/RECO/RECO_factsheet.pdf

[70] City of Boulder RECO Report (page 4) –http://www.bouldercolorado.gov/files/reco_report_boulder.pdf.

PASSIVE SOLAR DESIGN

Description: The strategy quantifies electricity reduction from passive solar design. To reduce energy demand, the General Plan includes policies that require new construction to be oriented along an east-west access and to incorporate energy efficient building and site design strategies for the desert environment that include appropriate solar orientation, thermal mass, use of natural daylight and ventilation, and shading (SNE Policies 2.1 and 2.2). It is expected that these policies will reduce electricity use in new buildings by 10%.

Sector	Building Energy – new construction	
Reduction Percent	10%	Source: National Renewable Energy Laboratory[71]
Currently Implemented by the Sector in 2010	0%	Source: N/A
Key Assumptions – the benefits of passive solar design vary depending on the specific strategies used. Buildings regularly attain reductions in energy use of 20% to 60%. The percent reduction is only applied to energy use heating and cooling: 31% of residential energy[72] and 29% of non-residential energy.[73]		

Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
Commercial buildings	100%	100%	2,113	5,905
Residential buildings	100%	100%	1,024	2,510

URBAN SHADE TREES

Description: The strategy quantifies electricity reduction from shade trees. This reduction calculation corresponds with policies S 5.13, S 5.14, D 1.14, and D 2.

[71] National Renewable Energy Laboratory, et. al. (n.d.). Passive Solar Design Strategies: Guidelines for Home Building. Retrieved from http://www.nrel.gov/docs/legosti/old/17286.pdf

[72] Energy Information Agency. 2009. Household Energy Use in California. Retrieved from http://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/ca.pdf

[73] California Energy Commission. 2006. Commercial End-Use Survey. Retrieved from http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF

Sector	Building Energy – new construction					
Reduction Percent	1.8% to 3.3%	Source: LBNL[74]				
Currently Implemented by the Sector in 2010	0%	Source: N/A				
Key Assumptions – Commercial (3.3%), single family (3%), and multifamily (1.8%) reductions in electricity use. The percent reduction is only applied to energy use for heating and cooling: 31% of residential energy[75] and 29% of non-residential energy.[76]						
Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
Commercial buildings	100%	100%	697	1,948		
Residential buildings	100%	100%	225	552		

COOL PAVING

Description: The strategy quantifies electricity reduction from cool paving. This reduction calculation corresponds with policy D 2.

Sector	Building Energy – new construction					
Reduction Percent	1%	Source: LBNL[77]				
Currently Implemented by the Sector in 2010	0%	Source: N/A				
Key Assumptions – 1% reduction in electricity use; California currently testing cool paving, possible inclusion in version of Title 24 after 2014. The percent reduction is only applied to energy use for heating and cooling: 31% of residential energy[78] and 29% of non-residential energy.[79]						
Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)		
Commercial buildings	100%	100%	211	590		
Residential buildings	100%	100%	102	251		

[74] LBNL. 2001. Energy Impacts of Heat Island Reduction Strategies in the Greater Toronto Area, Canada
[75] Energy Information Agency. 2009. Household Energy Use in California.
[76] California Energy Commission. 2006. Commercial End-Use Survey.
[77] LBNL. 2001. Energy Impacts of Heat Island Reduction Strategies in the Greater Toronto Area, Canada
[78] Energy Information Agency. 2009. Household Energy Use in California.
[79] California Energy Commission. 2006. Commercial End-Use Survey.

INSTALL HIGHER EFFICIENCY PUBLIC AND STREET LIGHTING

Description: Require all new non-City-owned street and parking lot lights to use high pressure sodium lights. This reduction calculation corresponds with policy S 22.

Sector	Lighting				
Reduction Percent	40%	Source: CAPCOA LE-1			
Currently Implemented by the Sector in 2010	0%	Source: N/A			
Key Assumptions – All new lights are high pressure sodium lights					
Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)	
Commercial buildings	100%	100%	301	753	

RENEWABLE ENERGY GENERATION

Description: The General Plan calls for solar energy performance targets for residential and nonresidential development. The policies require new construction to incorporate solar and encourages solar in existing building retrofits (SNE Policies 2.5 and 2.6).

Sector	Alternative Energy	
Reduction Percent	Varies	Source: CAPCOA AE-2
Currently Implemented by the Sector in 2010	0%	Source: N/A

Key Assumptions
Existing Buildings
In 2020, 1% electricity for existing residential structures and 1% of the electricity for existing commercial buildings will be generated by on-site renewable sources of energy
In 2035, 2.5% electricity for existing residential structures and 2.5% of the electricity for existing commercial buildings will be generated by on-site renewable sources of energy
New Construction
In 2020 and 2035, 10% of the electricity for new residential structures and 20% of the electricity for new commercial construction will be generated by on-site renewable sources of energy

Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
New commercial buildings	100% of new commercial buildings	100% of new commercial buildings	23,614	43,524
New residential buildings	100% of new residential buildings	100% of new residential buildings	398	991
Upgraded commercial buildings	1%	2.5%	467	1,157
Upgraded residential buildings	1%	2.5%	12,225	23,268

COMMUNITY CHOICE AGGREGATION

Description: The General Plan calls for the City to work with nearby local and regional agencies to develop a community choice aggregation system in order to secure alternative energy supply contracts for the community (SNE 2.4).

Sector	Alternative Energy			
Reduction Percent	17%	Source: CAPCOA AE-1		
Currently Implemented by the Sector in 2010	0%	Source: N/A		
Key Assumptions – 50% of the homes and businesses will participate in the program that purchases a portfolio of cleaner energy sources (17% above the 33% RPS)				
Sub-Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
Residential and Commercial Energy	50%	50%	13,064	22,526

URBAN FOREST

Description: The General Plan includes policies to protect the City's healthy trees and plant new ones to provide shade, increase carbon sequestration, and purify the air (SNE 1.13 and SNE 1.15). Trees sequester carbon when they are actively growing for approximately 20 years. Trimming and pruning trees offset carbon accumulation in trees.

Sector & Subsector	Vegetation			
Reduction (per tree)	0.035 MTCO2e	Source: CAPCOA V-1		
Currently Implemented by the Sector in 2010	N/A	Source: N/A		
Key Assumptions: 13 trees per 600 foot block, 64 blocks per square mile, 6.4 square miles of new development				
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)	
8,549 trees	21,272 trees	5,984	14,961	

PARKS AND OPEN SPACE

Description: Parks and open space serve a range of diverse purposes, and in turn, these produce different types of greenhouse gas benefits. Parks can help groundwater recharge, reduce vehicle trips, promote active transportation, mitigate the heat island effect, and sequester carbon. Policies that promote trip reduction, active transportation, and energy use are captured by quantifications of other General Plan policies (SNE 13.2, SNE 13.3, SNE 13.4, SNE 13.5, SNE 13.9, SNE 13.10, SNE 13.11, SNE 13.13, SNE 13.14)

Sector & Subsector	Vegetation		
Reduction (per tree)	0.035 MTCO2e	Source: CAPCOA V-1	
Currently Implemented by the Sector in 2010	N/A	Source: N/A	
Key Assumptions: 10 trees per acre, 5 acres of park per 1,000 residents			
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
218 acres of park	512 acres of park	1,320	1,981

RECYCLED WATER USE

Description: Accelerate the use of recycled water for irrigation and landscaping.

Sector & Subsector	Water		
Reduction Percent	81%	Source: CAPCOA WSW-1	
Currently Implemented by the Sector in 2010	0%	Source: N/A	
Key Assumptions: Applied to industrial, landscape, and commercial sectors: Industrial currently uses 2% of the water, landscape 12%, and commercial 14%.			
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
2.5%	20%	204	2,745

GRAY WATER

Description: Support the use of greywater and establish criteria and standards to permit the safe and effective use of greywater (also known as on-site water recycling) (SNE 3.3)

Sector & Subsector	Water – all sectors		
Reduction Percent	100%	Source: CAPCOA WSW-2	
Currently Implemented by the Sector in 2010	0%	Source: N/A	
Key Assumptions: Applied to industrial, landscape, and commercial sectors: Industrial currently uses 2% of the water, landscape 12%, and commercial 14%.			
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
1%	1%	251	446

WATER CONSERVATION PERFORMANCE TARGETS

Description: SNE policy 3.1 requires new construction to exceed the state's Green Building Code (GBC) for water conservation by an additional 10%. The GBC already requires indoor water use reductions of 20% and better irrigation system design.

Sector & Subsector	Water – new construction			
Reduction Percent	28% indoor, 6.1% outdoor	Source: CAPCOA WUW-1 (indoor); CAPCOA WUW-4 (Outdoor)		
Currently Implemented by the Sector in 2010	0%	Source: N/A		
Sector	Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
Indoor Water Use	100%	100%	4,018	5,468
Outdoor Water Use	100%	100%	1,000	1,722

REDUCE WATER FOR LANDSCAPING

Description: The General Plan also includes a separate policy for landscape design to encourage the reduction of water use through plant selection and irrigation technology (SNE 3.7).

Sector & Subsector	Outdoor Water – new construction		
Reduction Percent	30%	Source: CAPCOA WUW-3	
Currently Implemented by the Sector in 2010	N/A	Source: N/A	
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
25%	25%	1,230	2,117

INCREASE RECYCLING RATES

Description: the City proposes several General Plan policies to continue solid waste reductions and higher waste diversion rates (IPS 5.3, IPS 5.13, IPS 5.4).

Sector & Subsector	Solid waste – commercial		
Reduction Percent	Varies by year	Source: EPA Warm Model	
Currently Implemented by the Sector in 2010	44%	Source: City of Coachella	
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
50%	60%	743	3,490

Sector & Subsector	Solid waste – residential		
Reduction Percent	Varies by year	Source: EPA Warm Model	
Currently Implemented by the Sector in 2010	44%	Source: City of Coachella	
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
50%	60%	470	2,206

Sector & Subsector	Solid waste – construction		
Reduction Percent	Varies by year	Source: EPA Warm Model	
Currently Implemented by the Sector in 2010	50%	Source: City of Coachella	
Implementation Goal by 2020	Implementation Goal by 2035	GHG Reduction in 2020 (MT CO2e)	GHG Reduction in 2035 (MT CO2e)
75%	75%	516	909

ADDITIONAL CLIMATE ACTION PLAN MEASURES

RENEWABLE ENERGY GENERATION

Description: The General Plan calls for solar energy performance targets for residential and nonresidential development. The policies require new construction to incorporate solar and encourages solar in existing building retrofits (SNE Policies 2.5 and 2.6).

Sector	Alternative Energy	
Reduction Percent	Varies	Source: CAPCOA AE-2
Currently Implemented by the Sector in 2010	0%	Source: N/A
Key Assumptions *(initial General Plan analysis assumptions in parenthesis)* Existing Buildings In 2035, 2.5% (*1%)* electricity for existing residential structures and 25% (*2.5%)* of the electricity for existing commercial buildings will be generated by on-site renewable sources of energy New Construction In 2035, 25% (*10%*) of the electricity for new residential structures and 50% (*20%)* of the electricity for new commercial construction will be generated by on-site renewable sources of energy		
Sub-Sector	Implementation Goal by 2035	GHG Reduction in 2035 (MT CO2e)
New commercial buildings	100% of new commercial buildings	108,811
New residential buildings	100% of new residential buildings	58,169
Upgraded commercial buildings	25%	11,568
Upgraded residential buildings	2.5%	991

COMMUNITY CHOICE AGGREGATION

Description: The General Plan calls for the City to work with nearby local and regional agencies to develop a community choice aggregation system in order to secure alternative energy supply contracts for the community (SNE 2.4).

Sector	Alternative Energy	
Reduction Percent	17%	Source: CAPCOA AE-1
Currently Implemented by the Sector in 2010	0%	Source: N/A
Key Assumptions *(initial General Plan analysis assumptions in parenthesis)* 100% (*50%)* of the homes and businesses will participate in the program that purchases a portfolio of cleaner energy sources (17% above the 33% RPS)		
Sub-Sector	Implementation Goal by 2035	GHG Reduction in 2035 (MT CO2e)
Residential and Commercial Energy	100%	26,586

PARKS AND OPEN SPACE

Description: Parks and open space serve a range of diverse purposes, and in turn, these produce different types of greenhouse gas benefits. Parks can help groundwater recharge, reduce vehicle trips, promote active transportation, mitigate the heat island effect, and sequester carbon. Policies that promote trip reduction, active transportation, and energy use are captured by quantifications of other General Plan policies (SNE 13.2, SNE 13.3, SNE 13.4, SNE 13.5, SNE 13.9, SNE 13.10, SNE 13.11, SNE 13.13, SNE 13.14)

Sector & Subsector	Vegetation	
Reduction (per tree)	0.035 MTCO2e	Source: CAPCOA V-1
Currently Implemented by the Sector in 2010	N/A	Source: N/A
Key Assumptions *(initial General Plan analysis assumptions in parenthesis)* 20 (*10)* trees per acre, 5 acres of park per 1,000 residents		
Implementation Goal by 2035		GHG Reduction in 2035 (MT CO2e)
512 acres of park		5,942

RECYCLED WATER USE

Description: Accelerate the use of recycled water for irrigation and landscaping.

Sector & Subsector	Water	
Reduction Percent	81%	Source: CAPCOA WSW-1
Currently Implemented by the Sector in 2010	0%	Source: N/A
Key Assumptions: Applied to industrial, landscape, and commercial sectors: Industrial currently uses 2% of the water, landscape 12%, and commercial 14%.		
Implementation Goal by 2035		GHG Reduction in 2035 (MT CO2e)
50% *(20%)*		7,295

GRAY WATER

Description: Support the use of greywater and establish criteria and standards to permit the safe and effective use of greywater (also known as on-site water recycling) (SNE 3.3)

Sector & Subsector	Water – all sectors	
Reduction Percent	100%	Source: CAPCOA WSW-2
Currently Implemented by the Sector in 2010	0%	Source: N/A
Key Assumptions: Applied to industrial, landscape, and commercial sectors: Industrial currently uses 2% of the water, landscape 12%, and commercial 14%.		
Implementation Goal by 2035	GHG Reduction in 2035 (MT CO2e)	
5% (1%)	2,426	

WATER CONSERVATION PERFORMANCE TARGETS

Description: SNE policy 3.1 requires new construction to exceed the state's Green Building Code (GBC) for water conservation by an additional 10%. The GBC already requires indoor water use reductions of 20% and better irrigation system design.

Sector & Subsector	Water – new construction	
Reduction Percent	15% (*6.1%*) outdoor	Source: CAPCOA WUW-1 (indoor); CAPCOA WUW-4 (Outdoor)
Currently Implemented by the Sector in 2010	0%	Source: N/A

Sector	Implementation Goal by 2035	GHG Reduction in 2035 (MT CO2e)
Outdoor Water Use	100%	4,235

REDUCE WATER FOR LANDSCAPING

Description: The General Plan also includes a separate policy for landscape design to encourage the reduction of water use through plant selection and irrigation technology (SNE 3.7).

Sector & Subsector	Outdoor Water – new construction	
Reduction Percent	50% (*30%*)	Source: CAPCOA WUW-3
Currently Implemented by the Sector in 2010	N/A	Source: N/A

Implementation Goal by 2035	GHG Reduction in 2035 (MT CO2e)
25%	3,529

INCREASE RECYCLING RATES

Description: The City proposes striving for zero waste to landfills by 2040 through reusing, reducing and recycling solid waste (IPS 5.4). Under this policy, it is assumed that 90% of the community's commercial and residential waste will be diverted from the landfill.

Sector & Subsector	Solid waste – commercial	
Reduction Percent	Varies by year	Source: EPA Warm Model
Currently Implemented by the Sector in 2010	44%	Source: City of Coachella
Implementation Goal by 2035		GHG Reduction in 2035 (MT CO2e)
90% *(60%)*		10,033

Sector & Subsector	Solid waste – residential	
Reduction Percent	Varies by year	Source: EPA Warm Model
Currently Implemented by the Sector in 2010	44%	Source: City of Coachella
Implementation Goal by 2035		GHG Reduction in 2035 (MT CO2e)
90% *(60%)*		6,343

Sector & Subsector	Solid waste – construction	
Reduction Percent	Varies by year	Source: EPA Warm Model
Currently Implemented by the Sector in 2010	50%	Source: City of Coachella
Implementation Goal by 2035		GHG Reduction in 2035 (MT CO2e)
90% *(75%)*		1,455

COMMERCIAL ENERGY CONSERVATION ORDINANCE

Description: the City could explore enacting a commercial and industrial energy conservation ordinance that requires certain businesses to reduce energy use by 20% when a property is sold. This package of actions includes exploration of point of sale energy use disclosures, energy audits, and energy efficiency upgrades.

Sector & Subsector	Commercial buildings – total energy	
Reduction Percent	20%	Source: Berkeley[80] and Oakland programs[81], LBNL assessment of retro-commissioning[82]
Currently Implemented by the Sector in 2010	0%	Source: N/A
Implementation Goal by 2035		GHG Reduction in 2035 (MT CO2e)
50% of commercial square feet		-3,610

RESIDENTIAL ENERGY CONSERVATION ORDINANCE

Description: The City could adopt an ordinance that requires cost-effective energy efficiency upgrades in existing buildings be implemented at point of sale or during major renovation of residential units. A maximum cost ceiling would be established to protect owners from excessive fees.

Sector & Subsector	Residential buildings – total energy	
Reduction Percent	10%	Source: City of Berkeley,[83] City of San Francisco,[84] and Boulder, CO assessment[85]
Currently Implemented by the Sector in 2010	0%	Source: N/A
Implementation Goal by 2035		GHG Reduction in 2035 (MT CO2e)
85% of residential units		-3,760

[80] City of Berkeley. 2012. Commercial Energy Conservation Ordinance. http://www.ci.berkeley.ca.us/ceco/

[81] City of Oakland. 2012. Oakland Shines. http://oaklandshines.com/index.php

[82] Lawrence Berkeley National Laboratory. 2004. Cost-Effectiveness of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States (page 1). www.ga.wa.gov/eas/bcx/Cx_Cost Effectiveness.pdf

[83] City of Berkeley. 2012. Residential Energy Conservation Ordinance. http://www.ci.berkeley.ca.us/reco/

[84] Eco Leader – Residential Energy Conservation Ordinance Factsheet http://ecoleader.org/assets/downloads/RECO/RECO_factsheet.pdf

[85] City of Boulder RECO Report (page 4) -http://www.bouldercolorado.gov/files/reco_report_boulder.pdf.

MEMORANDUM

Date: April 25, 2013

To: Matt Burris, Raimi + Associates

From: Christopher Gray, Fehr & Peers

Subject: ***City of Coachella Climate Action Plan - Transportation Related Materials***

IE11-0067

This memorandum documents transportation related information for the City of Coachella Climate Action Plan (CAP). This memorandum includes:

- A VMT estimation background discussion
- Historical (2005, 2008, 2010) vehicle miles traveled (VMT) derived from the Riverside County (RIVTAM) Regional Travel Demand Model
- Future Year (2020 and 2035) VMT derived from the Riverside County (RIVTAM) Regional Travel Demand Model
- Quantification for GHG reduction measures

Additional information regarding these items is presented below.

VMT ESTIMATION BACKGROUND

The analysis focuses on VMT forecasts since emissions are calculated from VMT data. To evaluate VMT, two key questions must be answered. The first relates to "What VMT is Counted." The second relates to "How VMT is Counted." Each of these questions is critical to address in the analysis.

The issue of what VMT is counted is a complex one since vehicle travel patterns, especially in Southern California, can be extremely varied. As opposed to other emissions-producing activities that can be easily assigned to various cities, vehicular travel is not so easily assigned. For example, it is not uncommon for commute trips in Southern California to cross several city or even county boundaries. Therefore, the VMT analysis must specifically address the issue of inter-city or inter-county travel. For purposes of this discussion, this issue is referred to as "accounting rules for VMT" or "accounting rules."

The second aspect of the analysis is also problematic given the variety of data sources and tools available to estimate VMT. There are at least five methods available to estimate VMT and each approach has its own positive and negative aspects.

It should be noted that the accounting rules and analytical tools are strongly interlinked. Depending on the accounting rules selected, certain analytical tools may be required or conversely precluded. It is generally

recommended that the accounting rules be identified first and then an appropriate analytical tool be selected.

Accounting Rules

Accounting rules refer to the process by which various travel markets and trip types are segregated in estimating VMT. Some specific questions addressed by accounting rules include:

- How are internal trips (those beginning and ending within the City/County) treated?
- How are external trips (those beginning inside the City that might leave the City/County or those that might enter the City/County from outside) addressed?
- How are through trips (those not beginning or ending in the City/County) dealt with?

Most community inventories completed previously apply one of two potential approaches to deal with accounting rules: a geographically based approach, or an origin/destination based approach.

A recent development related to Greenhouse Gas (GHG) Emission and VMT estimates is the implementation of Senate Bill 375, which convened an advisory panel called the Regional Targets Advisory Committee (RTAC) to review issues related to the modeling of VMT and available tools. One of the major conclusions of the RTAC was to recommend the following approach in estimating VMT:

- VMT estimates should include 100% of all travel that begins and ends within a jurisdiction
- VMT estimates should include a portion of travel (50%) that either begins or ends within a jurisdiction
- VMT estimates should exclude travel that neither begins or ends within a jurisdiction

While these recommendations applied to Metropolitan Planning Organizations (MPO's), this same methodology can also apply to cities and counties conducting inventories. Information regarding this approach is outlined in the *Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375* (September 2009). The RTAC approach reflects the origin/destination based approach discussed below and represents an attempt to address jurisdictional issues identified above as they apply to MPO's.

Geographically Based Approach

One common approach is to estimate VMT based on geographical boundaries of a jurisdiction. As an example, a number of inventories completed to date at the city-wide or county-wide level have stopped at the jurisdictional boundaries. This approach has both positive and negative aspects as listed in Table 1 below.

Table 1
Pros/Cons of the Geographically Based Approach

Pros	Cons
It is often relatively easy to identify the jurisdictional boundaries for a city or county as these limits are legally defined.	This approach makes it difficult to exclude through travel. In cases of cities or counties with large amounts of through travel when a major freeway or roadway is located within the city, the use of this approach may overestimate transportation emissions. Including these vehicles in the inventory can be problematic given the limited ability for a city or county to influence through traffic VMT.
It is often relatively easier to calculate VMT using this approach as a number of the analytical tools discussed below report VMT geographically.	Most importantly, this approach excludes travel that might leave the jurisdictional boundary; which ignores the common realities of travel whereby people often live, work, and shop in different locations.

Source: Fehr & Peers, 2013

Origin/Destination Based Approach

A second approach looks at trip origins and destinations. This approach considers vehicular travel in terms of where trips start and end rather than limiting the analysis to jurisdictional boundaries. The positive and negative aspects of this approach are listed in Table 2 below.

Table 2
Pros/Cons of the Origin/Destination Based Approach

Pros	Cons
This approach is more consistent with the emerging consensus on VMT estimating, as outlined in the RTAC report.	Calculating VMT by origins/destinations can be more technically challenging, depending on the availability of data and analytical tool used.
This approach excludes through travel, which has been noted to be particularly problematic and difficult to effectively address by most cities and counties.	It may be difficult to determine the appropriate boundary to limit the tracking of trips. As an example, in Southern California, there are recorded instances of commutes that cross multiple city and county boundaries.
Similar approach being used for Riverside County and Moreno Valley Transportation analysis related to Climate Action Plan. Using the O/D approach will provide greater consistency with these analyses.	

Source: Fehr & Peers, 2013

Recommendation

The City of Coachella Climate Action Plan implemented the origin/destination based approach for the following reasons:

- This approach directly addresses the issues of through traffic, which is an issue of potential concern
- Several analytical tools can be used to identify VMT using this approach so it can be implemented with the available data
- This approach is consistent with efforts underway in other SCAG regions

Analytical Tools

Regional Travel Demand Models

Regional travel demand models are generally developed by MPO's to analyze existing and future travel behavior. Regional travel demand models include residential uses, non-residential uses (office, retail, industrial, etc.), and transportation networks (highway and sometimes transit facilities) as inputs to the model. Some of the reasons why regional travel models are used are:

- Regional models can track trips throughout a region, allowing the analysis to include vehicles entering or leaving a jurisdiction
- Regional models can be used to segregate through trips from any VMT estimates
- Regional models typically have both existing and future year data

The regional travel demand model available for use in this study area is the model developed by the Southern California Association of Governments (SCAG) for the 2008 Regional Transportation Plan (RTP). This model includes data for all six counties in the SCAG region including Ventura, Los Angeles, Orange, Riverside, San Bernardino, and Imperial. While the SCAG Model includes data for all of the regions, it often lacks detail within individual cities as compared to other tools. Table 3 provides pros and cons of regional travel demand models.

Table 3 Pros/Cons of Regional Travel Demand Models	
Pros	**Cons**
Regional models can track trips throughout a region, allowing the analysis to include vehicles entering or leaving a jurisdiction, thereby implementing the origin/destination approach identified above.	May require some level of technical assistance from technical experts (such as private consultants or regional agency staff) versed in the use of regional travel modeling as some manipulation of the model outputs is required.
Can be used to segregate through trips from VMT estimates.	Some regional agencies restrict use of their models to agency staff; therefore all requests for the use of the model have to be made through the regional agency.
Can also be used to implement a geographically based approach model if desired.	As regional models generally cover either a county or several counties, these models may not be as detailed as required, particularly for a smaller city located within a larger region.
Regional agencies typically have both existing and future year models, simplifying the forecasting process.	
Source: Fehr & Peers, 2013	

Local Travel Demand Models

Many cities and counties have elected to develop their own travel demand models. These models typically have more detail than the regional model with more refined land use and greater detail in the transportation network. In some cases, these travel demand models were developed using the regional model as a base. Local travel models are used for the same reasons regional travel models are used but are likely to have very detailed information regarding land use data and roadway networks for local jurisdictions. Table 4 provides pros and cons of local travel demand models.

Table 4
Pros/Cons of Local Travel Demand Models

Pros	Cons
Local travel models are likely to have very detailed information regarding land use data and roadway networks for a local jurisdiction.	It may be difficult to account for persons traveling outside of the city/county boundary unless adjustments are made to the model.
Local travel models can segregate through-traffic as needed.	Some technical assistance will be required as some manipulation of the model inputs and outputs would be required.
Local travel models are usually either maintained by in-house staff or transportation consultants and may be more accessible to those persons preparing the inventory as compared to a regional travel demand model.	
Local city travel demand models typically have both existing and future year versions, simplifying the forecasting process.	

Source: Fehr & Peers, 2013

Published Sources

One common way to obtain VMT data is to review published sources that provide VMT for existing communities. A common source is the Highway Pavement Monitoring System (HPMS), which is maintained by Caltrans. The HPMS data estimates VMT based on traffic counts and roadway length. One limitation is that in some instances, the VMT is taken from a larger study area, as in when the VMT estimates for a city are derived from the countywide data by applying a proportional reduction. It is also problematic to estimate future VMT using data from HPMS and other published sources unless more simplified extrapolation techniques are employed. Table 5 provides pros and cons of published sources.

Table 5
Pros/Cons of Published Sources

Pros	Cons
Compared to other methods, this one is relatively easy to apply.	It is generally not possible to segregate through trips in these VMT estimates.
Does not necessarily require persons with specialized expertise in transportation planning and engineering.	The method generally is not consistent with the origin/destination accounting rule and would only be applicable if the analysis was limited to jurisdictional boundaries.
	It is difficult to generate future forecasts without some form of an extrapolation process.

Source: Fehr & Peers, 2013

Air Quality Analysis Tools

Another option to estimate transportation emissions is using air quality analysis tools, such as EMFAC, URBEMIS, and CalEEMod. In the case of EMFAC, VMT data is provided for various counties in California, however, information is not provided for sub-areas less than the county level. Additionally, EMFAC, URBEMIS, and CalEEMod have extensive amounts of pre-coded data, which may or may not be appropriate for an individual city. Table 6 provides pros and cons of air quality analysis tools.

Table 6 Pros/Cons of Air Quality Analysis Tools	
Pros	**Cons**
In the case of EMFAC, a single number can be obtained if the area of analysis is an entire county.	EMFAC, URBEMIS, and CalEEMod have extensive amounts of pre-coded data, which may or may not be appropriate for an individual community.
URBEMIS, CalEEMod, and EMFAC are widely used throughout California by environmental consultants, creating a large pool of available persons who are well versed in their use.	In the case of EMFAC, a significant amount of post-processing would be required to obtain VMT estimates for an individual jurisdiction within a county. For example, using the EMFAC data for VMT estimates for an individual city could be obtained by proportioning the VMT based on the ratio of city to county population, although this approach is not generally recommended if other information is available.
EMFAC does provide future forecasts at the county level.	URBEMIS and CalEEMod require the input of future land use data to develop forecasts.
EMFAC, URBEMIS, and CalEEmod can be customized by the users.	Applying URBEMIS and CalEEMod on a citywide level would require that the individual land uses be input into URBEMIS and CalEEMod. While this process is relatively easy for an individual project, it would be quite complicated for a mid to large size city. URBEMIS and CalEEMod use trip generation rates that account for trips coming and going to a particular land use; therefore, on a city-wide basis it tends to double count trips and emissions.
	As both programs have data and assumptions coded into the models, it would be difficult to account for some accounting rules. For example, if there was a desire to exclude through traffic, then it would not be possible to exclude through traffic from the EMFAC outputs.
Source: Fehr & Peers, 2013	

Tool Selection

Based on a review of the available analytical tools described above, the SCAG regional travel demand model was selected for this study. This tool is able to implement the recommended origin/destination based approach while also providing base year and future year data.

HISTORICAL VMT

VMT for 2005, 2008, and 2010 is reported in Table 7. VMT data for this year was taken from the RIVTAM travel demand model as discussed above. This analysis uses 2010 as the baseline year because it is the most recent reasonably complete data set available for the analysis. Further, the City experienced very little growth between 2010 and 2013 and the VMT is considered a reasonably similar estimate of 2013 VMT.

Table 7
Historical VMT Forecast & Estimates

	Daily VMT		
	2005	**2008**	**2010**
City of Coachella	704,748	822,546	888,299
Source: Fehr & Peers, 2013			

FUTURE YEAR VMT

Future year VMT is provided for 2020 and 2035. Table 8 provides daily VMT for 2020 and 2035.

Table 8
VMT Forecasts

	Daily VMT	
	2020	**2035**
City of Coachella	2,214,286	3,870,652
Source: Fehr & Peers, 2013		

POTENTIAL GHG REDUCTION MEASURES

Measure #1- Increase Residential and Commercial Density

Application to City

This measure would encourage higher density development within the City since higher density development generally produces fewer trips than development configured with typical suburban densities. Higher density sites are also more conducive to transit, bicycle use, and walking. This measure is typically implemented through General Plan policies, the Zoning Code, and other related items.

Supporting Policy Language

Supporting policies in the General Plan include:

- LU-6 (Sub Area 2)
- LU-2.8
- LU 2.9
- LU 11.2
- S 1.2
- S 11.2

Potential Level of VMT Reduction

Land use policies, when applied globally, have the potential to produce relatively high levels of reduction. The CAPCOA document estimates that this measure can produce VMT reductions of up to 30%, though this reduction will only apply to areas of new development or redevelopment.

Estimated VMT Reduction

An estimate of the VMT reduction is dependent on two factors. First, the amount of VMT associated with new development is a limitation on how beneficial this policy might be. In the case of Coachella, 30% of the Future Year VMT (2035) is associated with existing development and 70% of the same VMT is associated with new development based on a ratio of 2035 to 2010 VMT. So, any reduction calculated would only be applied to 70% of the total 2035 VMT.

The second factor is the change in density Citywide. The current City has a density of 1,500 service population (residents plus employees) per square mile of the City. The Proposed General Plan has a density of 5,700 service population for the City. This increase in density represents a 280% change in the density of the City. The CAPCOA document indicates a VMT reduction elasticity of -0.07 with respect to density. Applying this elasticity to the percentage change in density results in a VMT reduction of 15%.

Potential Measure #2- Increase Level of Mixed-Use

Application to City

As part of this measure, the City would encourage additional mixed-use development as this type of development produces less VMT on a per capita basis as compared to traditional development. Providing

a mix of uses ensures that jobs, shopping, and housing are located proximate to each other, which allows many trips to be made through either walking or biking or through short-distance vehicular trips.

Supporting Policy Language

The General Plan provides the following statements related to mixed-use including:

- LU-1 (Sub-Area 1)
- LU-3 (Sub-Area 2)
- LU-5 (Sub-Area 3)
- LU-10 (Sub-Area 11)
- LU-5 (Sub-Area 14)
- LU-8-(Sub-Area 14)
- LU-2.8
- LU 2.9
- LU 5.1
- LU 5.15
- LU 6.6
- LU 9.6
- S 1.2

Potential Level of VMT Reduction

Similar to measures that address density, improving the level of mixed-use can have a significant effect on vehicular travel and GHG emissions. The CAPCOA document estimates that similar measures can produce VMT reductions of up to 30%. Since these policies could potentially involve the retrofit of uses within existing areas and new areas, we would apply the potential reduction to the future Citywide VMT.

Estimated VMT Reduction:

Using the jobs/housing balance as a measure of the Citywide level of mixed-use, the VMT reduction calculates to be 4% using the alternative approach identified in CAPCOA.

Potential Measure #3-Improve Design of Development

Application to City

The design of new development, including the provision of pedestrian and bicycle connections can have a significant influence on travel behavior. As an example, providing sidewalks and crosswalks can encourage high levels of walking. As a converse, when sidewalks are absent, people will often choose to drive even for short distance trips. One related issue is that it is often problematic to travel between neighborhoods because of a lack of direct connections.

Supporting Policy Language

This measure is partially referenced by the following policies in the proposed General Plan:

- LU-2 (Sub-Area 1)

- LU-3 (Sub-Area 1)
- LU-4 (Sub-Area 1)
- LU-7 (Sub-Area 1)
- LU-3 (Sub-Area 2)
- LU-5 (Sub-Area 3)
- LU-1 (Sub-Area 6)
- LU-3 (Sub-Area 6)
- LU-3 (Sub-Area 10)
- LU-10 (Sub-Area 11)
- LU-5 (Sub-Area 14)
- LU-8-(Sub-Area 14)
- LU-3.2
- LU-3.3
- LU 5.1
- LU 5.2
- LU 5.4
- LU 5.7
- LU 5.9
- LU 5.10
- LU 5.15
- LU 6.6
- LU 6.9
- LU 9.1
- LU 9.3
- M 3.4
- M 3.5
- M 3.7
- M 4.3
- S 1.2
- S 11.2

Likely Level of VMT Reduction

Similar to measures that address density, improving the level of mixed-use can have a significant effect on vehicular travel and GHG emissions. The CAPCOA document estimates that similar measures can produce VMT reductions of up to 20%. Since these policies could potentially involve the retrofit of uses within existing areas and new areas, we would apply the potential reduction to the future Citywide VMT.

Estimated VMT Reduction:

The CAPCOA document provides a variety of methods to estimate VMT reduction. One method to estimate the effect of this strategy is to look at intersections per square mile. According to information collected for Caltrans, intersections in more urbanized suburban areas have 70% more density than typical suburban

development in Riverside County. Applying this 70% increase against the CAPCOA elasticity provides a reduction of 8% for the design elements.

Potential Measure #4-Provide Pedestrian Network Improvements

Application to City

This measure would be implemented through the construction of additional sidewalks within the City. These sidewalks would either be constructed by the City in conjunction with the widening of existing roadways or the construction of new roadways. Additional sidewalks would also be built within new developments as they occur.

Supporting Policy Language

This measure is referenced by the following policies in the proposed General Plan:

- LU-2 (Sub-Area 1)
- LU-3 (Sub-Area 1)
- LU-4 (Sub-Area 1)
- LU-3 (Sub-Area 2)
- LU-5 (Sub-Area 3)
- LU-1 (Sub-Area 6)
- LU 5.8
- LU 5.11
- LU 5.10
- M 1.1
- M 1.2
- M 1.5
- M 3.1
- M 3.2
- M 3.3
- M 3.9

Likely Level of VMT Reduction

This strategy is likely to have a limited effect on VMT with a predicted reduction of 2% or less.

Estimated VMT Reduction:

Given the potential expansion of pedestrian facilities, the highest level of reduction is assumed for these pedestrian improvements at 2%.

Potential Measure #5-Provide Traffic Calming

Application to City

This measure would implement traffic calming techniques in existing and future developments within the City. These traffic calming techniques can include elevated crosswalks, elevated intersections, chicanes, speed tables, and other similar elements.

Supporting Policy Language

This measure is referenced by the following policies in the proposed General Plan:

- LU-4 (Sub-Area 1)
- LU-11 (Sub-Area 9)
- M 2.1
- M 2.2

Likely Level of VMT Reduction

The CAPCOA document estimates that the VMT reduction is likely to be less than 1%, depending on the number of roadways and intersections with traffic calming improvements.

Estimated VMT Reduction:

Given the uncertainty regarding the number of locations where traffic calming will be implemented, the reduction for the City of Coachella is assumed to be less than 1%.

Potential Measure #6-Provide Pedestrian Only Zones

Application to City

This measure would implement temporary areas within the City where vehicular traffic is limited or prohibited for festivals, community gatherings, and other events.

Supporting Policy Language

This measure is referenced by the Policy M 3.6 in the proposed General Plan.

Likely Level of VMT Reduction

The CAPCOA document estimates that the VMT reduction is likely to be less than 1%, depending on the number of roadways and intersections with traffic calming improvements.

Estimated VMT Reduction:

Since these closures would occur only on a temporary basis, the reduction for the City of Coachella is assumed to be less than 1%.

Potential Measure #7-Provide Bicycle Facilities (In-Street)

Application to City

The City would implement this measure by providing Class II (striped on-street bicycle lanes) or Class III (signed bicycle routes) bicycle facilities.

Supporting Policy Language

- LU-4 (Sub-Area 3)
- M 4.1
- M 4.2
- M 4.3
- M 4.5

Likely Level of VMT Reduction

The CAPCOA document estimates that this strategy will produce a VMT reduction of less than 1%. While creating bicycle lanes and routes could increase bicycle commuting substantially, the overall effect on vehicular travel is likely to be limited.

Estimated VMT Reduction:

The General Plan will add approximately 200 miles of roadways with Bicycle lanes, which will represent a significant expansion in the amount of bicycle lanes within the City. Nearly all of the arterials and collectors will have bicycle lanes added as they are built or reconstructed as the General Plan is implemented. Even with this significant expansion of bicycle facilities, the VMT and GHG reduction will be less than 1%.

Potential Measure #8-Provide Bicycle Parking

Application to City

In addition to the on-street bicycle facilities identified previously, the City would ensure that bicycle parking is provided throughout the City. Bicycle parking can be addressed through the Zoning Code and other similar implementation documents. Parking for bicycles is usually addressed through creating and enforcing parking requirements, similar to vehicular parking requirements.

Supporting Policy Language

This measure is referenced by the Policy M 4.6 in the proposed General Plan.

Likely Level of VMT Reduction

The level of VMT reduction for this measure is likely to be less than 1%.

Estimated VMT Reduction:

The VMT reduction is assumed to be less than 1%.

Potential Measure #9-Implement Bicycle Trails

Application to City

This measure is complementary to Measure #5 in that it addresses off-street bicycle facilities or trails. These facilities would likely extend from residential areas to parks and schools.

Supporting Policy Language

- LU-8 (Sub Area 9)
- LU-6 (Sub-Area 14)
- M 4.2
- M 4.3
- M 4.5
- M 8.3

Likely Level of VMT Reduction

The CAPCOA document was not able to provide a definitive quantification of this measure. As such, we would estimate the likely effectiveness to be limited. Much of the activity generated on these trails could be associated with recreational travel, exercise, and other trip types as compared to the longer distance commute trips.

Estimated VMT Reduction:

The General Plan will add approximately 50 miles of off-street Bicycle trails, which will represent a significant expansion as compared to the existing configuration. Even with this significant expansion of bicycle facilities, the VMT and GHG reduction will be less than 1%.

Potential Measure #10-Limit Parking Supply

Application to City

As part of this measure, the City would require parking requirements for private development, which could reduce vehicular use. Lack of available parking is often a strong disincentive to driving.

Supporting Policy Language

This measure is referenced by Policy M 3.8 in the proposed General Plan.

Likely Level of VMT Reduction

Parking reductions have the potential to produce a significant reduction in VMT with estimated reductions of up to 12%, based on the CAPCOA document.

Estimated VMT Reduction:

Quantifying this measure requires that we make assumptions about the level of parking reduction that is anticipated to occur. This analysis assumes that there is an aggregate reduction in parking requirements by 10%, which equates to a VMT reduction of 5%.

Potential Measure #11- Expand Transit Network

Application to City

A key aspect of any well-rounded transportation system is transit. Providing access to transit for City residents and employees can reduce automotive use. There are currently five Sunline Transit Bus Routes that provide access to the City. As part of this measure, the City would coordinate with Sunline Transit to increase transit service throughout the City.

Supporting Policy Language

- LU-10 (Sub Area 2)
- LU-12 (Sub-Area 2)
- M 5.1
- M 5.2
- M 5.3
- M 5.4
- M 5.5
- M 8.1

Likely Level of VMT Reduction

The potential level of reduction associated with this measure could be as high as 8%, based on materials provided by CAPCOA. However, the likely level of benefit in the City of Coachella would be much less given the suburban nature of the City.

Estimated VMT Reduction:

The VMT reduction is estimated to be 1%, based on a 100% increase in transit service coverage over the City.

Potential Measure #12- Travel Demand Management

Application to City

Travel demand management (TDM) refers to strategies which reduce the need for people to travel in automobiles, particularly for work trips. Example TDM applications could include:

- Alternative work schedules
- Vanpooling
- Carpooling
- Telecommuting

Supporting Policy Language

There are no explicit policy statements in the General Plan which reference TDM.

Likely Level of VMT Reduction

The potential level of reduction associated with this measure could be as high as 25% of all work trips based on materials provided by CAPCOA.

Estimated VMT Reduction:

We estimate that the level of reduction on a Citywide basis is likely to be approximately 5%, which assumes a relatively high level of TDM measure deployment across most of the employment areas of the City. This 5% anticipated level of reduction would be facilitated through the provision of complementary land use patterns and additional transit services, which should provide further incentives for non-automotive use. One limitation on this strategy is that a majority of the VMT is associated with residents, not employees, who would not participate in TDM programs centered on persons employed in the City.

Potential Measure #13- ITS/Traffic Flow Improvements

Application to City

One method available to the City to further reduce GHG emissions is the deployment of Intelligent Transportation Systems (ITS) which provide for more efficient traffic flow. These strategies are often implemented through signal coordination and retiming efforts.

Supporting Policy Language

There are no explicit policy statements in the General Plan which reference these strategies. However, the City has received a grant and will be preparing an ITS Master Plan to implement ITS strategies along its major corridors.

Likely Level of VMT Reduction

The potential level of reduction associated with this measure could be as high as 15% for all travel within a particular Corridor where ITS strategies were implemented.

Estimated VMT Reduction:

We estimate that the level of reduction on a Citywide basis is likely to be approximately 5% which assumes that a majority of the roadways within the City receive ITS improvements.

QUANTIFIED MEASURES

Table 9 documents high priority reduction measures discussed above and their anticipated level of effectiveness for the City of Coachella.

Table 9
Quantified Measures

Measure #	Measure	VMT Reduction
1	Density	15%
2	Mixed Use	4%
3	Development Design	8%
4	Pedestrian Networks	2%
5	Traffic Calming	<1%
6	Pedestrian Only Zones	<1%
7	Bicycle Facilities	<1%
8	Bicycle Parking	<1%
9	Bicycle Trails	<1%
10	Limit Parking Supply	5%
11	Expand Transit Network	1%
12	TDM	5%
13	ITS/Traffic Flow Strategies	5%
Totals		**40%**

Source: Fehr & Peers, 2013

The totals for each strategy are multiplied by each other, based on the direction in the CAPCOA document.

Table 10 summarizes the measures by category and documents the upper limits outlined in the CAPCOA document for the various measures.

Table 10
Summary of Reduction Measures

Category	Measures	Predicted Reduction	CAPCOA CAP	Final Reduction
Land Use/Location	1,2,3	27%	10%	10%
Neighborhood/Site Enhancements	4,5,6,7,8,9	4%	5%	4%
Parking	10	5%	20%	5%
Transit	11	1%	10%	1%
Transportation Measures CAP			**15%**	**15%**
TDM	12	5%	15%	5%
Transportation Measure + TDM CAP			**20%**	**20%**
ITS/Traffic Flow	13	5%	25%	5%
Transportation Measure+ TDM + ITS CAP			**25%**	**25%**

Source: Fehr & Peers, 2013

Applying the various caps and limitations in CAP reduces our theoretical reduction from 40% to 25%.

We hope you find this information helpful. If you have any questions or require additional information, please contact Chris Gray at c.gray@fehrandpeers.com.

APPENDIX E: BASELINE GREENHOUSE GAS INVENTORY

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Draft Report on Greenhouse Gas Emissions

Climate Action Plan E.2: Emissions Inventory

Prepared for:

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August 24, 2012

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Executive Summary

The Coachella Greenhouse Gas Emissions Inventory provides a snapshot of emissions for 2005 and 2010, quantifying the main sources of emissions from the community as a whole. The purpose of the greenhouse gas inventory is to:

- Identify and understand the sources and quantities of emissions within a local government's jurisdictional boundary;
- Create an emissions baseline that can be used by the City to measure progress towards emissions reductions targets;
- Use the baseline to prioritize and evaluate potential government actions; and
- Make informed policy decisions related to greenhouse gas emissions reduction.

Table 1: Community Emissions Summary by Sector, Scope, and Source for 2010

Sector and Emissions Source	Scope	Activity Data[1]		Metric Tons of CO_2e		
		2005	2010	2005	2010	% Change
Commercial and Industrial						
Natural Gas (therms)	Scope 1	1,575,000	1,631,000	8,000	9,000	4%
Electricity (kWh)	Scope 2	122,262,000	109,567,000	69,000	63,000	-9%
Residential						
Natural Gas (therms)	Scope 1	1,577,000	2,136,000	8,000	11,000	35%
Electricity (kWh)	Scope 2	79,444,000	99,131,000	43,000	53,000	25%
Infrastructure						
Electricity (kWh)	Scope 2	N/A	4,865,000	N/A	3,000	N/A
Transportation						
Gasoline (gallons)	Scope 1	27,000	31,000	87,000	98,000	12%
Diesel (gallons)	Scope 1	10,000	8,000	39,000	32,000	-18%
Solid Waste						
Landfill waste (tons)	Scope 3	33,000	23,000	8,000	5,000	-32%
Water						
Energy[2] (mil. of gallons)	Scope 3	3,000	4,000	12,000	17,000	45%
Scope 1 Emissions[3]				**143,000**	**149,000**	**5%**
Scope 2 Emissions[3]				**114,000**	**119,000**	**4%**
Scope 3 Emissions[3]				**19,000**	**22,000**	**15%**
Total Emissions[3]				**276,000**	**291,000**	**5%**

[1] Activity data includes a range of information, including annual metered electricity use, fuel consumption by type, solid waste production, and vehicle miles travelled. Emissions factors are used to convert activity data into greenhouse gas emissions quantities.

[2] The water sector uses both electricity and natural gas to collect, convey, treat, and deliver water to users, and then it uses additional energy to collect, treat, and dispose of the resulting wastewater. This embedded energy yields both direct and indirect greenhouse gas emissions.

[3] Totals may be slightly off due to rounding.

Key findings:

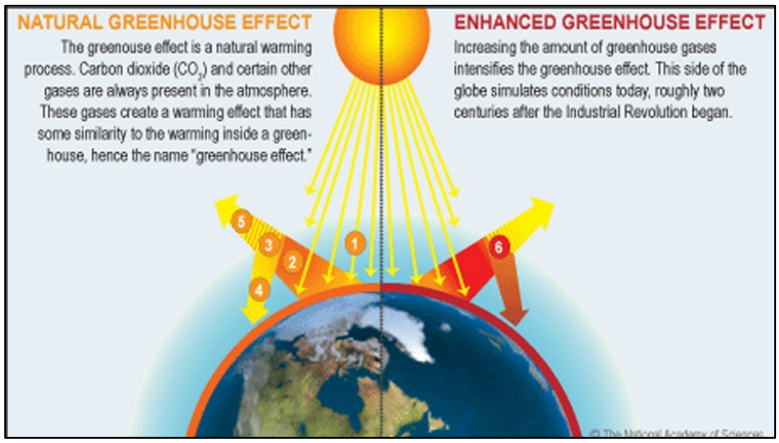
- Community-wide, the City of Coachella emitted 291,000 $MTCO_2e$ in 2010, up 5% from the 2005 greenhouse gas emissions estimate of 276,000 $MTCO_2e$.
- Greenhouse gas emissions from the transportation sector accounted for 130,000 $MTCO_2e$, or 45% of all community emissions.
- Purchased electricity accounted for 41% of the greenhouse emissions for the community as a whole.
- Annual per capita emissions were 7.14 $MTCO_2e$ emissions in 2010, down from 9.18 $MTCO_2e$ in 2005.

Chapter 1: Greenhouse Gas Emissions and Climate Change

During the last several decades, an overwhelming body of scientific evidence has demonstrated that human activity is altering the Earth's climate by increasing the concentration of greenhouse gases in the atmosphere. Climate change poses significant risks for, and may already be affecting, human and natural systems, including coastal infrastructure, human health, energy sources, agriculture, and freshwater resources.[1]

Greenhouse gases, such as carbon dioxide, ozone, methane, and nitrous oxide, have always been present in the Earth's atmosphere, keeping surface temperatures warm enough to sustain human, plant, and animal life. Greenhouse gases absorb heat radiated from the Earth's surface and then radiate the energy back toward the surface, a process called the "greenhouse effect", which is shown in Figure 1. Without the greenhouse effect, it is estimated that the Earth's average surface temperature would be approximately 60°F colder.

Figure 1: The Greenhouse Effect



Light passes through the atmosphere without being absorbed, and some of the light strikes the Earth (1) and is absorbed and converted to heat. The Earth's surface (2) emits heat to the atmosphere, where some of it (3) is absorbed by greenhouse gases and (4) re-emitted toward the surface; some of the heat is not trapped by greenhouse gases and (5) escapes into space. Human activities that emit additional greenhouse gases to the atmosphere (6) increase the amount of heat that gets absorbed before escaping to space, thus enhancing the greenhouse effect and amplifying the warming of the earth." Adapted by the Pew Center on Global Climate Change from The National Academy of Sciences).[2]

Human activities, such as the combustion of fossil fuels, industrial processes, and land use changes, have increased the amount of greenhouse gases in the atmosphere, intensified the greenhouse effect, and caused changes to the Earth's climate. Since the Industrial Revolution, greenhouse gas concentrations have risen 40% in the Earth's atmosphere and are at a level unequaled during the last 800,000 years. Higher concentrations of greenhouse gases trap additional energy in the atmosphere, resulting in more rapid warming. During the last century, the global average temperature rose 1.4°F with significant variation across the planet.[3] In California, average temperatures rose 2.1°F between 1915 and 2000.

Although climate change and global warming are often used interchangeably, warmer temperatures are only one component of climate change. Climate is an average of weather over time, and weather

[1] National Research Council, 2010. *Advancing the Science of Climate Change*. Washington, DC: The National Academies Press.
[2] Pew Center on Global Climate Change, 2011. *Climate Change 101: Science and Impacts.*
[3] Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson (eds.), 2009. *Global Climate Change Impacts in the United States*.

includes temperature, rainfall, snow storms, winds, flooding, heat waves, and other seasonal patterns. A simple way to remember the difference between weather and climate is: weather affects whether you bring an umbrella today, and climate influences whether you own an umbrella.

Climate change refers to the long-term shift in regional and global weather patterns, making it is crucial to understand more than just average annual temperature trends. Higher atmospheric greenhouse gas concentrations will alter the timing and amount of local precipitation, intensify extreme weather events, and drive sea level rise. These climatic changes may result in significant social, economic, and environmental consequences for residents and businesses in the Coachella Valley.

Projections of Future Climate

In California, studies predict that conditions will become hotter and drier, with decreased snow levels and accelerating rates of sea-level rise.[4] California should also expect an increase in the intensity of extreme weather events, such as heat waves, droughts, and floods. California's extreme warm temperatures, which have historically occurred in July and August, will most likely extend into June and September.[5] Coachella will likely experience very similar impacts.

Scientists' understanding of the fundamental processes responsible for global climate change has improved over the past decade and predictive capabilities are advancing. Scientists use atmosphere-ocean general circulation models to simulate the physical processes in the atmosphere, ocean, and land surface, using general circulation models to understand the response of the global climate system to rising greenhouse gas concentrations. These models produce grid-based information about temperature, precipitation, cloud cover, humidity, and other variables at a large-scale. These global models, however, produce data that are not precise at the regional and local scale. Therefore, scientists "downscale" model data by incorporating local historic data and adjusting for specific topographic characteristics to understand how climate variables will change in the future.

The general circulation models use scenarios that explore future development and greenhouse gas emissions. The scenarios are grouped into families according to a similar storyline that describe the factors driving greenhouse gas emissions. These factors include population growth, technological dispersion, energy sources, ecological factors, and economic growth.

In general, more than one scenario is used to capture the range of future greenhouse gas emissions and uncertainty in the assumptions about population growth, economic development, and technological deployment. This report uses A2 (higher emissions) and B1 (lower emissions) scenario data in the following section.

---

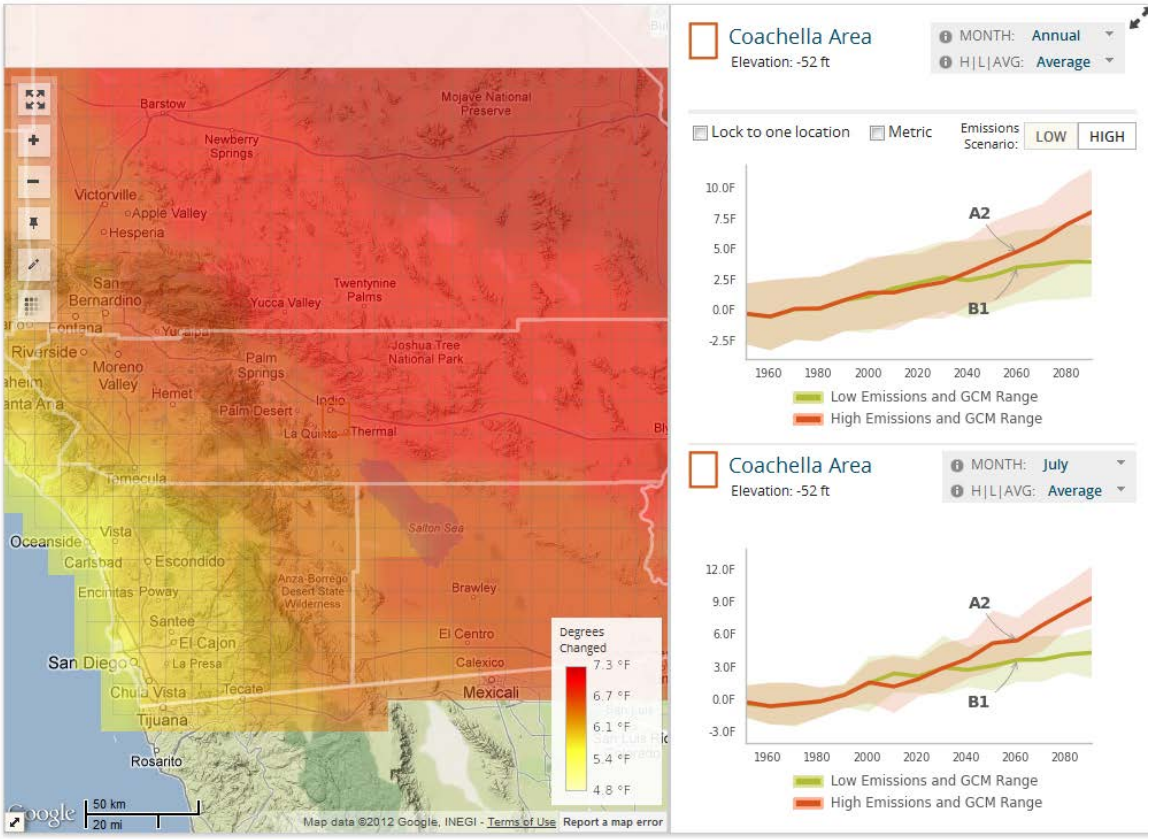
[4] Moser, Susanne, Guido Franco, Sarah Pittiglio, Wendy Chou and Dan Cayan (2008). The Future is Now: An Update on Climate Change Science Impacts and Response Options for California. 2008 Climate Change Impacts Assessment Project – Second Biennial Science Report to the California Climate Action Team, CEC-500-2008-071, Sacramento, CA.

[5] California Climate Action Team, "Draft Biennial Climate Action Report" March 2009. Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.

Temperature

Climate change will continue to increase temperatures across the globe and within California. Scientists predict that over the next century, global temperatures will increase between 2.5°F and 10.4°F, depending upon the amount of future emissions and how the earth responds to those emissions.[6] For California, the average annual temperature is expected to rise 1.8°F to 5.4°F by 2050 and 3.6°F to 9°F by the end of the century.[7] For the Coachella area, scientists expect average temperatures to increase between 2.5°F and 7.5°F as shown in Figure 2.

Figure 2: Temperature: Degrees of Change Map[8]



Along with changes to average annual temperature, climate change will alter seasonal temperatures. Average July temperatures could increase by as much as 9.0°F, resulting in average temperatures above 100°F.[9]

These long-term temperature increases will be experienced along with short-term variation (daily, annual, and multi-year) in temperature related to Earth system changes such as El Niño, La Niña, or

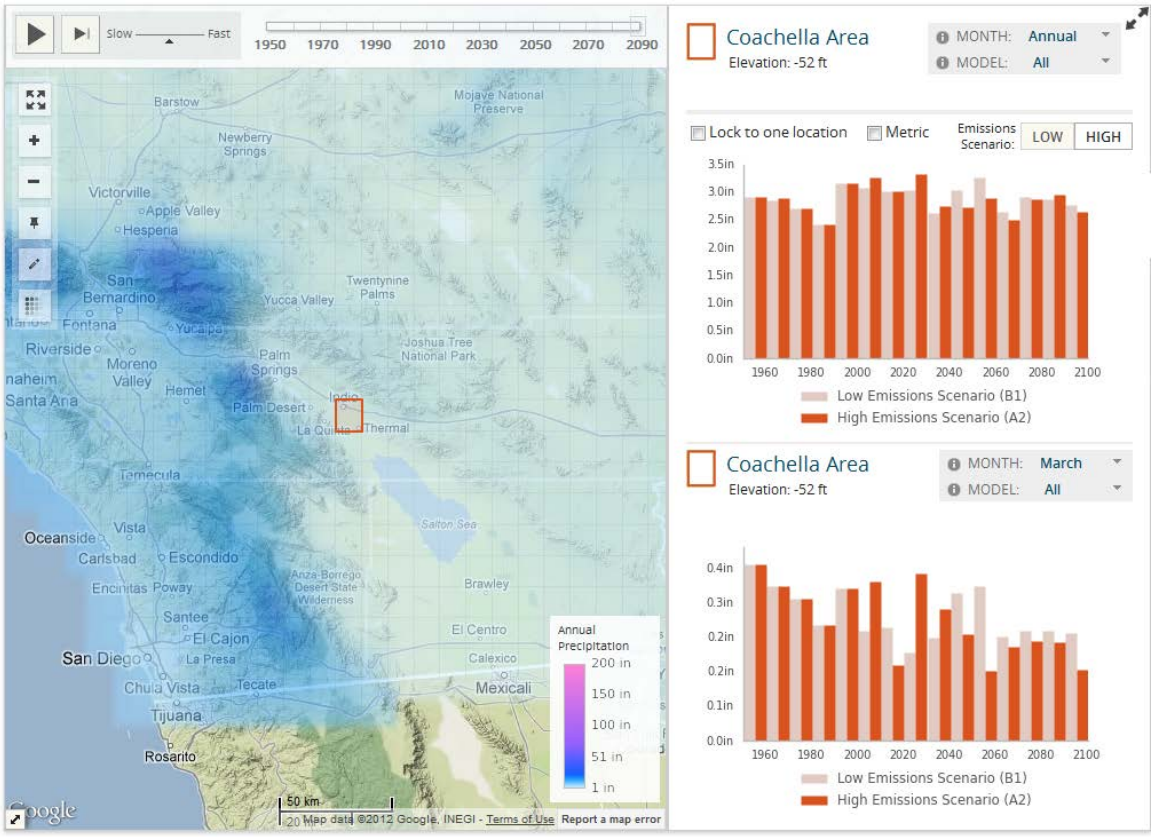
[6] Intergovernmental Panel on Climate Change, 2007. *Climate Change 2007: Mitigation of Climate Change*.
[7] California Natural Resources Agency, 2009. *California Climate Adaptation Strategy*.
[8] Scripps Institution of Oceanography. 2009. Projected Temperatures Data Set. Received from http://cal-adapt.org/temperature/century/.
[9] Scripps Institution of Oceanography. 2009. Projected Temperatures Data Set. Received from http://cal-adapt.org/temperature/century/.

volcanic eruptions. As a result, temperatures for a single day or year may be higher or lower than the long-term average.[10]

Precipitation

Research suggests that in California, climate change is likely to decrease annual precipitation amounts by more than 15% by the end of the 21st century.[11] In Coachella, precipitation will remain about the same over the next century, fluctuating around 3 inches per year as shown in Figure 3. Even though average annual precipitation will remain near the same regional total, seasonal precipitation will change more significantly with March and April receiving less rainfall than in the past. As a result of the seasonal change, Coachella will likely experience longer periods of drought, as the summer dry season extends earlier into the spring and later into the fall.

Figure 3: Precipitation: Decadal Averages Map[12]



Extreme Events and Storms

California will likely experience changes in heat waves, storms, and extreme weather events due to climate change. For example, heat waves are likely to become more frequent by the end of the century

[10] National Aeronautics and Space Administration. (2005). What's the difference between weather and climate?. Retrieved from http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html.

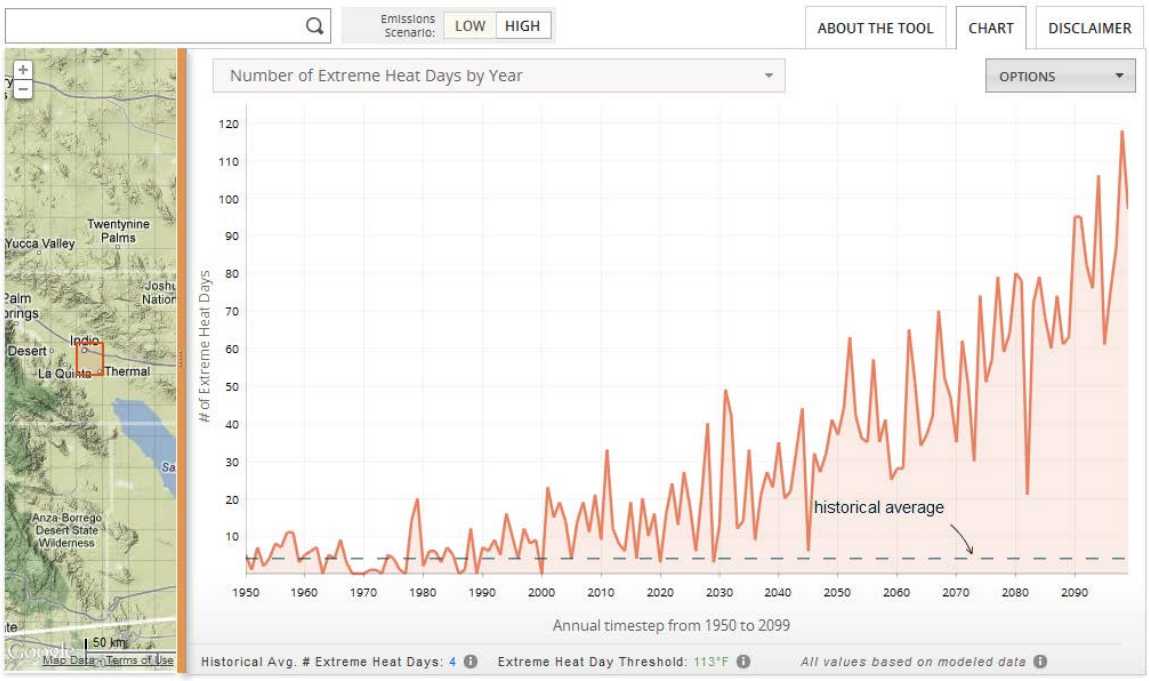
[11] California Climate Action Team, "Draft Biennial Climate Action Report" March 2009. Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.

[12] Scripps Institution of Oceanography. 2009. Projected Precipitation Data Set. Received from http://cal-adapt.org/precip/decadal/.

and storm surges and flooding in coastal storms are likely to impact the coast more severely. In addition, California's wet year and drought year cycles, which are connected to the El Nino Southern Oscillation cycles, are likely to become more intense. These changes can have significant impacts on both property and human health and safety.

In Coachella, the frequency, intensity, and duration of heat waves and droughts are expected to increase in the future. Coachella is likely to see a significant increase in the number of days when temperature exceeds the extreme heat threshold of 113°F. Between 1950 and 2011, the average number of extreme heat days was four. As shown in Figure 4, by 2050, the number of extreme heat days could raise to as many as fifty per year, and by the end of the century, the number of extreme heat days could exceed one hundred per year. Warmer days will also be accompanied by warmer nights, which could have a significant, negative effect on public health.

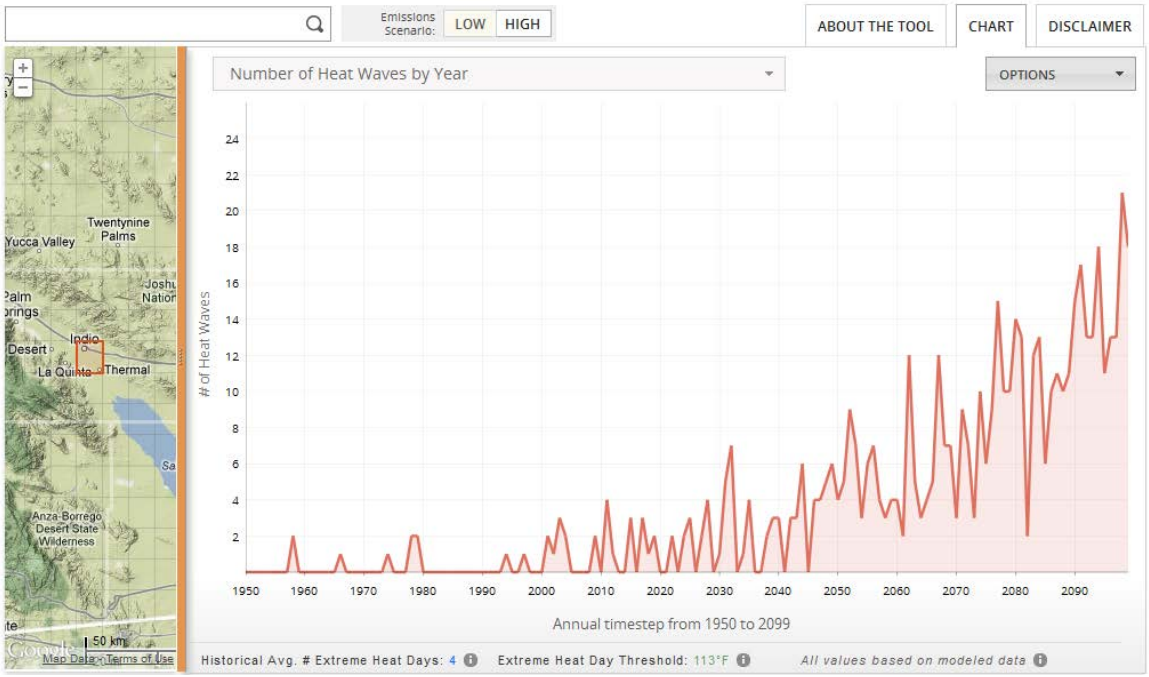
Figure 4: Number of Extreme Heat Days by Year[13]



In 2011, Coachella experienced four, five-day heat waves, where temperatures exceeded the extreme heat threshold of 113°F. By mid-century, the number of heat waves could reach approximately ten per year, potentially exceeding twenty by the end of the century as shown in Figure 5.

[13] Scripps Institution of Oceanography. 2009. Projected Daily Temperature Data Set. Received from http://cal-adapt.org/temperature/heat/.

Figure 5: Number of Heat Waves by Year[14]



Impacts of Climate Change in Coachella

Coachella will face significant challenges associated with rising temperatures, changes to precipitation patterns, and extreme weather. As indicated in the prior sections, many of the phenomena and impacts are already being observed. These climate changes will impact a number of sectors within the region, resulting in significant social and economic consequences across the region. This section describes the likely impacts of climate change on Coachella to the following sectors: public health, water resources, and economic systems.

The Summary of Climate Change Phenomena by Sector table (Table 2) outlines key climate change phenomena described in the previous chapter and their associated impacts and consequences by sector for Coachella. Many of the impacts and consequences will be felt across multiple sectors. This summary focuses on climate change impacts to sectors within the purview of city planners and does not include those impacts to all sectors.

[14] Scripps Institution of Oceanography. 2009. Projected Daily Temperature Data Set. Received from http://cal-adapt.org/temperature/heat/.

Table 2: Summary of Climate Change Phenomena, Impacts, and Consequences by Sector

Climate Change Phenomena	Sector Affected	Associated Impacts	Associated Consequences
Temperature and extreme heat events	Public Health	• Heat-related: heat waves and urban heat island • Wildfires	• Illnesses, injuries, and loss of life • Decline in air quality
	Water Resources	• Drought	• Decline in quantity and quality of freshwater • Increased water demand
	Economy	• Drought • Heat	• Loss of agricultural productivity • Energy disruption • Economic gains/losses
Precipitation and extreme precipitation events	Public Health	• Flooding • Drought	• Illnesses, injuries, and loss of life
	Water Resources	• Flooding • Drought • Nonpoint source pollution	• Illnesses, injuries, and loss of life • Decline in quality of freshwater • Economic losses
	Economy	• Flooding • Drought	• Loss of agricultural productivity • Destruction and damage to property • Economic gains/losses

Public Health

Climate change will affect the health and welfare of people and communities around California and within Coachella. Climate-related impacts related to heat, drought, and wildfires will have particularly significant health effects within the Coachella Valley. It is expected that climate change will have differential effects on different subpopulations within the region, where biological sensitivity, socioeconomic factors, and geography will likely contribute to the heightened risk for climate-sensitive health outcomes. Vulnerable populations include children, pregnant women, older adults, low-income communities, people with chronic diseases and mobility / cognitive constraints, and outdoor workers. Other socioeconomic factors include income, the prices of goods and services, access to vaccines, exposure to pesticides, diet, lifestyles, social networks, and other factors.

Heat-related

As discussed earlier, along with seasonal warming, California and Coachella will experience a larger number of extreme heat days, warm nights, and more prolonged periods of hot weather. Periods of increased high temperatures or extended high temperatures lead to increased heat-related mortality, cardiovascular-cause mortality, respiratory mortality, heart attacks, and other causes of mortality. Emergency medical services and hospitals also increase during heat waves.

California experienced a similar heat wave during July 2006, which broke temperature records around the State over a ten-day period and caused at least 140 deaths. During the heat wave, hospital and

emergency department visits increased statewide from the baseline conditions, resulting in 16,166 excess emergency department visits and 1,182 excess hospitalizations. Risk ratios for heat-related illness increased significantly during the heat wave for the Coachella region, but the heat wave also elevated risk ratios for electrolyte imbalance, acute renal failure, and nephritis. In particular, heat-related illnesses impacted people over 65 and Latino/Hispanic persons.[15]

Along with heat-related illness, changes in temperature are expected to worsen air quality, particularly ozone and particulate matter concentrations. Currently, Riverside County is ranked as the fourth most polluted county by short-term particle pollution (24-hour $PM_{2.5}$) and year-round particulate pollution (Annual $PM_{2.5}$) and the second most ozone-polluted county in the country. Riverside County received an F grade for High Ozone Days 2008-2010 with 227 orange days (unhealthy for sensitive populations), 66 red days (unhealthy), and 4 purple days (very unhealthy).[16]

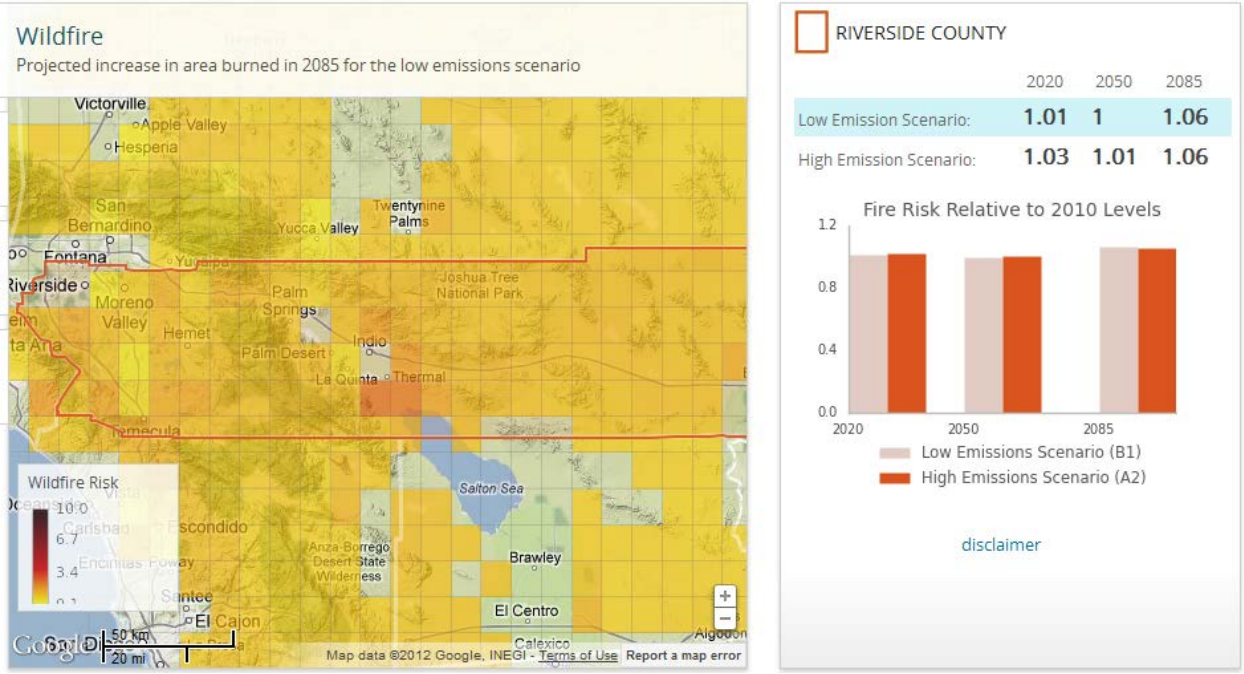
Not only could climate could slow California's progress toward attainment of health-based air quality standards and increase pollution control costs, it will increase the risk of incidences of asthma, allergies, chronic obstructive pulmonary disease, other cardiovascular and respiratory diseases, skin cancer, and cataracts.[17]

Wildfires

Many ecosystems in California are naturally fire dependent, and therefore naturally prone to wildfire. As California is likely to experience increased temperatures and reduced precipitation, these factors will likely lead to more frequent and more intense wildfires across the State. For Coachella, an increase in wildfires will not necessarily increase the direct injuries and deaths from fire, but it will likely worsen air quality and negatively impact public health. Figure 6 illustrates the increase in areas burned by wildfire by the end of the century around Coachella. The increase in area burned will likely exacerbate eye and respiratory illness as well as worsening asthma, allergies, chronic obstructive pulmonary disease, and other cardiovascular and respiratory diseases.

[15] Knowlton, K., et al. (2009). The 2006 California Heat Wave: Impacts on Hospitalizations and Emergency Department Visits. Environmental Health Perspectives: Volume 117, Number 1.
[16] American Lung Association. (2012). State of the Air. Available at http://www.stateoftheair.org/2012/assets/state-of-the-air2012.pdf.
[17] California Climate Action Team, "Draft Biennial Climate Action Report" March 2009. Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.

Figure 6: Projected Increase in Area Burned by Wildfires[18]



Water Resources

Climate change will affect California's snowpack, precipitation, and, consequently, water supply. There is some uncertainty as to how water supplies will be affected, but even the most conservative models anticipate less stable water supplies and potentially more competition for what are already over-drafted and over-allocated resources. Coachella Valley's two major sources of imported water, the Colorado River and the State Water Project, are likely to be affected by climate change.[19]

An important factor to be considered in water supply planning is the occurrence of drought. During periods of drought, water availability decreases and water demand increases. Climate change is expected to increase the frequency and severity of droughts in the region as temperatures rise and precipitation and stream flow decline during the summer.

Although the majority of the water used by Coachella is groundwater and is less susceptible to climate variability, the groundwater is recharged with allocations from the Colorado River and State Water Project, which will be affected by climate change. An evaluation of climate scenarios on the State Water Project found a 7% - 10% reduction in Sacramento Delta water exports by mid-century and up to a 25% reduction in end of the century. The analysis also found that reservoir storage is likely to decline.[20]

Along with changes in water supply, demands for water will likely increase with warmer temperatures, higher evapotranspiration, and higher per capita income, straining existing water supplies. Average summer temperatures are a significant factor in water use and Coachella's average summer

[18] Climate Applications Lab at UC Merced. 2008. Fire Risk Data Set. Received from http://cal-adapt.org/fire/
[19] Coachella Valley Water District. (2010). Urban Water Management Plan.
[20] Coachella Valley Water District. (2010). Urban Water Management Plan.

temperature is expected to increase by as much as 9.0°F.[21] This will increase water demand for crop and landscape irrigation and urban water use and result in larger losses from canals and open reservoirs.[22]

Coachella already suffers from seasonal flooding, and climate change is projected to shift peak runoff to winter and early spring, increasing peak runoff volumes and flooding. These factors will be aggravated by the conversion of undeveloped and agricultural land to impervious surfaces. The anticipated increase in flooding will cause more damage to communities and agricultural lands, result in additional illness and loss of life, and diminish water quality.

Economy

Each of the impacts of climate change discussed above is likely to impose substantial monetary costs to California. In fact, the California Climate Action Team estimates that climate change will cost California tens of billions of dollars annually. If greenhouse gas emissions begin to be reduced, however, these costs could be lowered.[23] Several potential impacts in the region include:

- Storms and heat waves can disrupt the supply of and increase the demand for energy in California.
- As the frequency and severity of droughts and floods increases in the future, farmers and ranchers will make it more difficult to grow crops and raise animals than in the past.
- Extreme heat events and worsening air quality will disproportionately affect low-income residents, particularly those that labor outside such as farm workers.

[21] Scripps Institution of Oceanography. 2009. Projected Temperatures Data Set. Received from http://cal-adapt.org/temperature/century/.
[22] Coachella Valley Water District. (2010). Urban Water Management Plan.
[23] California Climate Action Team, "Draft Biennial Climate Action Report" March 2009. Available at http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.

Chapter 2: Regulatory Setting

During the last decade, the State of California made great strides in developing a regulatory framework to curb future greenhouse gas emissions and to adapt to the consequence of climate change. California adopted a series of policies, programs, and regulations that set targets for greenhouse emission reductions and outlined strategic actions that enable government agencies, public institutions, and businesses to collaborate to achieve these reduction targets.

In 2005, the Governor signed Executive Order S-3-05, which set targets for the state to reduce its greenhouse gas emissions to 1990 levels by 2020 and 80% below 1990 levels by 2050. The State Assembly followed by passing Assembly Bill 32 (AB 32), the Global Warming Solutions Act. AB 32 directs the California Air Resources Board (ARB) to develop the rules and regulations necessary to achieve the greenhouse gas emissions reductions targets. In 2008, the ARB approved the California Climate Change Scoping Plan (Scoping Plan), which contains the primary strategies California will use to reduce the greenhouse gas emissions that cause climate change. A sample of the Scoping Plan strategies include: energy efficiency measures, regional transportation-related greenhouse gas emissions targets, a renewable portfolio standard, a cap-and-trade program, a light duty vehicle greenhouse gas standard, and a low carbon fuel standard.

The Scoping Plan recognizes the essential partnership between state, regional, and local governments to reduce greenhouse gas emissions. Local governments have authority over activities that produce both direct and indirect greenhouse gas emissions through land use planning and zoning, general permitting, local ordinances, and municipal operations. Therefore, many of the strategies outlined in the Scoping Plan need local governments to take action. The Scoping Plan also encourages local governments to inventory greenhouse gas emissions, adopt greenhouse gas emissions reduction targets, and develop local action plans to lower emissions. The continued re-inventory of Coachella's greenhouse gas emissions will continue to serve these purposes.

In California, the transportation sector produces between 35% and 40% of the State's greenhouse gas emissions, and the Scoping Plan includes a number of measures for the sector. In 2008, California adopted Senate Bill 375 (SB 375), the Sustainable Communities Strategy. SB 375 attempts to integrate regional land use, transportation, and housing planning in order to reduce greenhouse gas emissions from cars and trucks. SB 375 directs the ARB to set regional greenhouse gas reductions targets for cars and trucks, to assign each Metropolitan Planning Organizations (MPO) a target, and to require each MPO to create a plan (a Sustainable Community Strategy) to achieve that target. The law provides relief from specific California Environmental Quality Act (CEQA) requirements for infill development projects that are consistent with the Sustainable Community Strategy. SB 375 provides one method for local governments to achieve regional transportation-related greenhouse gas emissions targets described in the Scoping Plan.

The Southern California Association of Governments (SCAG) is the largest MPO in California, representing six counties and over 180 cities, including Coachella. The SCAG region is comprised of 15 subregions, and Coachella is located within the Coachella Valley Association of Governments (CVAG) planning area. The CVAG is comprised of 13 members.

SCAG adopted the Regional Transportation Plan and Sustainable Communities Strategy in April 2012. The regional SCS describes the goals and benefits of the SCS, the processed used to create the SCS, SCS requirements, and next steps. SCS strategies are organized into land use strategies, transportation supply management, transportation demand management, vehicle technology, and other areas.

Along with AB 32, the Scoping Plan, and SB 375, there are several other California regulations and laws that directly affect local government efforts to reduce greenhouse gas emissions and to respond to the potential impacts of climate change. The following describes several, but not all, of these measures.

- **AB 1493 - Pavley Vehicular Emissions Codes (2002)**: AB 1493 directed the ARB to set more stringent vehicle fuel economy standards for cars and light trucks that reduce greenhouse gas emissions. The Pavley bill required approval from the federal government, and in 2009, the U.S. Environmental Protection Agency granted California a waiver that enabled the State to enforce stricter tailpipe emissions on new passenger vehicles. In 2010, the U.S. EPA and the Department of Transportation's National Highway Safety Administration announced new vehicle greenhouse gas emissions standards and corporate average fuel economy standards that reinforced California's standard. The standards would reduce emissions from passenger vehicles by approximately 30% in 2016, aiding local government efforts to reduce greenhouse gas emissions.
- **EO S-21-09 - California Renewable Portfolio Standard (2009)**: EO S-21-09 directed the ARB to adopt regulations increasing California's Renewable Portfolio Standard (RPS) to 33% by 2020. These rules apply to investor-owned utilities, such as Southern California Edison. These standards will reduce greenhouse gas emissions from electricity purchased by local governments.[24]
- **SB 1368 - Emissions Performance Standards (2006):** Signed in 2006, SB 1368 limits the ability of California's utilities to make long-term investments in carbon-intensive electricity generation. The bill enables utilities to make capital investments in baseload power plants if their emissions are as low or lower than emissions from a new, combined-cycle natural gas power plant. The bill makes certain that the standards will not impact the reliability of California's energy services.
- **California Green Building Code (2011):** The California Building Standards Commission and other state agencies developed green building standards for residential, commercial, and public building construction. The "CALGreen Code" is the first statewide green building standards code in the U.S. The code attempts to achieve reductions in greenhouse gas emissions and water and energy use.[25]
- **EO S-1-07 - Low Carbon Fuel Standard (2007):** EO S-1-07 established a Low Carbon Fuel Standard (LCFS) for transportation fuels in California, which the ARB included in the Scoping Plan. The EO requires that the carbon intensity California's transportation fuels are reduced at least 10% by 2020.[26] ARB expects the LCFS to achieve the minimum 10% reduction goal;

[24] SCE Renewable Energy. http://www.sce.com/PowerandEnvironment/renewables/
[25] California Building Standards Commission. "CALGreen." Retrieved on May 21, 2010 from http://www.bsc.ca.gov/CALGreen/default.htm.
[26] California Low Carbon Fuel Standard. Retrieved from http://www.arb.ca.gov/fuels/lcfs/lcfs.htm.

however, many of the early action items outlined in the Scoping Plan work in tandem with one another. To avoid the potential for double-counting emission reductions associated with AB 1493, the Scoping Plan has modified the aggregate transportation sector reduction expected from the LCFS to 6.7% for 2020.[27]

- **SB 97 - CEQA and Greenhouse Gas Emissions (2007):** SB 97 provides that greenhouse gas emissions and their effects are subject to CEQA. Local governments are required to determine whether a project's climate-related impacts are significant, and if so, mitigate those effects. The Governor's Office of Planning and Research (OPR) created CEQA guidelines to help local governments reduce greenhouse gas emissions and address their impacts.
- **AB 811**: AB 811 allows local governments to define areas where property-owners can receive long-term, low-interest loans for energy and water efficiency improvements. Improvements financed through AB 811 are fixed to the property and repaid through property tax bills. Local governments can participate in a state-wide program called CaliforniaFIRST, or they can establish their own AB 811 programs, called Property Assessed Clean Energy (PACE) programs.
- **EO S-13-08 - California Climate Adaptation Strategy (2008)**: The EO directed the California Natural Resources Agency to lead a statewide effort to develop a climate adaptation strategy. Published in 2009, the statewide plan describes climate trends and the potential impacts of climate change on key sectors, and it outlines short- and long-term actions that state and local governments can take to address future climate impacts.[28]

[27] Scoping Plan. http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm
[28] California Department of Natural Resources, 2009. *California Climate Adaptation Strategy.* http://resources.ca.gov/climate_adaptation/statewide_adaptation/californias_adaptation_strategy.html

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Chapter 3: Methodology

The Coachella Greenhouse Gas Emissions Inventory provides a snapshot of emissions for 2005 and 2010, quantifying the main sources of emissions from the community as a whole. The purpose of the greenhouse gas inventory is to:

- Identify and understand the sources and quantities of emissions within a local government's jurisdictional boundary;
- Update the emissions baseline by applying new protocols and incorporating better data, allowing the City to set emission reductions targets and measure future progress;
- Use the baseline to prioritize and evaluate potential government actions; and
- Make informed policy decisions related to greenhouse gas emissions reduction.

This greenhouse gas inventory summarizes community-wide emissions using the greenhouse gas accounting methodology outlined in the Local Government Operations Protocol (LGOP), which was adopted by the ARB in 2008. The LGOP serves as the national standard for quantifying and reporting emissions from government operations. The 2010 Greenhouse Gas Emissions Inventory includes data from a variety of sources. The following table briefly summarizes the data and data sources used in the community inventory.

Table 3: Activity Data Sources for the Community Inventory[29]

Activity Data	Year	Source	Obtained From
Electricity	2005 and 2010	Imperial Irrigation District	Electricity consumption report
Natural Gas	2005 and 2010	SoCal Gas Company	Natural gas consumption report
Vehicle Miles Traveled	2005 and 2010	Southern California Association of Governments	Regional Transportation Model
Solid Waste	2005 and 2010	City of Coachella	CalRecycle
Water Use	2005 and 2010	City of Coachella	2010 Urban Water Management Plan

What is a Greenhouse Gas?

The LGOP recommends that local governments assess emissions of six globally important greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). These gases are regulated under the Kyoto Protocol. Since carbon dioxide is the most abundant greenhouse gas, greenhouse gas emissions are converted to metric tons of carbon dioxide equivalent (CO_2e) units. Each greenhouse gas has a different potential for trapping heat in the Earth's atmosphere, which is called the global warming potential or GWP (Table 4). For instance, methane has twenty-one times more heat trapping potential than one pound of carbon dioxide.

[29] For additional details, please see Appendix A of this report.

Table 4: Greenhouse Gases[30]

Greenhouse Gas	Formula	Activity	Global Warming Potential (CO_2e)
Carbon dioxide	CO_2	Combustion	1
Methane	CH_4	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	21
Nitrous Oxide	N_2O	Combustion, Wastewater Treatment	310
Hydrofluorocarbons	Various	Leaked Refrigerants, Fire Suppressants	12-11,700
Perfluorocarbons	Various	Aluminum Production, Semiconductor Manufacturing, HVAC equipment,	6,500-9,200
Sulfur Hexafluoride	SF_6	Transmission and Distribution of Power	23,900

This inventory focuses on the four greenhouse gases most relevant for local governments. This group includes CO_2, CH_4, N_2O, and hydrofluorocarbons.

Calculating Emissions

The Coachella Greenhouse Gas Emissions Inventory uses a calculation-based methodology to estimate most of the community's emissions. These calculations combine activity data with emission factors to determine greenhouse gas emissions for a particular sector or activity. The following equation illustrates the general relationship:

- Activity Data x Emission Factor = Greenhouse Gas Emissions

Activity data includes a range of information, including annual metered electricity use, fuel consumption by type, solid waste production, and vehicle miles travelled. Emissions factors are used to convert activity data into greenhouse gas emissions quantities. These factors are expressed in terms of emissions per unit of activity, e.g. lbs CO_2 per kWh or CH_4 per ton of waste. Appendix A includes a list of activity data and emissions factors utilized in the Coachella inventory.

Reporting Emissions

This section describes two types of reporting frameworks, scopes and sectors, used in the Coachella Greenhouse Gas Emissions Inventory. It also explains rolling up emissions into a single number and double counting.

The Scopes Framework

Greenhouse gas inventories are reported according to a three-tiered classification system of scopes. Classification relates to the degree of control over the emissions source and location of the source. Emissions sources are categorized as direct (Scope 1) or indirect (Scope 2 or Scope 3).

Scope 1 emissions are comprised of all direct emissions from sources located within the boundary of a jurisdiction. These encompass stationary combustion to produce electricity and heat, and to power equipment. These emissions also include mobile combustion of fuels; emissions that result from the production, processing, transmission, storage, and use of fuels; and direct emissions from landfills in the

[30] California Air Resources Board, et. al., 2010, *Local Government Operations Protocol, Version 1.1*. Appendix E.

community. Scope 2 emissions are composed of indirect emissions from the consumption of energy generated outside the jurisdiction, such as electricity purchased from a regional utility. Scope 3 emissions are all other indirect emissions that occur within the jurisdictional boundaries or due to specific activities occurring within the jurisdictional boundaries.

For community-wide inventories, Scope 1 and Scope 2 emissions sources represent the most important components of the greenhouse gas inventory. Typically, these scopes include the largest contributions of emissions for a community. At the same time, local governments have a broad influence within their jurisdictional boundaries, and a jurisdiction's authority over land use, permitting, local ordinances, and environmental education can impact emissions.

Rolling Up Scopes and Double Counting

To aid policy-making and public understanding, local governments often use a single number to describe greenhouse gas emissions within a climate action plan. Rolling up emissions makes it easier for a local government to understand the relative proportion of emissions from various sources and use this information to focus policy decisions. The Coachella Greenhouse Gas Inventory includes rolled up numbers for both the community-wide and government operations inventories. These rolled up figures include direct emissions (Scope 1) and indirect emissions (Scope 2 and Scope 3).

Despite rolling up these numbers, they should be used with caution. The roll-up number only includes the data available at the time of the inventory and the best available estimation methods. By producing one single figure, the roll-up number is often viewed as comprehensive and inclusive of all emissions within a jurisdiction.

Roll-up numbers may also double count emissions, especially across sectors and jurisdictions. For example, a municipal government may operate a utility that provides electricity to City-owned buildings. These emissions would be accounted for in building use and power generation, inadvertently resulting in the double counting of emissions. The roll-up number in this report avoids double counting within the City of Coachella.

Finally, roll-up numbers are often used to compare emissions between local governments. While protocols, like the LGOP, exist for inventorying and reporting emissions, no protocol exists for rolling up emissions into a single figure. Each jurisdiction has a unique set of circumstances and provides a different set of services.

Emissions Sectors

Along with summarizing greenhouse gas emissions by scope, the Coachella inventory classifies emissions by the sector responsible for the emissions. This approach allows local governments to develop emission reduction strategies and actions for specific sectors within the climate action plan.

The community inventory includes the following sectors:

- Commercial and industrial;
- Residential;
- Infrastructure;
- Transportation;
- Solid waste; and
- Water.

Chapter 4: Community Greenhouse Gas Inventory Results

In 2010, total greenhouse gas emissions in Coachella were approximately 291,000 metric tons of CO_2e ($MTCO_2e$) up 5% from the 2005 base year emissions. This aggregate number accounts for Scope 1 direct emissions from the on-site combustion of fuels and the combustion of fuel in vehicles. This figure also includes all indirect emissions associated with community electricity consumption (Scope 2), and emissions from solid waste generated and water consumed by Coachella (Scope 3). Table 5 summarizes Coachella's community emissions by scope, sector, and source for 2005 and 2010.

Table 5: Community Emissions Summary by Sector, Scope, and Source for 2005 and 2010

Sector and Emissions Source	Scope	Activity Data[1]		Metric Tons of CO_2e		
		2005	2010	2005	2010	% Change
Commercial and Industrial						
Natural Gas (therms)	Scope 1	1,575,000	1,631,000	8,000	9,000	4%
Electricity (kWh)	Scope 2	122,262,000	109,567,000	69,000	63,000	-9%
Residential						
Natural Gas (therms)	Scope 1	1,577,000	2,136,000	8,000	11,000	35%
Electricity (kWh)	Scope 2	79,444,000	99,131,000	43,000	53,000	25%
Infrastructure						
Electricity (kWh)	Scope 2	N/A	4,865,000	N/A	3,000	N/A
Transportation						
Gasoline (gallons)	Scope 1	27,000	31,000	87,000	98,000	12%
Diesel (gallons)	Scope 1	10,000	8,000	39,000	32,000	-18%
Solid Waste						
Landfill waste (tons)	Scope 3	33,000	23,000	8,000	5,000	-32%
Water						
Energy[2] (mil. of gallons)	Scope 3	3,000	4,000	12,000	17,000	45%
Scope 1 Emissions[3]				**143,000**	**149,000**	**5%**
Scope 2 Emissions[3]				**114,000**	**119,000**	**4%**
Scope 3 Emissions[3]				**19,000**	**22,000**	**15%**
Total Emissions[3]				**276,000**	**291,000**	**5%**

[1] Activity data includes a range of information, including annual metered electricity use, fuel consumption by type, solid waste production, and vehicle miles travelled. Emissions factors are used to convert activity data into greenhouse gas emissions quantities.

[2] The water sector uses both electricity and natural gas to collect, convey, treat, and deliver water to users, and then it uses additional energy to collect, treat, and dispose of the resulting wastewater. This embedded energy yields both direct and indirect greenhouse gas emissions.

[3] Totals may be slightly off due to rounding.

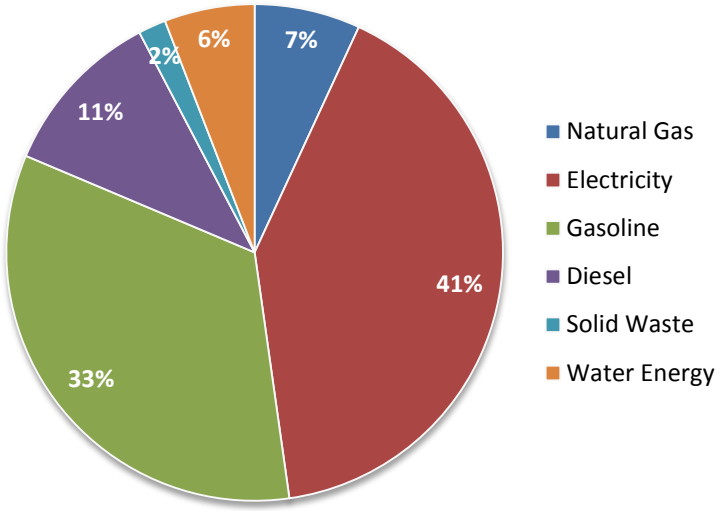
Summary by Scope

Table 5 shows Coachella's community emissions categorized by scope for 2010.[31] Scope 1 activities accounted for the largest proportion of greenhouse gas emissions, approximately 149,000 $MTCO_2e$. Scope 2 emissions from purchased electricity were the second largest category of emissions, totaling 119,000 $MTCO_2e$. Other indirect emissions from solid waste, water, and wastewater (Scope 3) account for 22,000 $MTCO_2e$.

Summary by Source

In 2010, the combustion of gasoline contributed the second largest portion of greenhouse gas emissions by fuel source in Coachella. Transportation gasoline use resulted in 98,000 $MTCO_2e$ of emissions or 33% of the community total. Diesel use by the transportation sector contributed an additional 32,000 $MTCO_2e$ of greenhouse gas emissions.

Figure 7: Community Emissions Summary by Source in 2010



By source, electricity use resulted in the largest emissions total community-wide. The consumption of electricity in buildings, facilities, water delivery, and infrastructure accounted for 41% of the greenhouse gas emissions. Natural gas combustion contributed 7% of the emissions, and water and solid waste resulted in 6% and 2% of the emissions respectively.

What's the Difference between Sector and Scope?

Greenhouse gas emissions are classified by scope and sector. Global emissions are commonly categorized by scope to attribute ownership over the emissions. Scope 1 includes emissions sources directly controlled by the entity, while Source 2 and 3 encompass indirect emissions from sources beyond an entity's boundary. Source 2 includes electricity purchased by an entity, and Source 3 includes other indirect emissions, such as energy used to transport water or landfill emissions.

Although many local governments report greenhouse gas emissions by scope, community inventories often focus on sector-specific emissions. Typical sectors include residential, commercial, transportation, solid waste, and water. Calculating emissions by sector allows local decision-makers to employ their broad regulatory powers for land use planning and permitting, transportation, water, and solid waste to take strategic actions to reduce greenhouse gas emissions.

[31] For more information on Scopes, please see Chapter 3: Methodology

Total electricity use in 2005 and 2010 was drawn from the Electricity Use Reports provided by Imperial Irrigation District. These reports included information about commercial, residential, street lighting, traffic control, and public authority electricity use.[32] Table 6 shows electricity use and the associated greenhouse gas emissions by sector in 2005 and 2010.

Table 6: Community Electricity Use and Emissions Summary by Sector in 2005 and 2010

Sector	Electricity (kWh)			Metric Tons of CO_2e		
	2005	2010	% Change	2005	2010	% Change
Commercial & Industrial	128,048,000	116,786,000	-9%	69,000	63,000	-9%
Residential	79,444,000	99,131,000	25%	43,000	53,000	25%
Infrastructure	4,777,000	4,865,000	N/A	3,000	3,000	2%
Total	**212,269,000**	**220,782,000**	**4%**	**114,000**	**119,000**	**4%**

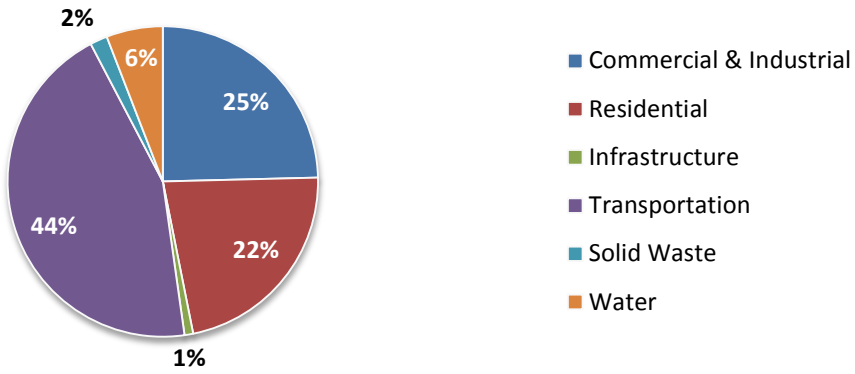
[1] Totals may be slightly off due to rounding.

Between 2005 and 2010, purchased electricity and the associated greenhouse gas emissions grew for the community as a whole. Electricity consumption increased from approximately 212 million kWh to 221 million kWh, and the associated greenhouse gas emissions rose from 114,000 $MTCO_2e$ to 119,000 $MTCO_2e$. The commercial and industrial sector accounted for most of the electricity use and emissions from purchased electricity, but nonetheless, electricity use fell 9% and emissions declined 9%. During the same period, residential sector electricity use increased 25%, while emissions grew 25%.

Summary by Sector

By understanding the relative scale of emissions within each sector, Coachella can develop strategic actions that will achieve the largest greenhouse gas emissions. Figure 8 summarizes Coachella's community emissions by sector for 2010. The transportation sector emitted the largest quantity of greenhouse gases emissions, 130,000 $MTCO_2e$ or 45% of the community total. The commercial and industrial sector was the second largest producer of greenhouse gases, contributing 71,000 $MTCO_2e$ of emissions or 25% of the community total. The remainder of the emissions came from the residential (22%), infrastructure (1%), solid waste (2%), and water (6%) sectors.

Figure 8: Community Emissions Summary by Sector in 2010



[32] Public authority electricity use has been included in the commercial and industrial sector electricity use.

Per Capita Emissions

Focusing on absolute emissions numbers provides a limited understanding of the energy use and greenhouse gas emissions picture. Per capita emissions can be a useful indicator to measure progress towards the City-wide goals. It can also provide a simple metric to compare one jurisdiction to another; however, as discussed in "Rolling Up Scopes and Double Counting" (Chapter 3), caution must be used when comparing per capita emissions from Coachella to other cities, since there could be methodological differences between jurisdictions.

Table 7 shows the per capita emissions for Coachella, 7.14 $MTCO_2e$, which is obtained by dividing the total community greenhouse gas emissions by the total Coachella population. 2010 per capita emissions were down from the 2005 base year emissions of 9.29 $MTCO_2e$ per person. This number is not the carbon footprint of residents living within the city, which would include emissions from other activities, such as air travel.

Table 7: Per Capita Emissions in 2005 and 2010

Data	2005	2010
Electricity Use (kWh)	212,267,000	220,782,000
Greenhouse Gas Emissions from Electricity ($MTCO_2e$)	114,000	119,000
Total Community Greenhouse Gas Emissions ($MTCO_2e$)	276,000	291,000
Population	29,754	40,704
Employees	6,441	5,891
Electricity Use Per Capita (kWh/per person)[1]	**7,100**	**5,400**
Greenhouse Gas Emissions from Electricity Per Capita ($MTCO_2e$/per person)[1]	**3.84**	**2.92**
Total Per Capita Emissions ($MTCO_2e$/per person)[1]	**9.29**	**7.14**
Total Per Service Area Emissions ($MTCO_2e$/per person)[1]	**7.64**	**6.23**

[1] Totals may be slightly off due to rounding.

Electricity use per capita is also a useful indicator to show change over time. Electricity use per capita fell 1,700 kWh per person to 5,400 kWh per person in 2010, while greenhouse gas emissions from electricity per capita declined from 3.84 $MTCO_2e$ to 2.92 $MTCO_2e$.

Community Inventory Detail by Sector

This section explores greenhouse gas emissions by sector in greater detail. It includes six main sectors: commercial and industrial; infrastructure; residential; transportation; solid waste; and water.

Commercial and Industrial Sector

As shown in Table 8, the commercial and industrial sector released an estimated 72,000 $MTCO_2e$ for 2010. Commercial and industrial sector emissions are the result of the on-site combustion of natural gas, as well as emissions resulting from purchased electricity. Ninety-six percent of the sector's emissions in 2010 resulted from the use of purchased electricity, and combustion of natural gas generated 4% of the sector's emissions.

Table 8: Commercial and Industrial Sector Emissions Sources in 2010

Source	Metric Tons of $C0_2e$	Share of 2010 Total
Natural Gas	9,000	4%
Electricity	63,000	96%
Total Emissions[1]	**72,000**	**100%**

[1] Totals may be slightly off due to rounding.

How Are Emissions from Government Operations Counted in the Community Inventory?

In the Coachella Greenhouse Gas Emissions Inventory, government operations emissions are a subset of the community inventory and are included within the community inventory totals. For example, Coachella employees produce greenhouse gas emissions during their daily commute to work, and these emissions are captured by the transportation sector of the community inventory, which estimates the total annual vehicle miles traveled for the community and the resulting greenhouse gas emissions. This is the case for other sectors as well. Municipal building and facility energy use are accounted for in the commercial and industrial sector emissions of the community inventory. In general, emissions from government operations usually account for a small percentage of the community total, in most cases no more than 1% to 2%.

Infrastructure Sector

Streetlights, traffic signals and controllers, and other outdoor lighting required approximately 5 million kWh of electricity in 2010. The electricity used to power this infrastructure contributed 2,000 $MTCO_2e$ of greenhouse gas emissions, making it the fourth largest contributor to greenhouse gas emissions included in the community inventory. Total 2010 emissions increased 2% from the 2005 base year emissions of 2,000 $MTCO_2e$.

Residential Sector

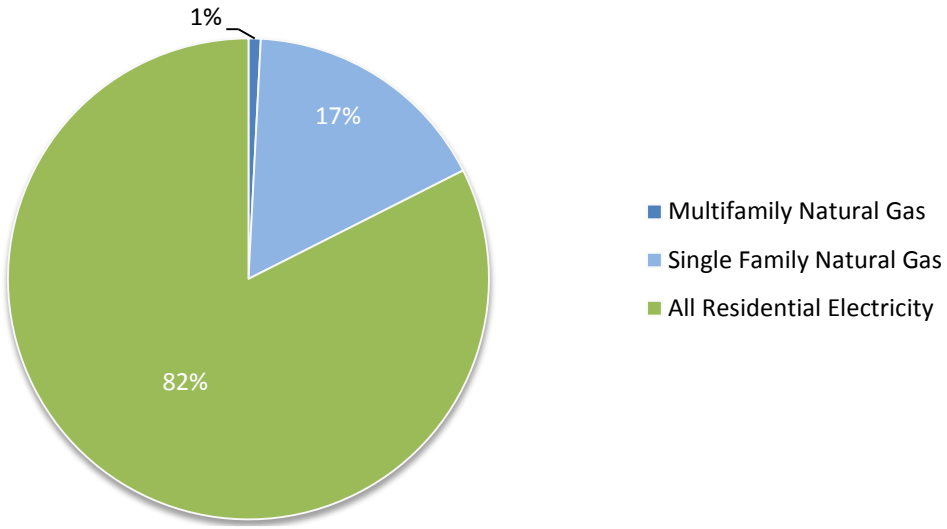
In 2010, the residential sector accounted for 64,000 $MTCO_2e$ or 22% of Coachella's greenhouse gas emissions. Table 9 depicts the emissions by source.

Table 9: Residential Emissions Sources in 2010

Source	Metric Tons of CO_2e	Share of 2010 Total
Natural Gas	**11,000**	**100%**
Multifamily Natural Gas	1,000	5%
Single Family Natural Gas	11,000	95%
All Residential Electricity	**53,000**	**100%**
Total Emissions	**64,000**	**-**

The residential sector consumed approximately 2.1 million therms of natural gas and 99 million kWh of electricity. Natural gas combustion resulted in 11,000 $MTCO_2e$ of greenhouse gases emissions, and an additional 53,000 $MTCO_2e$ of emissions were the result of electricity use. Figure 9 highlights the proportion of residential emissions by source.

Figure 9: Residential Emissions Sources in 2010



Transportation Sector

The transportation sector emitted 45% of Coachella's greenhouse gas emissions in 2010, the largest proportion. The sector produced 130,000 $MTCO_2e$. Transportation sector emissions were estimated by applying conversion factors to daily vehicle miles traveled (VMT). VMT was obtained from the Southern California Association of Government's regional transportation model, which is based on the trip production and attraction of land uses within Coachella. It was estimated that 75% of the greenhouse gas emissions from the transportation sector were the result of burning gasoline. The remainder of the emissions resulted from burning diesel fuel.

This greenhouse gas inventory does not account for off-road transportation activities, such as lawn and garden care and construction, as data on these activities in Coachella are not readily available. For cities like Coachella, these activities typically represent a very small portion of the total transportation emissions.

Solid Waste Sector

The solid waste sector produced 5,000 $MTCO_2e$ in 2010, accounting for 2% of the community-wide total. The community generated approximately 23,000 tons of solid waste in 2010, down from 33,000 tons in 2005.

Solid waste emissions are an estimate of the decomposition of municipal solid waste and alternative daily cover. Organic materials found in solid waste, such as paper, food scraps, plant debris, textiles, and wood waste, decompose in a landfill. Table 10 shows the share of solid waste by material for businesses and households in Coachella. As these materials decay, methane gas is generated and released into the atmosphere. Since organic materials decay over a long-time period (100+ years), the Coachella inventory accounts for the future decomposition of the waste in the base year. Because of the long-time period, these emissions are considered Scope 3.

Table 1: Solid Waste Materials by Share of Waste[33]

Material	Share of Waste
Paper Products	27.8%
Food Waste	19.7%
Plant Debris	21.5%
Wood or Textiles	5%
All Other Waste	21.5%

An estimated 75% of the methane emissions are collected by landfills.[34] The captured methane can be flared off to negate the global warming potential of the gas, or increasingly, it can be used to power gas-fired turbines that generate energy. Twenty-five percent of the methane emissions escape into the atmosphere as a significant contributor to global warming.

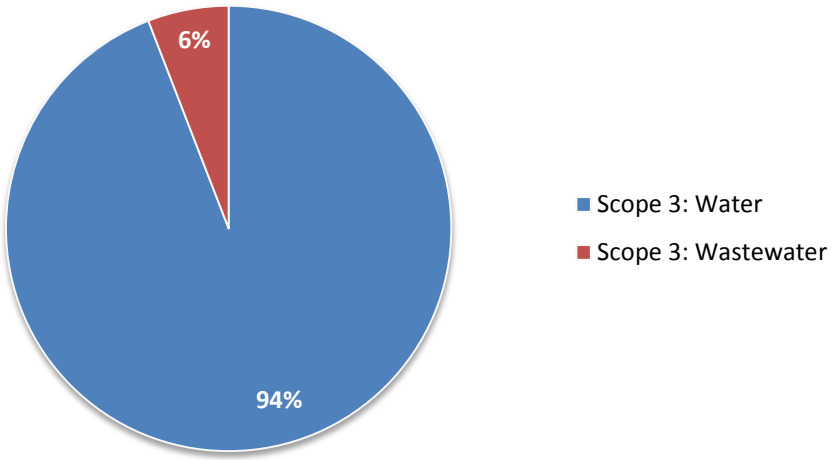
Water Sector

The water sector uses energy to collect, convey, treat, and deliver water to users, and then it uses additional energy to collect, treat, and dispose of the resulting wastewater. This energy use yields both direct and indirect greenhouse gas emissions. For Coachella, the water sector contributed 17,000 $MTCO_2e$ of Scope 3 emissions in 2010, making up 6% of the community-wide greenhouse gas emissions. These Scope 3 emissions were calculated by combining the amount of water used and the amount of wastewater produced with emissions factors. These activities are shown in Figure 11. 2010 emissions from the water sector increased 45% from the 2005 base year emissions total.

[33] California Integrated Waste Management Board. Solid Waste Characterization Database. http://www.calrecycle.ca.gov/WasteChar/JurisSel.asp

[34] California Air Resources Board, et. al., 2010, *Local Government Operations Protocol, Version 1.1*.

Figure 10: Water Emissions Sources in 2010



Chapter 5: Conclusion

By inventorying community-wide greenhouse gas emissions, the City of Coachella is taking an important step towards understanding their emissions profile. This emissions inventory provides the baseline of information necessary to evaluate greenhouse gas emissions reduction targets, to identify and implement key mitigation measures, and to monitor the effectiveness of the Coachella's actions to reduce greenhouse gas emissions.

This conclusion summarizes the key findings from the greenhouse gas inventory and provides additional background on setting a greenhouse gas emissions reduction target.

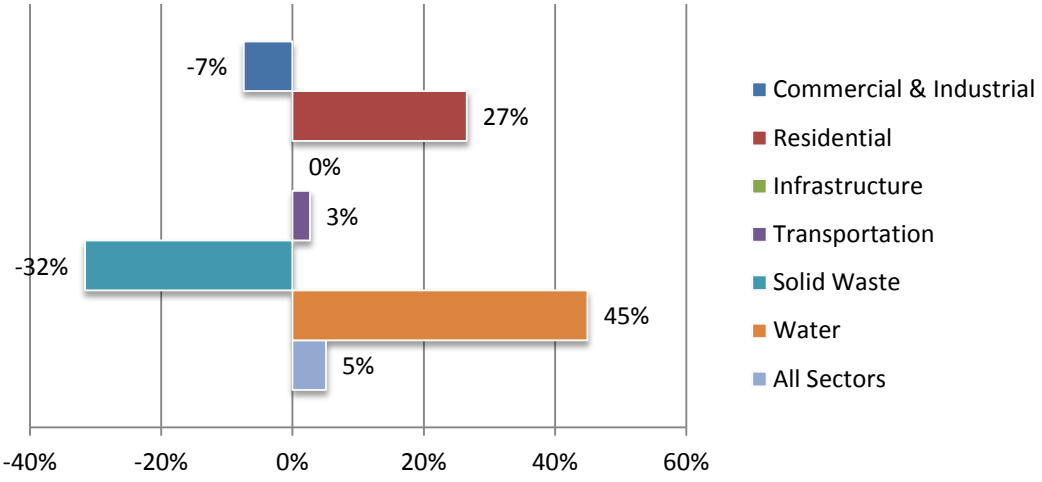
Key Findings

The following section includes key findings from the community inventory.

Community Inventory

Between 2005 and 2010, greenhouse gas emissions increased from the 2005 base year emissions of 276,000 $MTCO_2e$ to 291,000 $MTCO_2e$ in 2010, a 5% increase. Emissions increased 27% in the residential sector, 3% in the transportation sector, 2% in the infrastructure sector, and 45% in the water sector. Emissions declined 7% in the commercial and industrial sector and 32% in the solid waste sector.

Figure 11: Change in Community Emissions from the 2005 Base Year Total to the 2010 Total



Overall, commercial and industrial sector greenhouse gas emissions fell from the 2005 base year emissions of 77,000 $MTCO_2e$ to 71,000 $MTCO_2e$ in 2010. The commercial and industrial sector used 11 million kWh of electricity and 56,000 therms of natural gas less in 2010 than in 2005. The residential sector used 19.7 million kWh of electricity and 559,000 therms of natural gas more in 2010 than 2005. As a result, greenhouse gas emissions increased from the 2005 base year emissions of 51,000 $MTCO_2e$ to 65,000 $MTCO_2e$ in 2010. Similarly, Coachella used over 800 more acre-feet of water in 2010 than in 2005. Emissions from water delivery rose to 17,000 $MTCO_2e$ in 2010, a 45% increase. Coachella

generated approximately 10,000 tons of solid waste less than 2005, lowering emissions from 8,000 $MTCO_2e$ to 5,000 $MTCO_2e$.

Greenhouse gas emissions from the transportation sector accounted for 129,000 $MTCO_2e$, or 45% of all community emissions.

During the next several decades, emissions from cars and trucks will be heavily influenced by state regulations that set more stringent fuel standards to reduce greenhouse gas emissions (AB 1493), lower the carbon intensity of vehicle fuels (EO S-1-07), and monitor regional transportation-related greenhouse gas emissions targets (SB 375). These regulations and programs will help local governments reduce vehicle miles traveled and the associated emissions.

Purchased electricity accounted for 41% of the greenhouse emissions for the community as a whole.

In 2010, Coachella used 221 million kWh of electricity to power homes, businesses, government buildings, and public infrastructure, resulting in 119,000 $MTCO_2e$ of greenhouse gas emissions. As with the transportation sector emissions, these emissions will be influenced by state regulations. Higher renewable portfolio standards for investor-owned utilities like Southern California Edison (EO S-21-09) and regulations that limit investment in carbon-intensive power generation (SB 1368) will reduce greenhouse gas emissions from purchased electricity. Further, energy efficiency measures are often the most cost-effective actions to lower energy use and reduce emissions.

Annual per capita emissions were 7.14 $MTCO_2e$ emissions in 2010. According to the Scoping Plan, California's 2010 per capita emissions were approximately 13.3 $MTCO_2e$, the 2020 target is 9.6 $MTCO_2e$ per person, and the 2035 target is 4.6 $MTCO_2e$ per person.

Appendix A: Activity Data, Methodology, and Emission Factors

Listed below are the data, data sources, and emissions factors for the community-wide greenhouse gas emissions inventories. The table includes activity data, such as electricity used to power homes, and the emissions factors used to convert activity data to greenhouse gas emissions.[35] To make the data easier to use, the information is grouped by sector. This data will be crucial for re-inventorying emissions.

2010 Activity Data for the Community Greenhouse Gas Inventory

Sector	Emissions Source	Data Used	Data Source	Greenhouse Gas	Emissions Factors	Emission Factor Source	Pertinent Assumptions / Key Equations Used to Derive Emissions Source Data
Residential	Electricity	99,130,740 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Residential	Natural Gas	2,135,733 Therms	SoCal Gas Company	CO_2	53.02 kg CO2/MMBTU	LGOP Table G.1	
				CH_4	0.005 kg CO2/MMBTU	LGOP Table G.3	
				N_2O	0.0001 kg CO2/MMBTU	LGOP Table G.3	
Commercial	Electricity	109,566,971 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Commercial	Natural Gas	1,631,435 Therms	SoCal Gas Company	CO_2	53.02 kg CO2/MMBTU	LGOP Table G.1	
				CH_4	0.005 kg CO2/MMBTU	LGOP Table G.3	
				N_2O	0.0001 kg CO2/MMBTU	LGOP Table G.3	
Infrastructure	Electricity	4,865,479 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Public Authority	Electricity	7,219,150 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.3	
				N_2O	0.011 lbs/MWh	LGOP Table G.3	

[35] For more information on calculating greenhouse gas emissions, see Chapter 3: Methodology.

Sector	Emissions Source	Data Used	Data Source	Greenhouse Gas	Emissions Factors	Emission Factor Source	Pertinent Assumptions / Key Equations Used to Derive Emissions Source Data
Transportation	Gasoline	222,283,548 Annual Vehicle Miles Traveled	Southern California Association of Governments Regional Transportation Model	CO_2 CH_4 N_2O	Varies by vehicle class	EMFAC 2011	Vehicle Class percentage breakdown for total VMT from EMFAC Model. ~75% of the emissions from gasoline.
Transportation	Diesel	222,283,548 Daily Vehicle Miles Traveled	Southern California Association of Governments Regional Transportation Model	CO_2 CH_4 N_2O	Varies by vehicle class	EMFAC 2011	Vehicle Class percentage breakdown for total VMT from EMFAC Model. ~25% of the emissions from diesel
Solid Waste	Solid waste	23,289 tons	Coachella	CH_4	Varies by waste type · 2.138 tons per ton of paper · 1.21 tons per ton of food waste · 0.686 tons per ton of plant · 0.605 tons per ton of food/textiles	USA Defaults from the ICLEI Clean Air and Climate Protection Software	Waste Type · Paper Products – 27.8% · Food Waste – 19.7% · Plant Debris – 21.5% · Wood or Textiles – 5%

Sector	Emissions Source	Data Used	Data Source	Greenhouse Gas	Emissions Factors	Emission Factor Source	Pertinent Assumptions / Key Equations Used to Derive Emissions Source Data
Water	Electricity - Water	2,691,000,000 gallons	Coachella Municipal Water Department	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Water	Electricity - Wastewater	975,940,650 gallons	Coachella Valley Water District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	

2005 Activity Data for the Community Greenhouse Gas Inventory

Sector	Emissions Source	Data Used	Data Source	Greenhouse Gas	Emissions Factors	Emission Factor Source	Pertinent Assumptions / Key Equations Used to Derive Emissions Source Data
Residential	Electricity	79,444,150 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Residential	Natural Gas	1,577,036 Therms	SoCal Gas Company	CO_2	53.02 kg CO2/MMBTU	LGOP Table G.1	
				CH_4	0.005 kg CO2/MMBTU	LGOP Table G.3	
				N_2O	0.0001 kg CO2/MMBTU	LGOP Table G.3	
Commercial	Electricity	122,261,754 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Commercial	Natural Gas	1,574,880 Therms	SoCal Gas Company	CO_2	53.02 kg CO2/MMBTU	LGOP Table G.1	
				CH_4	0.005 kg CO2/MMBTU	LGOP Table G.3	
				N_2O	0.0001 kg CO2/MMBTU	LGOP Table G.3	
Infrastructure	Electricity	4,776,900 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Public Authority	Electricity	5,785,820 kWh	Imperial Irrigation District	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.3	
				N_2O	0.011 lbs/MWh	LGOP Table G.3	

Sector	Emissions Source	Data Used	Data Source	Greenhouse Gas	Emissions Factors	Emission Factor Source	Pertinent Assumptions / Key Equations Used to Derive Emissions Source Data
Transportation	Gasoline	202,184,655 Annual Vehicle Miles Traveled	Southern California Association of Governments Regional Transportation Model	CO_2	Varies by vehicle class	EMFAC 2011	Vehicle Class percentage breakdown for total VMT from EMFAC Model. ~75% of the emissions from gasoline.
				CH_4			
				N_2O			
Transportation	Diesel	202,184,655 Daily Vehicle Miles Traveled	Southern California Association of Governments Regional Transportation Model	CO_2	Varies by vehicle class	EMFAC 2011	Vehicle Class percentage breakdown for total VMT from EMFAC Model. ~25% of the emissions from diesel
				CH_4			
				N_2O			
Solid Waste	Solid waste	33,463 tons	Coachella	CH_4	<u>Varies by waste type</u> · 2.138 tons per ton of paper · 1.21 tons per ton of food waste · 0.686 tons per ton of plant · 0.605 tons per ton of food/textiles	USA Defaults from the ICLEI Clean Air and Climate Protection Software	<u>Waste Type</u> · Paper Products – 27.8% · Food Waste – 19.7% · Plant Debris – 21.5% · Wood or Textiles – 5%

Sector	Emissions Source	Data Used	Data Source	Greenhouse Gas	Emissions Factors	Emission Factor Source	Pertinent Assumptions / Key Equations Used to Derive Emissions Source Data
Water	Electricity - Water	1,857 Acre-feet	Coachella Municipal Water Department	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	
Water	Electricity - Wastewater	673 Acre-feet	Proxy	CO_2	1181.61 lbs/MWh	2009 PUP Report	
				CH_4	0.029 lbs/MWh	LGOP Table G.7	
				N_2O	0.011 lbs/MWh	LGOP Table G.7	