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Introduction

1.1 Scope and Purpose

Background and Purpose

The Climate Action Plan (CAP) is designed to reduce Carlsbad's greenhouse gas (GHG) emissions and streamline environmental review of future development projects in the city in accordance with the California Environmental Quality Act (CEQA).

The original CAP, adopted in September 2015, ~~has been~~was prepared concurrently with the city's updated General Plan and include~~s~~d actions to carry out the General Plan's goals and policies, consistent with the Community Vision articulated during Envision Carlsbad. The original CAP ~~is~~was also correlated with the Environmental Impact Report (EIR) on the General Plan, with the CAP GHG reduction target synchronized with the EIR. CAP Amendment No. 1, adopted in May 2020, revised the greenhouse gas inventory, reduction targets and forecast, updated reductions from existing measures, and incorporated Community Choice Energy as a new reduction measure (Measure P). An Addendum to the EIR was also prepared.

Community Vision and Environmental Stewardship

Carlsbad has long been a steward of environmental sustainability. In 2007, the Carlsbad City Council adopted a set of sustainability and environmental guiding principles (Resolution No. 2007-187) to help guide city investments, activities, and programs. Sustainability emerged as a key theme during the Envision Carlsbad community outreach process, and reflected as a Core Value of the Community Vision:

> ***Core Value 6: Sustainability.*** Build on the city's sustainability initiatives to emerge as a leader in green development and sustainability. Pursue public/private partnerships, particularly on sustainable water, energy, recycling, and foods.

The General Plan

The General Plan includes strategies such as mixed-use development, higher density infill development, integrated transportation and land use planning, promotion of bicycle and pedestrian movements, and transportation demand management. It also includes goals and policies to promote energy efficiency, waste reduction, and resource conservation and

recycling. These strategies, goals, and policies would result in GHG reduction compared to baseline trends.

CAP

The CAP includes goals, policies, and actions for Carlsbad to reduce GHG emissions and combat climate change and includes:

- An inventory of Carlsbad's citywide and local government GHG emissions;
- Forecasts of future citywide and local government GHG emissions;
- A comprehensive, citywide strategy and actions to manage and reduce GHG emissions, with emission targets through 2035; and
- Actions that demonstrate Carlsbad's commitment to achieve state GHG reduction targets by creating enforceable measures, and monitoring and reporting processes to ensure targets are met.

The timeframe for the Plan extends from the date of adoption through 2035.

1.2 Climate Change and Greenhouse Gases Overview

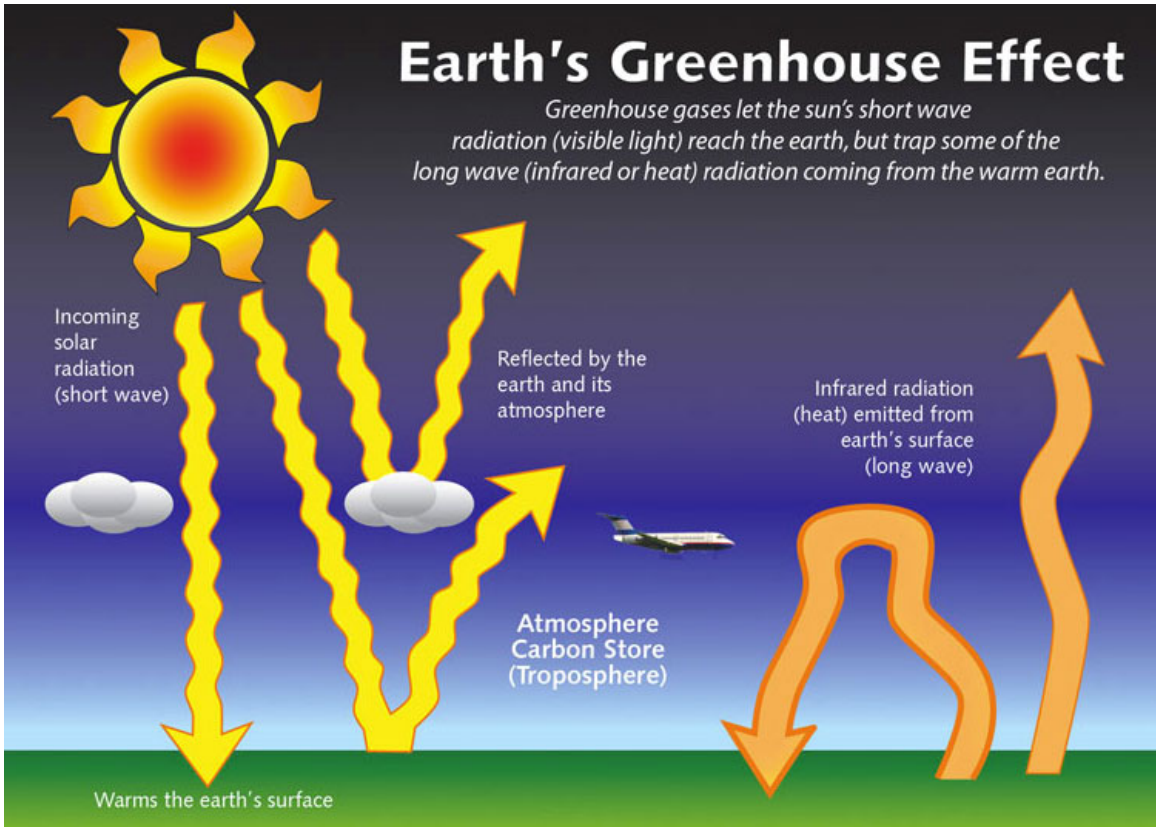
Greenhouse Effect and GHGs

Gases that trap heat in the atmosphere are often called "greenhouse gases" (GHGs). The greenhouse effect traps heat in the troposphere through a threefold process as follows: Short-wave radiation emitted by the sun is absorbed by the earth; the earth emits a portion of this energy in the form of long-wave radiation; and GHGs in the upper atmosphere absorb this long-wave radiation, emitting some of it into space and the rest back toward the earth. This "trapping" of the long-wave (thermal) radiation emitted back toward the earth is the underlying process of the greenhouse effect (Figure 1-1).

Principal GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and water vapor (H_2O). Some GHGs, such as CO_2, CH_4, and N_2O, occur naturally and are emitted to the atmosphere through natural processes and human activities. Since different gases contribute to the greenhouse effect in different proportions, the term CO_2e (carbon dioxide equivalent) provides the reference frame based on comparison to CO_2's contribution.

The greenhouse effect is a natural process that contributes to regulating the earth's temperature. Without it, the temperature of the earth would be about 0°F (−18°C) instead of its present 57°F (14°C) and unlikely to support human life in its current form.

Figure 1-1: Greenhouse Gas Effect



(Source: NYS Department of Environmental Conservation, http://www.dec.ny.gov/energy/76533.html)

Carbon Cycle and Global Temperatures

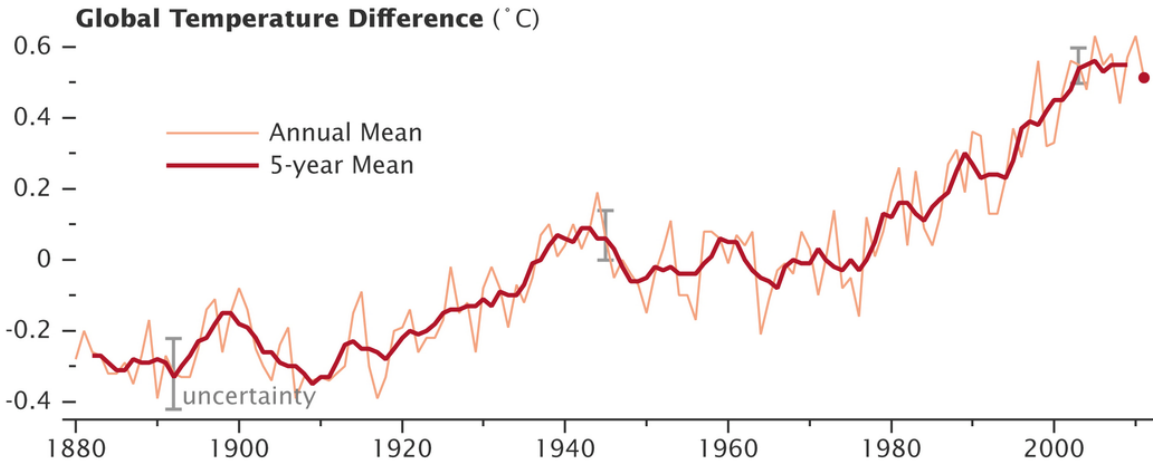
The global carbon cycle is complex and incorporates natural sources of atmospheric carbon dioxide, including respiration of aerobic organisms, wildfires, and volcanic outgassing, and sinks such the removal of CO_2 from by land plants for photosynthesis, and absorption by the ocean. Data collected on global GHG concentrations over the past 800,000 years demonstrates that the concentration of CO_2, the principal GHG, has increased dramatically since pre-industrial times, from approximately below 300 parts per million (ppm) in 1800, to about 353 ppm in 1990, 379 ppm in 2005, and ~~399 ppm in early 2013~~407 in 2018.[1]

Increased atmospheric concentrations of GHGs have led to a rise in average global temperatures. Figure 1-2 shows the increase in global temperatures from 1880 to ~~2011~~2019. While average global temperatures fluctuate on a yearly basis, the general trend shows a long-term temperature increase. ~~Nine~~ All of the ten warmest years since 1880 have occurred since the year 2000, and scientists expect the long-term temperature increase to continue as well. The consensus among climate scientists is that earth's climate system is unequivocally

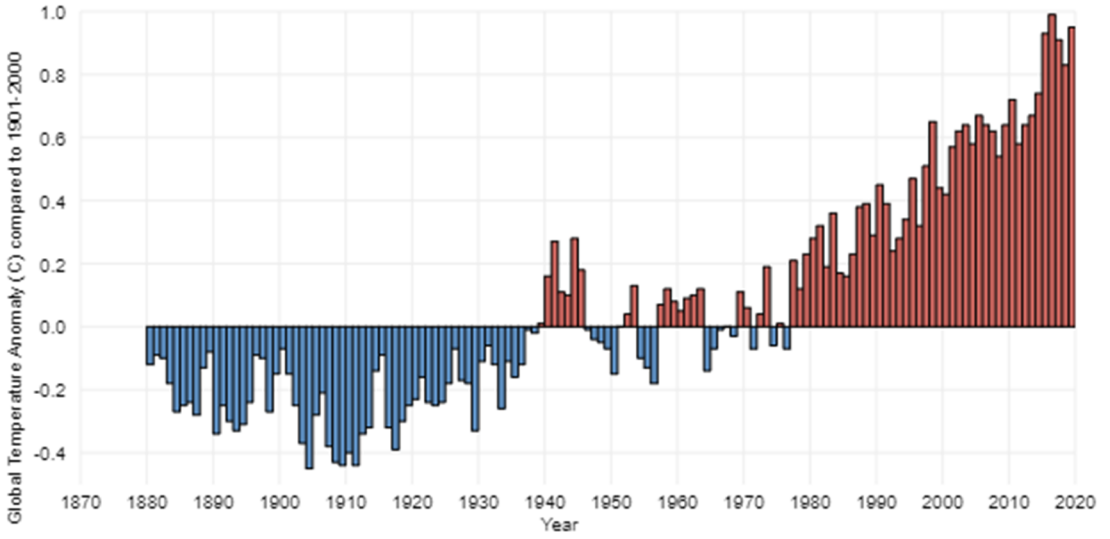
[1] Source: NOAA ~~"Trends in Atmospheric Carbon Dioxide,"~~Climate.gov http://www.~~esrl.noaa.gov/gmd/ccgg/trends/~~climate.gov

warming, and rigorous scientific research demonstrates that anthropogenic[2] greenhouse gases are the primary driver.

Figure 1-2: History of global surface temperature since 1880~~Change in Average Global Temperatures~~



~~(Source: N~~



Source: NOAA Climate.gov, http://www.climate.gov~~ASA Headquarters Release No. 12-020, http://www.nasa.gov/topics/earth/features/2011-temps.html)~~

[2] Caused by human activities

Climate Change

Global climate change concerns are focused on the potential effects of climate change resulting from excessive GHGs in the atmosphere and how communities can mitigate effects and adapt to change in the short and long term.

Numerous observations document the impacts of global climate change, including increases in global average air and ocean temperatures, the widespread melting of snow and ice, more intense heat waves, and rising global average sea level. Scientists have high confidence that global temperatures will continue to rise in the foreseeable future, largely due to anthropogenic GHG emissions. In addition to the physical impacts to the environment from increased temperatures, sea level rise, and more frequent extreme weather events, global climate change is predicted to continue to cause ecological and social impacts. Ecological impacts of climate change include greater risk of extinction of species, loss of species diversity, and alteration of global biogeochemical cycles, which play an essential role in nutrient distribution. The social impacts of climate change include impacts on agriculture, fisheries, energy, water resources, forestry, construction, insurance, financial services, tourism and recreation.

~~According to the International Panel on Climate Change (IPCC) in North America, the regional impacts of climate change are a forecast of decreased snowpack in the western mountains, a 5 to 20 percent decrease in the yields of rain fed agriculture in some regions, and increased frequency, intensity and duration of heat waves in cities that currently experience them.~~

~~In California, the Climate Action Team (CAT) – a group of state agency secretaries and the heads of agency, boards and departments, led by the Secretary of the California Environmental Protection Agency – synthesized current research on the environmental and economic impacts of climate change. The CAT found that climate changes are poised to affect virtually every sector of the state's economy and most ecosystems. Key findings of the CAT include predicted decreases in water supply that could cause revenue losses of up to $3 billion in the agricultural sector by 2050, increases in statewide electricity demand of up to 55 percent by the end of the century, increased wildfire risk that may cause monetary impacts of up to $2 billion by 2050, and ecosystems impacts affecting California's historic ranching culture and a source of local, grass-fed beef.~~

Higher temperatures, changes in precipitation, decreased water supplies accompanied by increased demand, increased risk of wildfire, a greater number of extremely hot days, the decline or loss of plant and animal species, and other impacts of climate change are expected to continue to affect Carlsbad. Climate change also has public health impacts. City residents who are already more vulnerable to health challenges are likely to be the most affected by climate change. These populations tend to be the young and the old, the poor, and those who are already sick. Increases in extreme heat events can increase the risk of heat-related illness or death, or the worsening of chronic health conditions. Food scarcity and higher food prices from impacts to agriculture can cause increased hunger and reduced availability of nutrition. The increased frequency of natural disasters such as floods, droughts, wildfires, and storm surges can cause injury or death, illness, and increases or shifts in infectious diseases.

1.3 California GHG Reduction Legal Framework

California has taken an aggressive stance to reduce GHG emissions in order to combat the impacts of climate change.

Governor's Executive Order S-3-05

Executive Order S-3-05 (EO S-3-05) recognizes California's vulnerability to increased temperatures causing human health impacts, rising sea levels, and reduced Sierra snowpack due to a changing climate. The Executive Order established targets to reduce GHG emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.

Global Warming Solutions Act of 2006 and CARB Scoping Plans

The Global Warming Solutions Act of 2006 (Assembly Bill 32, or AB 32) codifies the target set in EO S-3-05 of statewide reductions to 1990 emissions levels by 2020. AB 32 directs the California Air Resources Board (CARB) to develop and implement a scoping plan and regulations to meet the 2020 target.

CARB approved the first Scoping Plan in 2008, which provide~~sd~~ guidance for local communities to meet AB 32 and EO S-3-05 targets. The Scoping Plan adopted a quantified cap on GHG emission representing 1990 emission levels, instituted a schedule to meet the emission cap, and developed tracking, reporting, and enforcement tools to assist the State in meeting the required GHG emission reductions. ~~The Scoping Plan recommends that local governments target 2020 emissions at 15 percent below 2005 levels to account for emissions growth since 1990, as proxy for 1990 emissions, since few localities know those levels.~~California is currently on track to meet or exceed the AB 32 target of reducing GHG emissions to 1990 levels by 2020.

Executive Order B-3015 (EO B-30-15) established a new GHG emissions reduction target of 40 percent below 1990 levels by 2030 and directed CARB to update the Scoping Plan. In September 2016, Senate Bill 32 (SB 32) was signed into law and codified EO B-30-15. In November 2017, CARB published the 2017 Climate Change Scoping Plan, which offers the framework for achieving the 2030 reductions set forth in EO B-30-15 and SB 32.

~~The Carlsbad CAP's GHG emission targets are based on meeting the goals set in EO S-3-05 and AB 32.~~

1.4 Federal and State Emissions Reductions Strategies and Standards

Several federal and state standards have been adopted to reduce GHG emissions, in addition to and in support of the targets set in EO S-3-05 and AB 32.

Federal Standards

The United States Environmental Protection Agency (EPA) regulates and tests gas mileage or fuel economy in order to deter air pollution in the United States. As the transportation sector produces approximately 30 percent of GHG emissions in the U.S. as a whole, fuel economy regulations are an important way to reduce GHG emissions.[3] The EPA's Corporate Average Fuel Economy (CAFE) standards require vehicle manufacturers to comply with the gas mileage or fuel economy standards to reduce energy consumption by increasing the fuel economy of cars and light trucks. ~~The most recent CAFE GHG emissions standards were set in 2012, which will increase the fuel economy to 54.5 miles per gallon average for cars and light trucks by Model Year 2025, and reduce U.S. oil consumption by 12 billion barrels per year. The EPA also imposes the Gas Guzzler Tax on manufacturers of new cars that do not meet required fuel economy levels, to discourage the production and purchase of fuel-inefficient vehicles.~~ Also, in 2007, the U.S. Supreme Court ruled that CO_2 is an air pollutant under the Federal Clean Air Act, confirming that the EPA can regulate GHG emissions.

~~The EPA is taking further action to reduce GHG emissions in addition to setting fuel economy standards. The EPA established a renewable fuel standard to include a minimum volume of renewable fuel in 2013, which applies to all gasoline and diesel produced or imported. On September 20, 2013, the EPA proposed the first national limits on the amount of carbon pollution that new power plants will be allowed to emit. The EPA will propose standards for existing power plants by June 1, 2014. The EPA also approved oil and natural gas air pollution standards in 2013 to reduce pollution from the oil and natural gas industry.~~

State Standards

California Senate Bill 375

SB 375 (2008) requires each Metropolitan Planning Organization (MPO) in the state to adopt a Regional Transportation Plan (RTP) aimed at achieving a coordinated and balance regional transportation system, including mass transit, highways, railroads, bicycles, and pedestrians, among other forms of transit. Each MPO is required to prepare a Sustainable Communities Strategy (SCS) which sets forth forecast development patterns and describes the transportation system that achieve the regional GHG emission reduction targets set by CARB.

~~CARB's targets for San Diego County call for the region to reduce per capita emissions 7 percent by 2020 and 13 percent by 2035 based on a 2005 baseline. There are no mandated targets beyond 2035. San Diego Association of Governments (SANDAG), the San Diego County MPO, adopted its current RTP/SCS in October 2011. The SCS lays out how the region will meet the CARB GHG targets to the year 2035. As the SCS is focused on passenger vehicle emissions on a regional scale, it is considered separate from the reductions outlined in this CAP.~~

[3] In 2011, GHG emissions from transportation were about 28 percent of the total 6,702 million metric tons CO_2 equivalents (Source: https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions~~http://www.epa.gov/climatechange/ghgemissions/sources/transportation.html~~)

~~Senate Bill 1368~~

~~SB 1368 creates GHG emissions performance standards for baseload generation[4] from investor-owned utilities. The bill requires that any long-term financial investment in baseload generation resources made on behalf of California customers must meet a performance standard of producing below 1,000 lbs CO_2 per MWh (megawatt-hour), approximately equal to a combined-cycle natural gas plant.~~

Governor's Executive Order S-1-07 (Low Carbon Fuel Standard)

Executive Order S-1-07, the Low Carbon Fuel Standard (LCFS), requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. The LCFS requires oil refineries and distributors to ensure that the mix of fuel sold in California meets this reduction. The reduction includes not only tailpipe emissions but also all other associated emissions from the production distribution and use of transport fuels within the state.

Renewable Portfolio Standards

California's Renewable Portfolio Standard (RPS), established in 2002 by the California State Senate in Senate Bill 1078, accelerated in 2006 and expanded in 2011 through SB X1-2, is one of the most ambitious renewable energy standards in the country. The RPS requires each energy provider to supply electricity from eligible renewable energy resources to 33 percent of the total supply by 2020. In 2015, SB 350 increased the RPS to 50 percent renewable by 2030 and a doubling of energy savings in electricity and natural gas customers. In 2018, SB 100 updated SB X1-2 and requires 100 percent of electric retail sales and 100 percent of electricity procured to serve state agencies be carbon-free by 2045.

Pavley Fuel Economy Standards (AB 1493)

In 2009, CARB adopted amendments to the Pavley regulations to reduce GHG emissions in new passenger vehicles from 2009 to 2016. The standards became the model for the updated federal CAFE standards.

Title 24 Building Standards & CALGreen

Title 24 is California's Building Energy Code, which is updated every three years. In 2010, Title 24 was updated to include the "California Green Building Standards Code," referred to as CALGreen. CALGreen requires that new buildings reduce water consumption, increase system efficiencies, divert construction waste from landfills, and install low pollutant-emitting finish materials. CALGreen has mandatory measures that apply to nonresidential and residential construction. The most recent CALGreen code was adopted in 2013~~9~~ and became effective in 2014~~20~~. CALGreen contains voluntary Tier 1 and Tier 2 levels, which are designed to exceed energy efficiency and other standards ~~by 15 percent or 30 percent~~.

[4] ~~Baseload generation is the minimum amount of power that a utility must make available to customers to meet minimum demands based on customer usage.~~

1.5 Planning Process

How This Plan Was Prepared

The CAP reflects the city's commitment to the Core Values presented in the General Plan, and links the elements of the plan—including Sustainability; Open Space and the Natural Environment; Access to Recreation and Active, Health Lifestyles; Walking, Biking, Public Transportation, and Connectivity; and Neighborhood Revitalization, Community Design, and Livability—with the goal of GHG reduction. The original CAP was prepared in 2013 by City staff and consultants, with input from the public.

On August 22, 2013 the City of Carlsbad hosted a Community Workshop on the CAP. The workshop provided an opportunity to present the citywide emissions inventory that had been completed, and discuss potential emission reduction strategies. Feedback from the Community Workshop was used to guide the preparation of this document.

Relationship to the California Environmental Quality Act

The California Environmental Quality Act (CEQA) is a statute that requires local agencies to identify significant environmental impacts of their actions and avoid or mitigate those impacts, if feasible. In 2007, California's lawmakers enacted Senate Bill (SB) 97, which expressly recognizes the need to analyze GHG emissions as part of the CEQA process. SB 97 required the Governor's Office of Planning and Research (OPR) to develop recommended amendments to address GHG emissions as an environmental effect.

In 2010, OPR's amendments to the CEQA guidelines addressing GHG emissions became effective. Lead agencies are now obligated to describe, calculate or estimate the amount of GHG emissions resulting from a project, by using a model or methodology to quantify GHG emissions resulting from a project or relying on a qualitative analysis or ~~performance based~~performance-based standards. The lead agency should determine whether a project's GHG emissions significantly affect the environment by considering whether the project's emissions, as compared to the existing environmental setting, exceeds a threshold of significance that the lead agency determines applies to the project, and the extent to which the project complies with the regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions. In addition, the lead agency is required to impose feasible mitigation to eliminate or substantially reduce significant effects.

The CAP will help the city with compliance with CEQA Guidelines Section 15183.5(b): Tiering and Streamlining the Analysis of Greenhouse Gas Emissions, which became effective in 2010.[5] The required elements of a CAP, as cited in the guidelines, state that a plan for the reduction of GHG emissions should:

[5] 15183.5(b) of CEQA Guidelines states, "Plans for the Reduction of Greenhouse Gas Emissions. Public agencies may choose to analyze and mitigate significant greenhouse gas emissions in a plan for the reduction of greenhouse gas emissions or similar document. A plan to reduce greenhouse gas emissions may be used in a cumulative impacts analysis as set forth below. Pursuant to sections 15064(h)(3) and 15130(d), a lead agency may determine that a

- Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;
- Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable;
- Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;
- Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;
- Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels;
- Be adopted in a public process following environmental review.

The CAP is intended to fulfill these requirements. The CAP also contains a Project Review Checklist, which allows for streamlined review of GHG emissions for projects that demonstrate consistency with the CAP, as described in CEQA Guidelines Section 15183.5(b).

Relationship to General Plan and Future Projects

Carlsbad's approach to addressing GHG emissions within the General Plan is parallel to the climate change planning process followed by numerous California jurisdictions. A General Plan is a project under CEQA, and projects under CEQA are required to estimate CO_2 and other GHG emissions, as described above. According to the Attorney General, "in the context of a general plan update, relevant emissions include those from government operations, as well as from the local community as a whole. Emissions sources include, for example, transportation, industrial facilities and equipment, residential and commercial development, agriculture, and land conversion." The CAP is designed to provide discrete actions to operationalize the General Plan policies that help with GHG reduction, as well as outline additional actions to help meet GHG reduction targets. The preparation of a CAP is also consistent with CEQA Guidelines Section 15183.5 that allows jurisdictions to analyze and mitigate the significant effects of GHG at a programmatic level, by adopting a plan to reduce GHG emissions.

Project-specific environmental documents prepared for projects consistent with the General Plan may rely on the programmatic analysis contained in the CAP and the EIR certified for the Carlsbad General Plan. The thresholds presented in Section 5.3 present a clear method for determining the significance of GHG emissions for future projects.

project's incremental contribution to a cumulative effect is not cumulatively considerable if the project complies with the requirements in a previously adopted plan or mitigation program under specified circumstances."

1.6 How to Use This Plan

The CAP is intended to be a tool for policy makers, community members and others to guide the implementation of actions that limit Carlsbad's GHG emissions. Ensuring that the mitigation measures in the CAP translate from policy language to on-the-ground results is critical to the success of the CAP. Chapter 5 describes how the city will review development projects to achieve the GHG reduction measures in Chapter 4, consistent with state CEQA Guidelines. This chapter also outlines how the city will monitor progress in reducing emissions, and periodically revisit assumptions and key provisions of the plan.

2

Emissions Inventory

This chapter identifies the major sources and the overall magnitude of greenhouse gas (GHG) emissions in Carlsbad, pursuant to Sections 15183.5(b)(1)(A) and 15183.5(b)(1)(C) of the state CEQA Guidelines. The City of Carlsbad prepared an inventory ~~of 2005~~ for communitywide GHG emissions in 2012, 2014 and 2016, the latter of which was provided through the San Diego Association of Government's (SANDAG) Regional Climate Action Planning (ReCAP) program. The city also prepared a 2005 and 2011 inventory of~~, including emissions from~~ government operations~~, in 2008~~. ~~As part of the Climate Action Plan (CAP) preparation effort, this inventory was updated to 2011 to provide a more current measure of emissions, and is summarized in this chapter.~~ Appendix B-1 provides the ~~2005~~ communitywide inventories~~y~~ ~~and 2011 update~~ in detail and Appendix B-2 contains the government operations inventories, both of~~,~~ which are~~is~~ summarized in Section 2.2 and 2.3 in this chapter, respectively.

The inventory follows the standards developed by the International Council for Local Environmental Initiatives (ICLEI) for community and government operations GHG inventories. The inventory methodology is described first, followed by the inputs, and results.

2.1 Methodology

The community inventories~~y~~ cover~~s~~ all direct GHG emissions[6] from sources within the boundaries of the City of Carlsbad, including fuel combusted in the community and direct emissions from landfills within the community. Indirect emissions associated with the consumption of energy (such as electricity, with no end point emissions) that is generated outside the borders of the city are also included. The U.S Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol), published by ICLEI USA, requires a minimum of five basic emissions-generating activities to be included in Protocol-compliance community-scale inventories. The emissions from off-road transportation (e.g. lawn and garden, construction and industrial equipment) are considered in the inventories. The ~~community inventory tallies emissions from six~~ seven emissions-generating activities included in the community inventories are:

[6] GHGs considered in the report are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons. The emissions have been converted to carbon dioxide equivalents (CO_2e), which converts the three other GHGs into the equivalent volume of carbon dioxide.

~~sectors:~~

- On-Road Transportation~~Residential~~;
- Electricity~~Commercial~~;
- Natural Gas~~Industrial~~;
- Solid Waste~~Transportation~~;
- Off-Road Transportation;
- Water~~Solid waste~~; and
- Wastewater.

As the city has much greater ability to influence its own operations, the government operations inventory is presented separately, and covers direct emissions from sources the City of Carlsbad owns and/or controls. This includes mobile combustion of fuel for city vehicles and the use of natural gas to heat city buildings. Indirect emissions associated with the consumption of electricity, steam, heating or cooling for city operations that are purchased from an outside utility are also included. All other indirect emissions sources, including employee commutes and the decomposition of government-generated solid waste, are not included as part of the local government operations, but rather counted in the community inventory. The government operations inventory covers emissions from the following sectors:

- Buildings and Facilities;
- Vehicle Fleet;
- Public Lighting; and
- Water and Wastewater Transport within city borders

~~ICLEI's CACP[7] model is used to estimate emissions from residential, commercial, and industrial consumption of energy and solid waste disposal. The California Air Resource Board's (CARB's) EMFAC[8] models were used to calculate transportation emissions, and other sources were used for solid waste and wastewater sectors.~~

The majority of emissions are calculated using activity data and emissions factors. Activity data refers to a measurement of energy use or another GHG-generation process, such as residential electricity use, or vehicle miles traveled. Emissions factors are used to convert activity data to emissions, and are usually expressed as emissions per unit of activity data (e.g. metric tons carbon dioxide [CO_2] per kilowatt hour of electricity). To estimate emissions, the following basic equation is used:

[*Activity Data*] *x* [*Emissions Factor*] = Emissions

~~[7] Clean Air and Climate Protection (CACP) is a model developed by ICLEI to inventory and forecast GHG emissions. The 2011 update utilized the CACP 2009 Version 3.0 software.~~

~~[8] The Emissions Factors (EMFAC) model was developed by CARB to measure various emissions from vehicles. There are multiple versions of EMFAC which focus on different vehicle types.~~

As an example, multiplying the total amount of residential electricity use (activity data, expressed in kilowatt-hours) by the emissions factor (expressed as CO_2e emissions per kilowatt-hour) produces the emissions in CO_2e from residential energy use. ~~The following section describes the inputs for the community inventory based on activity data (or usage).~~ Table 2-1 below describes data sources for estimating activities and emissions factors.

TABLE 2-1: DATA SOURCES FOR ACTIVITIES AND EMISSIONS FACTORS IN COMMUNITY INVENTORIES

Category	Category Detail	Data Source
On-Road Transportation	Activity	Disaggregated vehicle miles traveled (VMT) using the origin-destination method provided by SANDAG using Activity Based Model
	Emission factor	San Diego region emission factor by vehicle class from latest approved California Air Resources Board (CARB) EMFAC model converted to average vehicle emission factor using VMT distribution by vehicle class
Electricity	Activity	Data from SDG&E based on customer class and customer type, rate schedule and service provider
	Emission factor	Weighted average emission factor based on SDG&E procurement from each fuel type at each facility and emission factor of electricity generation at each facility
Natural Gas	Activity	Data from SDG&E based on customer class and customer type, rate schedule and service provider
	Emission factor	Natural gas emission factor in California from CARB statewide inventory
Solid Waste	Activity	Waste disposal from CalRecycle
	Emission factor	Based on waste composition study from similar jurisdiction (Oceanside) and methane recovery factor at landfills obtained from the landfill
Off-Road Transportation	Activity	CARB off-road model estimates for applicable San Diego sub-categories, adjusted using scaling factors for Carlsbad's proportion of off-road activity.
	Emission factor	
Water	Activity	

	Emission factor	Jurisdiction-specific water use and energy intensity from the supply agency
Wastewater	Activity	Jurisdiction-specific wastewater generation and emission factor based on treatment process from agency
	Emission factor	

Source: ReCAP Technical Appendix I

Certain emissions that occur in the city are not counted in the community inventory. For example, ~~during the community workshop on the CAP some participants questioned why~~ emissions related to the Encina Power Plant are not included in Carlsbad's GHG inventory. The reason is as follows: embodied emissions, such as those resulting from power generation that is produced locally but distributed regionally, are not covered in Carlsbad's inventory, in accordance with ICLEI standards. These emissions are included at the points where energy is *consumed* (some of which are in Carlsbad) rather than where it is simply *produced*—otherwise emissions would either be double counted, or if only counted at the production source, electricity consumption (which is the second largest contributor to GHG) in climate action planning would be meaningless. ~~Similarly, for water consumed in Carlsbad, emissions associated with its transport from Northern California and Colorado are counted in Carlsbad's inventory, rather than elsewhere.~~

~~The Carlsbad Desalination Plant, which will begin operations in 2016, would therefore not contribute emissions to the 2011 GHG inventory. The emissions forecast (Chapter 3) uses a regional average for water consumption emissions, which accounts for the effect of the desalination plant. In general, including these large regional facilities would effectively add GHGs from consumption of services outside of Carlsbad to the city's emission totals.~~

The McClellan-Palomar airport is county owned and operated, and is outside of the city's jurisdiction. The city has little, if any, influence over airport operations, and emissions associated with airport flight operations are excluded because they occur in a regional context.

For transportation trips that originate or end in Carlsbad, emissions for half of the entire trip are included, and not just for the miles traveled within Carlsbad; however, trips that just pass through Carlsbad are excluded, as their emissions would be reflected at their trip ends.[9] Furthermore, although pass-through trips contribute a substantial amount to VMT totals, the city and Carlsbad community has limited ability to influence them.

[9] For example, for a trip that begins in downtown San Diego and ends in Carlsbad, the entire trip length is calculated for that trip. Half of the entire trip length is assigned to Carlsbad, and the other half is assigned to the City of San Diego. Using half the trip length is standard SANDAG methodology for assigning regional VMT to a particular city.

2.2 2012 Baseline Community GHG Inventory

~~Residential, Commercial, and Industrial (RCI) Electricity and Natural Gas Usage~~GHG Emissions By Category

~~The inputs for the CACP model for the residential, commercial and industrial (RCI) sectors are electricity and natural gas consumed. Table 2-1 shows RCI electricity and natural gas consumption, and the total citywide consumption of electricity and natural gas. The commercial sector has the largest electric consumption followed by residential and industrial. The greatest natural gas consumption is from the residential sector, used for heating homes and water, followed by commercial and industrial sectors.~~ As discussed in Section 2.1, a GHG inventory describes the emissions in various categories for a given calendar year. Some of the inputs, such as electricity and natural gas, are based directly on consumption data. Others, such as on-road transportation, are based upon model outputs. In order to determine a community's GHG emissions reduction targets, and its consistency with state reduction targets, a baseline GHG inventory is needed. The City of Carlsbad is using the 2012 community GHG inventory as its baseline for the purpose of deriving GHG reduction targets. A detailed description of the community GHG inventory, including methods and inputs, is contained in Appendix B-1.

TABLE 2.2 – 2012 COMMUNITY GHG EMISSIONS

Emissions Category	GHG Emissions ($MTCO_2e$)	Percentage of Total Emissions (%)
On-Road Transportation	488,000	49.9
Electricity	301,000	30.8
Natural Gas	134,000	13.7
Solid Waste	25,000	2.5
Off-Road Transportation	14,000	1.4
Water	12,000	1.2
Wastewater	3,000	<1
Total	**977,000**	**100**

TABLE 2-1: RESIDENTIAL, COMMERCIAL AND INDUSTRIAL (RCI) INPUTS; 2011		
		Inputs
Residential	Electric (kWh)	275,033,189
	Natural Gas (therms)	15,769,481
Commercial	Electric (kWh)	411,249,580
	Natural Gas (therms)	7,844,336
Industrial	Electric (kWh)	116,341,521
	Natural Gas (therms)	1,536,470
Total by Source		
Electricity (kWh)		802,624,290
Natural Gas (therms)		23,613,817

Source: SDG&E, 2013

Differing emissions based on the source of electricity, either bundled or direct access electricity, were taken into account. Bundled electricity is produced for SDG&E and transmitted by SDG&E. Direct access electricity is produced elsewhere in the region but ultimately transmitted to the consumer by SDG&E. Natural gas produces CO_2e regardless of source.

Transportation

Transportation emissions are based on vehicle miles traveled (VMT) for vehicles and off road equipment. GIS based 2011 VMT data from SANDAG for all roadways was used. All roadways including the zone connectors were used. The SANDAG data is reported as daily weekday VMT. This was converted to annual VMT by multiplying it by 347, as recommended by CARB.[10] The total annual VMT in 2011 was 510,973,969 vehicle miles traveled.

CARB's latest model, EMFAC2011, is made up of three modules: SG, LDV, and HD. The SG module covers all vehicle types, while LDV calculates light duty vehicles and HD calculates heavy duty vehicles. Appendix B provides a more detailed explanation of how CO_2e were calculated using each module. As inputs, emissions from local roadway VMT and freeway VMT were determined separately.

Off road emissions in Carlsbad include lawn and garden equipment, construction equipment, industrial equipment, and light commercial equipment. While CARB's OFFROAD2007 model generates emission outputs for 16 categories across San Diego County, only the off road emissions listed above are included, as they generate the most emissions in Carlsbad in this category. The CO_2, N_2O, and CH_4 emissions were calculated in short tons per day for the county. These emissions were then pro rated by the city's share of the county population, multiplied by 365 days, and converted to metric tons.

[10] CARB recommends that 347 be used instead of 365 to convert from average daily VMT to annual VMT to account for less travel on weekends.

Solid Waste

The default values in the CACP were used for solid waste emissions. For methane emissions from the one landfill in the city limits – the closed Palomar Airport Landfill – the same data from the 2005 community inventory was used, as it was unlikely to have changed substantially, if at all.[11]

For emissions from solid waste disposed of in Carlsbad and taken to landfills elsewhere, 2011 data for Carlsbad was obtained from CalRecycle. The composition of waste was estimated from the latest such survey, the 2008 CalRecycle Statewide Waste Characterization Study, which has averages for the southern region of California. The amount of average daily cover, which is made of plant debris, was also entered.

Wastewater Treatment

Emissions from methane and nitrous oxide generated in the process of wastewater treatment were determined using the University of San Diego's EPIC (Energy Policy Initiatives Center) model. The EPIC estimate of GHG emissions from countywide wastewater treatment was used and pro-rated to Carlsbad's share of the county population.

Total Community Emissions

The total community GHG emissions were 705,744 $MTCO_2e$ in 2011. Table 2-2 summarizes the sources and quantities of community emissions, and Figure 2-1 shows the emissions graphically by sector. The largest sector is transportation, at 39 percent, followed by commercial and industrial (32 percent), residential (25 percent), solid waste (3 percent) and wastewater (1 percent).

[11] In November 2014, city staff contacted the County of San Diego Public Works Department in response to a comment on the draft CAP. County staff reported that for 2011, it calculated GHG emissions from Palomar landfill at 6,703 $MTCO_2e$. Although it is unknown why the reported figure is higher than the assumed figure for the city's GHG inventory update, County staff did note that their GHG calculation methodology had changed in 2010. The difference in the County's calculations of GHG emissions from Palomar landfill does not have a material effect on the assumptions, conclusions, or recommendations of this CAP.

Figure 2-1: 201~~1~~2 Community GHG Emissions by ~~Sector~~ Category ~~(MTCO$_2$e)~~

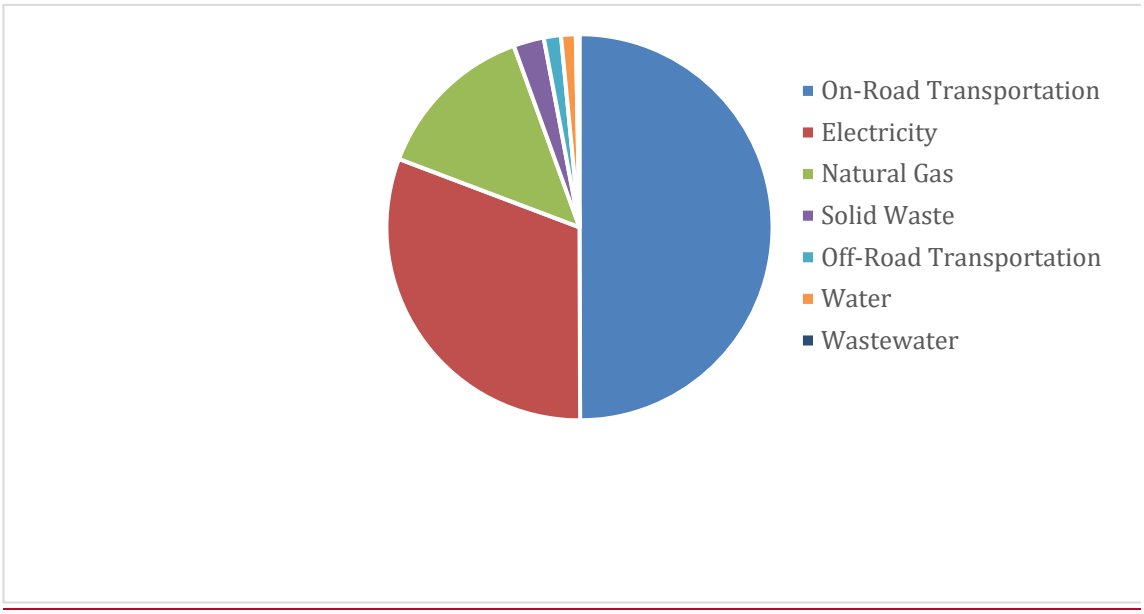
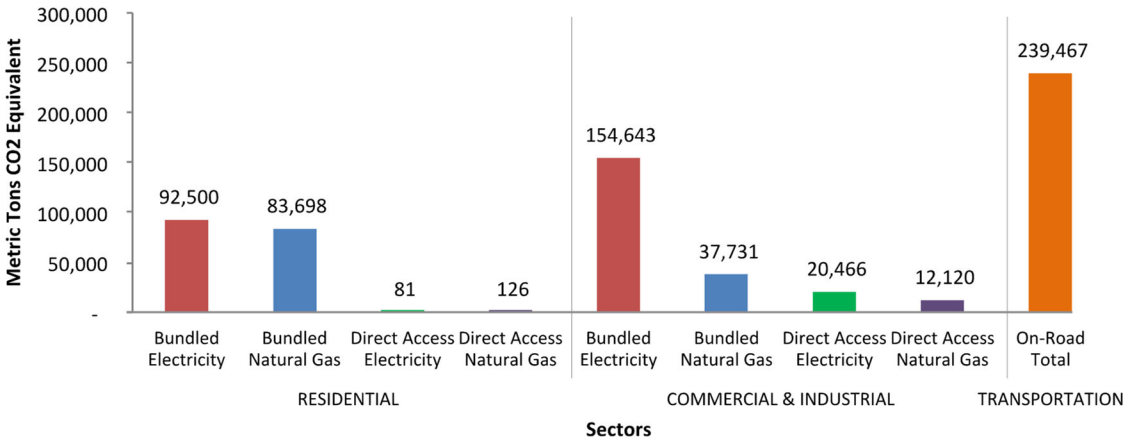


TABLE 2-2: 2011 COMMUNITY GHG EMISSIONS ($MTCO_2E$)		
Sector	**Subsector**	**Emissions**
	Bundled Electricity	92,500
	Bundled Natural Gas	83,698
	Direct Access Electricity	81
	Direct Access Natural Gas	126
Residential	**Total Residential**	**176,405**
	Bundled Electricity	125,314
	Bundled Natural Gas	37,731
	Direct Access Electricity	11,701
	Direct Access Natural Gas	3,966
Commercial	**Total Commercial**	**178,712**
	Bundled Electricity	29,329
	Bundled Natural Gas	-
	Direct Access Electricity	8,765
	Direct Access Natural Gas	8,154
Industrial	**Total Industrial**	**46,248**
	On-Road Total	*239,467*
	Lawn and Garden Equipment	2,449
	Construction Equipment	23,830
	Industrial Equipment	4,943
	Light Commercial Equipment	3,056
	Off-Road Subtotal	*34,279*
Transportation	**Total Transportation**	**273,745**
	Community-generated solid waste	21,719
	Landfill Waste-in-Place	2,598
Solid Waste	**Total Solid Waste**	**24,317**
Wastewater	**Total Community-generated Wastewater**	**6,317**
GRAND TOTAL		**705,744**

Figure 2-2 shows the emission by source for the three largest sectors: residential, commercial and industrial, and transportation. The largest individual sources are on-road transportation, bundled commercial and industrial electricity, and bundled residential electricity.

Figure 2-2: 2011 Community GHG Emissions by Source for Three Largest Sectors ($MTCO_2e$)



Emissions By Source

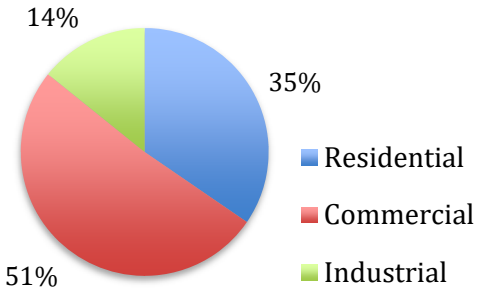
Electricity

Electricity emissions account for 38 percent of the total emissions. Table 2-3 and Figure 2-3 show electricity use by sector – commercial sector consumes more than half of all electricity in Carlsbad, followed by residential sector, which accounts for just over a third of total electricity use.

TABLE 2-3: ELECTRICITY EMISSIONS BY SECTOR ($MTCO_2e$)

Sector	2011 Emissions
Residential	92,581
Commercial	137,015
Industrial	38,093

Figure 2-3: Electricity Emissions by Sector



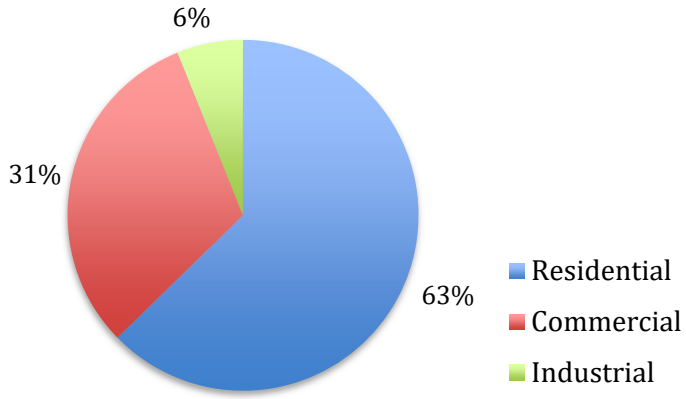
Natural Gas

Natural gas use accounts for 19 percent of total emissions in Carlsbad. The residential sector accounts for 63 percent of natural gas use, while the commercial sector accounts for 31 percent. Table 2-4 and Figure 2-4 show natural gas use emissions by sector.

TABLE 2-4: NATURAL GAS EMISSIONS BY SECTOR ($MTCO_2e$)

Sector	2011 Emissions
Residential	83,824
Commercial	41,697
Industrial	8,154

Figure 2-4: Natural Gas Emissions by Sector



Change Between 2005 and 2011 Community Emissions

Total community emissions in 2005 were 630,310 $MTCO_2e$ compared with 705,744 in 2011. The increase in total GHG emissions of 12 percent in the period parallels the population and jobs increase, as well as the service population increase (the number of residents plus number of jobs). While total GHG emissions have increased, emissions per service population (population plus workers) have held steady since 2005. Table 2-5 summarizes these changes.

TABLE 2-5: POPULATION AND JOBS, 2005 AND 2011			
	2005	2011	% Change
Carlsbad Population[a, b]	94,961	106,403	12.0%
Carlsbad – # of Jobs[c]	59,309	66,417	12.0%
Carlsbad – Service Population[d]	154,270	172,820	12.0%
GHG Emissions ($MTCO_2e$)	630,310	705,744	12.0%
Emissions per Service Population	4.09	4.08	-0.1%

a. 2011 population from the California Department of Finance, Table E-5.

b. The 2005 Inventory used different populations for the community and local government analyses. This is the population used for the community inventory.

c. Numbers from SANDAG.

d. The service population is the total number of residents plus workers

Table 2-6 shows the source of growth in emissions. The largest increase in emissions came from commercial electricity usage (37% of increase), followed by residential electricity usage (29%). All other emissions increased at a slower pace than the rate of population growth, with emissions from residential natural gas consumption increasing by 9 percent, and all other sources increasing by 5 percent, or decreasing, in the case of roadway emissions.

For electricity, the increase was largely caused by the increase (35%) in the CO_2 generated by SDG&E electricity since 2005. For example, residential electricity consumption increased by 10 percent but emissions from that source increased by 29 percent. Commercial electricity consumption went up by 8 percent while related emissions increased by 37 percent – an even higher increase as some commercial customers in the greater San Diego region switched from cleaner direct access electricity to sources producing more CO_2.

TABLE 2-6: SOURCES OF GROWTH IN GHG EMISSIONS (METRIC TONS CO2E)				
Source	2005 CO2e	2011 CO2e	Growth	% of Growth
Commercial Electric	98,352	137,015	38,663	37%
Residential Electric	62,290	92,581	30,291	29%
Residential NG	74,137	83,824	9,688	9%
Roads	260,467	239,467	-21,000	-8%
Industrial Electric	32,417	38,093	5,676	5%
Commercial NG	36,259	41,697	5,438	5%
Off Road	28,963	34,279	5,315	5%
Industrial NG	3,013	8,154	5,141	5%
Wastewater	4,397	6,317	1,920	2%
Solid Waste	30,015	24,317	-5,698	-5%
TOTAL	630,310	705,744	75,434	

~~Table 2-7 shows the sources of emissions, ordered by volume of overall contribution. The largest contributor continues to be transportation, but that has declined in proportion as emissions from building energy consumption have grown faster. These sources – roadway VMT, off-road vehicles, and private electricity and natural gas consumption – account for 96 percent of Carlsbad's communitywide GHG emissions.~~

~~TABLE 2-7: GREENHOUSE GAS EMISSIONS SUMMARY BY SECTOR (METRIC TONS CO2E)~~				
~~Sector~~	~~2005~~	~~% of Total~~	~~2011~~	~~% of Total~~
~~Transportation~~	~~289,431~~	~~46%~~	~~273,745~~	~~39%~~
~~Commercial / Industrial~~	~~170,041~~	~~27%~~	~~224,960~~	~~32%~~
~~Residential~~	~~136,427~~	~~22%~~	~~176,405~~	~~25%~~
~~Solid Waste~~	~~30,015~~	~~5%~~	~~24,317~~	~~3%~~
~~Wastewater~~	~~4,397~~	~~1%~~	~~6,317~~	~~1%~~
~~TOTAL~~	~~630,310~~	~~-~~	~~705,744~~	

2.3 Government Operations Inventory

Government operations represent a small portion (1.2%; see end of this section) of the communitywide GHG emissions. However, more detailed information is available to characterize GHG emissions by source and sector. The city has the ability to directly influence emissions from government operations, and can provide community leadership in reducing GHG emissions. As described before, the four sectors included in the government operations inventory are buildings and facilities, vehicle fleet, public lighting, and water and wastewater transport.

Buildings and Facilities

The inputs for this sector are electricity and natural gas. Data was entered by individual facility along with departmental information. Table 2-8 lists all of the buildings and facilities operated by the city and electricity and natural gas inputs.

TABLE 2-~~3~~8: BUILDINGS AND FACILITIES INPUTS; 2011			
Department	**Building**	**Electricity (kWh)**	**Natural gas (therms)**
City	City Administration	1,203,726	1,738
City	City Hall	233,680	5,313
City	Farmers Insurance Bldgs	112,057	-
City	Hawthorne Equipment Bldg	10,040	-
City Total		**1,559,503**	**7,051**
Community Development	Hiring Center	6,972	-

TABLE 2-38: BUILDINGS AND FACILITIES INPUTS; 2011			
Department	**Building**	**Electricity (kWh)**	**Natural gas (therms)**
Community Development	Las Palmas	55,570	-
Community Development Total		**62,542**	
Fire	Fire Station No. 1	63,600	1,358
Fire	Fire Station No. 2	32,643	1,069
Fire	Fire Station No. 3	33,972	675
Fire	Fire Station No. 4	28,867	1,062
Fire	Fire Station No. 5	98,720	2,061
Fire	Fire Station No. 6	55,180	1,464
Fire Total		**312,982**	**7,689**
Golf Course	The Crossings	**1,056,015**	**18,019**
Library	Cole Library	430,160	2,119
Library	Cultural Arts Department	14,444	321
Library	Dove Library	1,432,492	11,200
Library	Library Learning Center	192,000	421
Library Total		**2,069,096**	**14,061**
PD/Fire	Safety Center	**988,001**	**19,816**
Public Works	City Yard	88,335	729
Public Works	CMWD M&O	189,440	86
Public Works	Fleet Yard	72,320	456
Public Works	Parks Maintenance	39,694	149
Public Works Total		**389,789**	**1,420**
Recreation	Calavera Community Center	54,970	-
Recreation	Carrillo Ranch	58,080	-
Recreation	Harding Community Center	60,120	952
Recreation	Parks Total	914,888	3,006
Recreation	Senior Center	308,318	3,349
Recreation	Stagecoach Community Center	195,920	1,424
Recreation	Swim Complex	247,240	34,266
Recreation	Trails	65,929	-
Recreation Total		**1,905,465**	**42,997**
Housing and Neighborhood Services		**31,277**	**-**
TOTAL		**8,374,670**	**111,053**

VEHICLE FLEET

The inputs for this sector are all vehicles used by the city. The key data used are fuel consumed and VMT, broken out by model year, vehicle type, and fuel type. CACP uses fuel consumption to calculate CO_2 emissions and VMT to calculate NO_2 and CH_4 emissions.

Although the vehicle fleet data from the city was broken down by department, the inputs were loaded into CACP as a single set for the entire city due to the time-consuming nature of processing and entering this very detailed information.

Table 2-9 summarizes the inputs by vehicle and fuel type. Gasoline accounted for the largest amount of fuel consumption (167,345 gallons) and greatest vehicle miles traveled (1,965,416 VMT).

TABLE 2-~~49~~: GOVERNMENT OPERATIONS VEHICLE FLEET INPUTS

	2011	
	Fuel (gal)	**VMT**
Diesel	**62,407**	**407,826**
Light Truck/SUV/Pickup	31,162	298,388
Heavy Truck	31,245	109,438
Gasoline	**167,345**	**1,965,416**
Light Truck/SUV/Pickup	76,663	938,733
Passenger Car	85,874	931,979
Motorcycle	1,787	74,024
Heavy Truck	3,021	20,680
Hybrid	**3,581**	**137,096**
Passenger Car	2,478	108,136
Light Truck/SUV/Pickup	1,103	28,960

For the analysis in CACP, motorcycle inputs were grouped under passenger cars and hybrid fuel consumption was included with gasoline. Hybrid VMT was assumed at one-third of listed mileage to account for the likely reality of most hybrid miles being under electric power during low speed driving on local streets.

Public Lighting

This sector covers electricity consumed from three sources: traffic signals, streetlights, and other outdoor lighting. As shown in Table 2-10, streetlights make up the great majority of electricity consumption in this sector. Between 2005 and 2011, the city retrofitted its existing streetlights with more energy-efficient lamps.

TABLE 2-~~5~~10: PUBLIC LIGHTING INPUTS (KWH)		
	2011	% of Total
Streetlights	4,403,265	85%
Traffic Signals/Controllers	768,784	15%
Outdoor Lighting	17,740	<1%
TOTAL	**5,189,789**	

Water and Wastewater Transport

This sector covers fuel consumed by pumps and other mechanisms used to convey water and wastewater: water delivery pumps, sprinklers and irrigation, sewage pumps, and recycled water pump stations. These systems all consumed electricity plus a small amount (170 gallons) of diesel fuel for water delivery generators.

Table 2-11 shows the electricity consumed by the city's water and wastewater transport systems in 2011. The greatest electricity consumption is from sewage pumps (53 percent), followed by recycle pump stations (34 percent), water delivery pumps (12 percent), and sprinklers and irrigation (1 percent).

TABLE 2-~~6~~11: WASTE AND WASTEWATER TRANSPORT INPUTS (KWH)		
	2011	% of Total
Sewage Pumps	1,262,824	53%
Recycle Pump Stations	791,732	34%
Water Delivery Pumps	285,345	12%
Sprinklers/Irrigation	22,554	1%
TOTAL	**2,362,455**	

Inventory Results

Emissions by Sector

Government operations in 2011 generated an estimated 8,205 metric tons CO_2e in GHG emissions, as shown in Table 2-12. Emissions for government operations mainly came from buildings and facilities (42%) and the vehicle fleet (27%), followed by public lighting (21%) and water and wastewater transportation (10%).

TABLE 2-~~7~~12: GOVERNMENT OPERATIONS EMISSIONS BY SECTOR ($MTCO_2e$)		
Source	**2011**	**% of Total**
Buildings and Facilities	3,410	42%
Vehicle Fleet	2,253	27%
Public Lighting	1,747	21%
Water and Wastewater Transport	795	10%
TOTAL	**8,205**	

Emissions by Source

Most of the government operations emissions came from electricity consumption, accounting for 65 percent of emissions, as shown in Table 2-13. Gasoline produced about 19 percent of emissions, followed by diesel/propane (8 percent), natural gas (7 percent) and mobile refrigerants (1 percent).

TABLE 2-~~8~~13: EMISSIONS BY SOURCE ($MTCO_2e$)		
Source	**2011**	**% of Total**
Electricity	5,362	65.4%
Gasoline	1,538	18.7%
Diesel / Propane	641	7.8%
Natural Gas	590	7.2%
Mobile Refrigerants	74	0.9%
TOTAL	**8,205**	

Comparison of 2011 Government Operations to 2012 Citywide Emissions

Table 2-14 shows a comparison of the 2011 government operations to 2012 citywide emissions. Government operations account for a very small portion of GHG emissions ~~in 2011~~, comprising ~~about 1.2~~less than one percent of emissions.

TABLE 2-9: 2011 GOVERNMENT OPERATIONS EMISSIONS VS 2012 COMMUNITY EMISSIONS ($MTCO_2e$)	
	~~2011~~
Government operations emissions	8,205
Community emissions	~~705,744~~977,000
Government operations as proportion of community emissions	~~1.2~~0.8%

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3

Greenhouse Gas Reduction Target, Forecasts, and Emissions "Gap"

This chapter describes the greenhouse gas (GHG) reduction targets provided by state law, provides a baseline forecast of community GHG emissions, and models forecasts of future community and local government GHG emissions through 2035. The chapter also quantifies GHG reductions from (1) state and federal actions and (2) the updated Draft General Plan policies and actions, and applies these reductions to the community forecast. The emissions "gap" between the forecasts (with GHG reductions) and the emissions targets is addressed by the Climate Action Plan (CAP) GHG reduction strategies in Chapter 4.

3.1 GHG Reduction Target

~~Governor's Executive Order S-3-05 and the Global Warming Solutions Act of 2006~~ Statewide GHG Reduction Targets and 2017 CARB Scoping Plan

Executive Order S-3-05 (EO S-3-05) and the California Global Warming Solutions Act of 2006 (AB 32 and SB 32) provide the basis for the CAP's GHG emissions targets. ~~EO S-3-05~~Collectively they commit~~s~~ California to reduce its GHG emissions to 1990 levels by 2020, to 40 percent below 1990 by 2030, and to 80 percent below 1990 levels by 2050. ~~AB 32 codifies the 2020 target and tasks CARB with developing a plan to achieve this target.~~

CARB first approved the Scoping Plan in 2008, which provides guidance for local communities to meet AB 32 and EO S-3-05 targets. The Scoping Plan recommended "a greenhouse gas reduction goal for local governments of 15 percent below today's levels by 2020 to ensure that their communitywide emissions match the state's reduction targets.[12] ~~s that~~

[12] CARB 2008. *Climate Change Scoping Plan. Pursuant to AB 32 the California Global Warming Solutions Act of 2006,* pg. ES-5.

~~local governments target 2020 emissions at 15 percent below 2005 levels to account for emissions growth since 1990, as proxy for 1990 emissions, since few localities know those levels~~. The 2014 First Update to Scoping Plan repeated that emissions reduction target and provided guidance for local governments to develop post-2020 GHG reduction targets. It stated that "there is a need for local government climate action planning to adopt mid-term and long-term reduction targets that are consistent with…the statewide goal of reducing emissions 80 below 1990 levels by 2050."[13]

CARB's 2017 Climate Change Scoping Plan recommended statewide targets of "no more than six metric tons CO2e per capita by 2030 and no more than two metric tons CO2e per capita by 2050."[14] These goals are based upon the 2030 and 2050 goals of 40 percent and 80 percent reductions below 1990 levels and the projected population for those years. Using the statewide GHG inventories, percentage reductions can be derived for various baseline years

Total Carlsbad GHG emissions from the ~~2005~~ 2012 inventory were ~~630,310~~977,000 ~~metric tons carbon dioxide equivalents (~~$MTCO_2e$~~)~~ per year. Therefore, the 2020 target under State guidance is a ~~15~~ 15 percent reduction from ~~2005~~ 2012 emissions, which corresponds to a target of ~~535,763~~939,000 $MTCO_2e$. The 2030 target would be 42 percent below 2012 levels and the 2050 goal would be 81 percent below 2012 levels.

~~The long range 2050 target set by EO S-3-05 is an 80 percent reduction from 2020 emissions target, which represents the level scientists believe is necessary to stabilize the climate. The 2050 target for Carlsbad is citywide emissions of 107,153 $MTCO_2e$. This is a substantial decrease in overall emissions, over 500,000 $MTCO_2e$ below baseline 2005 emissions levels.~~ While CARB's Scoping Plan does not specifically set target levels for intermediate years between ~~2020~~2030 and 2050, the Scoping Plan recommends a linear progression in annual GHG emissions reductions to meet the final targets.

The horizon year for this CAP is 2035, corresponding with the ~~Draft~~ General Plan horizon. The CAP uses a linear trajectory in emissions reductions between ~~2020~~ 2030 and 2050 to determine the 2035~~,~~ target. Table 3-1 summarizes these emissions targets and the percentage reduction from ~~2005~~ 2012 emissions. ~~Figure 3-1 graphs the emissions targets, following a linear trajectory, from 2020 to 2035. As can be seen, the baseline exceeds the 2020 reduction target by 15 percent, and the 2035 target by 49 percent.~~

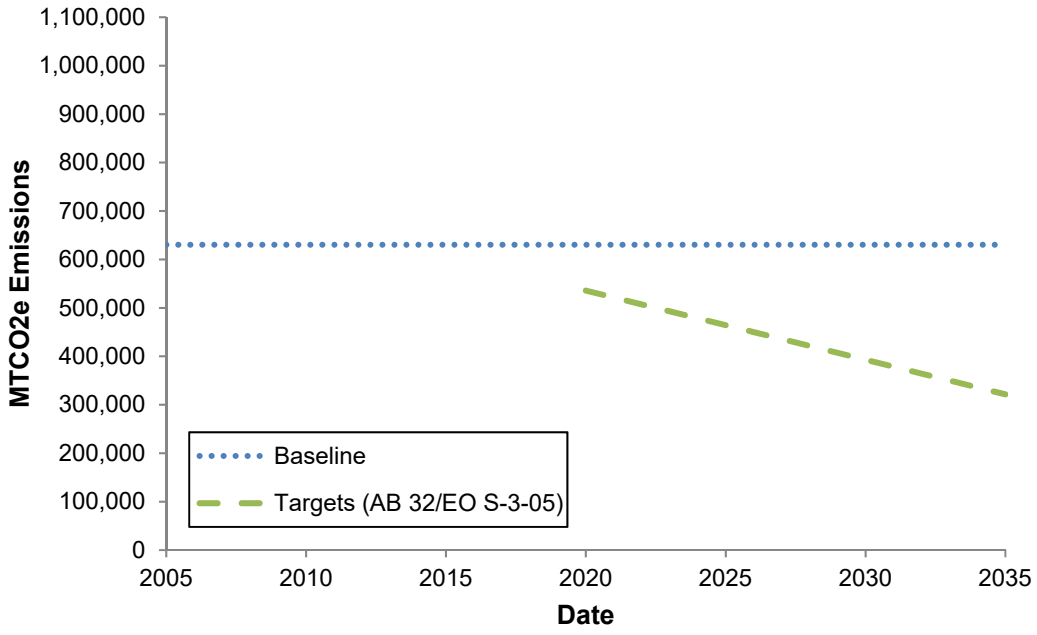
TABLE 3-1: ~~2005~~ 2012 EMISSIONS AND EMISSIONS TARGETS

Year	GHG Emissions and Targets	Reduction From ~~2005~~ 2012 Baseline
~~2005~~2012	~~630,310~~977,000 $MTCO_2e$	N/A
2020	~~535,763~~939,000 $MTCO_2e$	~~15~~ 4 percent
2035	~~321,458~~472,000 $MTCO_2e$	~~49~~ 52 percent

[13] CARB 2014. *First Update to the Climate Change Scoping Plan. Building on the framework pursuant to AB 32 the California Global Warming Solutions Act of 2006,* pg. 113

[14] CARB 2017. *California's 2017 Climate Change Scoping Plan. The strategy for achieving California's 2030 greenhouse gas target,* pg. 101.

Figure 3-1: 2005 Emissions and Emissions Targets



3.2 Business as Usual Forecast

The first step in projecting GHG emissions is to calculate the business as usual forecast (BAU). The ~~business as usual (~~BAU~~)~~ forecast estimates community emissions through the year 2035, based on the growth in emissions ~~from the 2005 to 2011 citywide inventory~~in the absence of any new policies or programs. The BAU calculation relies upon the latest data available, as well as the most recent projections for population, housing and job growth. ~~The increase in community emissions from 2005 to 2011 was linearly projected outward to the year 2035. The BAU forecast simply assumes that emissions will increase in the future at the same growth rate that occurred between the 2005 and 2011 citywide inventories. Thus, BAU emissions are forecast to reach 1,007,473 $MTCO_2e$ in the year 2035.~~ The BAU calculation typically represents a linear extrapolation of the most recent data, holding other variables constant.

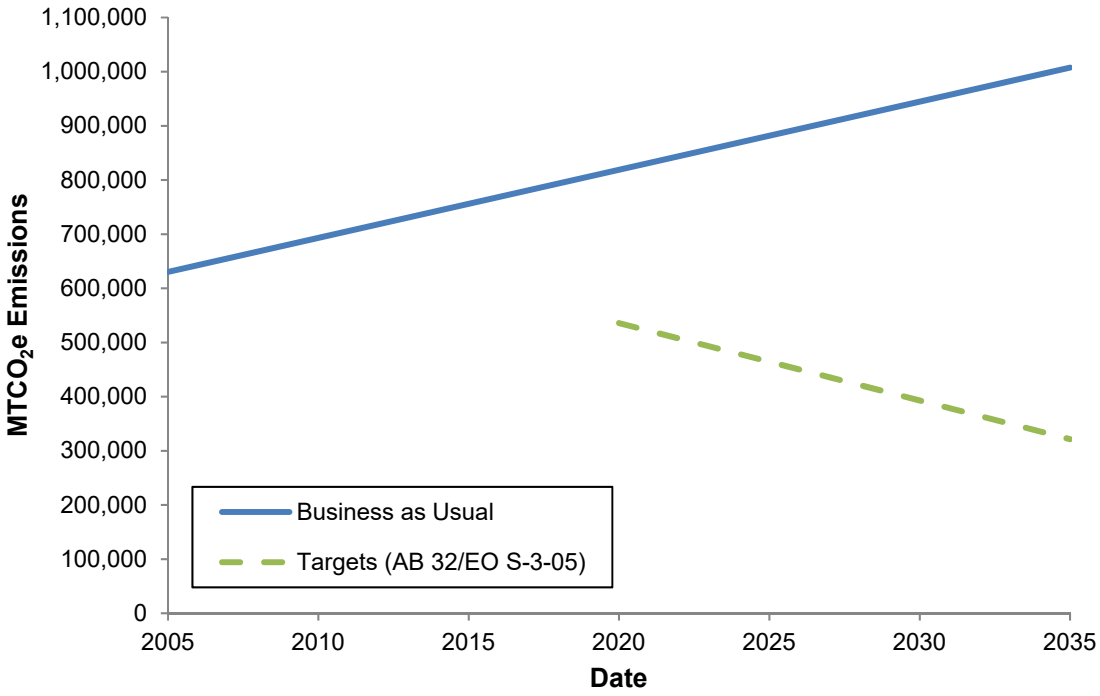
The BAU includes emissions projections in the following categories:

- On-road Transportation
- Electricity
- Natural Gas
- Solid Waste

- Off-road Transportation
- Water
- Wastewater

~~Figure 3-2 shows the difference between emissions under the business as usual forecast and the 2020 and 2035 emissions targets.~~

~~Figure 3-2: Business as Usual Forecast and Emissions Targets~~



~~3.3 Community Forecast with General Plan Land Use and Circulation System~~

Methodology

The Series 14 Regional Growth Forecast included in the SANDAG 2019 Federal Regional Transportation Plan was used to obtain the population and job growth in Carlsbad. As of March

2020, SANDAG Series 14 Growth Forecast does not have a breakdown of the number of jobs by employment type (e.g. construction, agriculture) for each jurisdiction. Therefore, the ratio of the number of jobs by each employment type to total number of jobs from SANDAG Series 13 Growth Forecast were applied to the job forecast from Series 14. Table 3-2 shows the population and job growth projections for 2020 and 2035.

TABLE 3-2: 2020 and 2035 POPULATION AND JOB GROWTH FORECAST

Year	Population	Commercial Jobs	Industrial Jobs	Total Jobs
2020	116,101	65,880	12,548	78,428
2035	119,798	74,039	14,103	88,142

Source: SANDAG 2013, 2019, Energy Policy Initiative Center, 2020

~~The Statewide Energy Efficiency Collaborative model (SEEC) is used to predict community GHG emissions across all sectors to 2035. A product of the collaborative, this tool is based on the International Council for Environmental Initiatives' (ICLEI's) Clean Air and Climate Protection (CACP) model used to estimate the 2005 and 2011 emissions inventories. The primary reason for using SEEC rather than CACP is that SEEC includes the effects of the Renewable Portfolio Standard (RPS) and Pavley I Fuel Economy Standards, whereas CACP requires manual adjustment to account for the state mandated electrical production and fuel efficiency improvements. Section 3.4 quantifies other state and federal actions that reduce GHG emissions and incorporates these actions into the forecast.~~

~~The SEEC community forecast predicts all direct GHG emissions[15] from sources within the boundaries of the City of Carlsbad, including fuel combusted in the community[16] and direct emissions from landfills within the community. Indirect emissions associated with the consumption of energy that is generated outside the borders of the city are also included. Other indirect or embodied emissions are not covered in the forecast, in accordance with ICLEI standards. The SEEC community forecast tallies emissions from seven sectors:~~

- ~~Residential~~
- ~~Commercial~~
- ~~Industrial~~
- ~~Transportation~~
- ~~Solid Waste~~

~~[15] GHGs considered in the report are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons. The emissions have been converted to carbon dioxide equivalents (CO_2e), which converts the three other GHGs into the equivalent volume of carbon dioxide.~~

~~[16] This does not include the Encina Power Station, for reasons described in Chapter 2.~~

- ~~Landfills[17]~~
- ~~Wastewater~~

~~The emissions projected in the SEEC community forecast use the activity data (or usage) from the 2005 community inventory as an initial value, and the 2011 inventory to provide an intermediate value to adjust the model. The predicted growth in each sector is then added into the model to project future emissions. The following section describes how the predicted growth in each section was determined.~~

Inputs

~~Residential~~On-Road Transportation

Emissions related to on-road transportation are based upon the vehicle miles traveled (VMT) and the average vehicle emission rate for the San Diego region. VMT is calculated using the SANDAG Activity-Based Model and the Origin-Destination (O-D) method. 2035 VMT projections are estimated from extrapolating SANDAG Series 14 2016 VMT data according to service population. The service population is the sum of population and jobs, which is projected to be 207,940 in 2035. With an average annual VMT of 1,231,554,425 miles, and an average vehicle emission rate of 361 pounds of CO_2e per mile, the projected 2020 emissions from on-road transportation are 452,000 $MTCO_2e$ and 2035 emissions total 445,000 $MTCO_2e$.

Electricity

Emissions projections from the residential electricity sector are ~~from electricity and natural gas demand. The growth in residential electricity and natural gas consumption was assumed to scale with population growth, estimated at 0.9 percent per year thorough 2035, based on General Plan buildout estimates.~~ based upon the per capita electricity use on 2014 (2,159 kWh per person per year) multiplied by the SANDAG Series 14 population forecast. The commercial and industrial emissions projections are based upon per-job electricity consumption on 2016 (6,936 kWh per commercial job per year and 10,126 kWh per industrial job per year) multiplied by the SANDAG Series 13 job growth forecast. The projected 2020 emissions from electricity are 274,000 $MTCO_2e$ and 2035 emissions total 296,000 $MTCO_2e$.

~~Commercial~~Natural Gas

The emissions projections for natural gas are calculated similar to those for electricity. Per capita consumption for 2016 (118 therms per person per year, 151 therms per commercial job per year, and 126 therms per industrial job per year) multiplied by population and job growth forecasts. The projected 2020 emissions from natural gas are 137,000 $MTCO_2e$ and 2035 total 147,000 $MTCO_2e$.

~~increase in commercial demand for electricity and natural gas was assumed to scale with the General Plan employment forecasts to 2035 in the commercial sector by land use category:~~

[17] ~~The 2011 inventory considered landfill emissions as part of solid waste. The SEEC model separates out landfills from solid waste as an emissions source, so the separation has been preserved in this chapter.~~

~~commercial, hotel, office, and other, including construction and transportation related employment. For 2010 to 2035, an annual growth of 1.1 percent was used.~~

~~Industrial~~Solid Waste

The emissions from solid waste disposal are based upon the per capita disposed in 2016 (3.5 kilograms per person per day) multiplied by forecasted population growth. The projected 2020 emissions from solid waste are 36,000 $MTCO_2e$ and 2035 emissions total 37,000 $MTCO_2e$.

~~growth rate in industrial electricity and natural gas demand was based on General Plan employment forecasts to 2035 in the industrial sector. An annual growth rate of 0.8 percent was used through 2035.~~

Off-Road Transportation~~—With General Plan Land Use and Circulation System~~

The emissions from off-road transportation include four categories: lawn and garden equipment, light commercial equipment, construction and mining, and industrial. Lawn and garden equipment include sources such as lawn mowers, chainsaws and leaf blowers. Light commercial equipment includes sources such as generators and pumps. The construction and mining emissions sources include excavators, off highway tractors and paving equipment. Industrial equipment sources include forklifts, aerial lifts and sweepers. These emissions are derived from several models, such as OFFROAD2007 and RV2013, and the CARB In-Use Off-Road Equipment 2011 Inventory. The projected 2020 emissions from off-road transportation are 15,000 $MTCO_2e$ and 2035 emissions total 19,000 $MTCO_2e$.

~~Transportation emissions are based on the emissions associated with VMT. The VMT projections were taken from SANDAG GIS models of regional VMT projections clipped to the city boundaries and adjusted to remove through trips, or trips that did not originate nor end within city boundaries.[18] The SANDAG data was reported as daily weekday VMT. This was converted to annual VMT by multiplying it by 347, as recommended by CARB.[19]~~

~~The VMT forecasts incorporate GHG reductions from General Plan land use projections and new roadway construction thorough 2035. These VMT forecasts reflect the General Plan land use patterns, include the effects of compact and infill, mixed use, and transit oriented development, and the protection of open space. New roadway construction includes the effects of street extensions and citywide traffic signalization. The land use projections and new roadway construction are described in detail in the General Plan.~~

~~The SEEC model automatically incorporates the effect of Pavley I Fuel Economy Standards. Table 3-2 shows the citywide VMT for 2011 and projected VMT forecast, used to estimate transportation emissions.~~

---

[18] ~~Excluding through trips removes much of the regional traffic through the Interstate 5 Freeway.~~

[19] ~~347 was used instead of 365 to average out the effect of a dip in traffic during the weekend.~~

~~TABLE 3-2: 2011 VMT AND PROJECTED 2020 AND 2035 VMT[20]~~	
~~Year~~	~~Vehicle Miles Traveled~~
~~2011~~	~~510,973,969~~
~~2020~~	~~560,972,562~~
~~2035~~	~~651,739,086~~

~~Solid Waste~~

~~Waste emissions from solid waste disposed of in Carlsbad and taken to landfills elsewhere, was assumed to scale with population growth at 0.9 percent per year through 2035.~~

~~Landfill~~Water

The emissions from water are based upon the 2016 per capita water consumption (141 gallons per person per day for potable water and 32 gallons per person per day for recycled water) multiplied by forecasted population growth. The projected 2020 emissions from water are 9,000 $MTCO_2e$ and 2035 emissions total 9,000 $MTCO_2e$.

~~Emissions from the landfill sector are an estimate of methane generation from the anaerobic decomposition of all organic waste sent to a landfill. Within city boundaries, landfill emissions are comprised of leaking methane from the closed Palomar Airport Landfill. Currently, most of the methane generated at this capped landfill is captured. The EPA estimates 95 percent methane capture rate for capped landfills and estimates that emissions follow a first-order exponential decay. Therefore, baseline landfill emissions were estimated to decrease exponentially over time, at a decay rate of 5 percent over 10 years to 2035, the largest allowed percentage decrease in the model.~~

Wastewater

The emissions from wastewater are based upon the 2016 per capita wastewater generation (53 gallons per person per day) multiplied by forecasted population growth. The projected 2020 emissions from wastewater are 3,000 $MTCO_2e$ and 2035 emissions total 3,000 $MTCO_2e$.

~~The Carlsbad Municipal Water District's 2010 Urban Water Management Plan (UWMP) was used to determine the growth in emissions from wastewater treatment.[21] The demand for~~

~~[20] VMT includes the effect of an additional 327 units above the growth cap in the Northwest Quadrant by 2035, as shown in the 2014 Draft General Plan. While the City Council will adjust housing sites or densities at adoption time so that the development cap is not breached, the inclusion of these units in the CAP represents a conservative estimate that leads to a slightly higher VMT (and corresponding GHG emissions) above levels anticipated under General Plan that would be adopted.~~

~~[21] Carlsbad Municipal Water District serves the majority of the city, with the exception of the southeast corner of the City, which is served by Olivenhain Municipal Water District, and Vallecitos Water District. The changes in water demand from the UWMP were assumed to be representative of the city as a whole for the purposes of the SEEC model.~~

~~wastewater treatment was assumed to scale with projected 2035 water deliveries listed in the UWMP. The UWMP includes the effect of conservation policies. Table 3-3 shows water deliveries and annual growth rates used in the forecast.~~

~~TABLE 3-3: PROJECTED UWMP WATER DELIVERY, USED TO DETERMINE WASTEWATER EMISSIONS~~		
~~Year~~	~~Water Delivery (acre-feet per year, all sectors)~~	~~Annual Percentage Growth~~
~~2005~~	~~19,759~~	~~-~~
~~2010~~	~~15,076~~	~~-5.3%~~
~~2020~~	~~20,529~~	~~3.1%~~
~~2030~~	~~21,147~~	~~0.3%~~
~~2035~~	~~22,122~~	~~0.9%~~

~~*Source: 2010 Carlsbad Municipal Urban Water Management Plan*~~

Results

Table 3-~~3~~4 shows the emissions from the business-as-usual~~SEEC~~ community forecast for each sector—residential, commercial, industrial, transportation, solid waste, landfill, and wastewater—and the sum total community emissions. ~~The forecast includes the reduction from RPS and Pavley I Fuel Economy Standards, which are quantified separately in Section 3.5, below. The forecast also includes the effect of the General Plan land use and circulation system on transportation emissions (compact, infill, mixed use, and transit oriented development, open space protection, new traffic signals and roadway extensions). The Carlsbad General Plan EIR quantifies the reduction in VMT due to the proposed General Plan in comparison to higher VMT under the existing General Plan (the No Project alternative).~~

The greatest projected emissions continue to be from the on-road transportation ~~sector~~category, which accounts for 4~~8.91~~ percent of emissions in 2020 and ~~36~~ 46.5 percent of emissions in 2035. ~~Residential~~ Electricity emissions are the next largest ~~sector~~category, with 2~~9.66~~ percent of emissions in 2020 and ~~28~~ just under 31 percent of the total in 2035. ~~Commercial, industrial, and~~Emissions from solid waste, off-road transportation, water and wastewater remain relatively low compared to other categories.~~, and landfill emissions are the next largest sectors in order of total emissions.~~

TABLE 3-3: 2020 COMMUNITY FORECAST EMISSIONS BY CATEGORY		
Emissions Category	GHG Emissions ($MTCO_2e$)	Percentage of Total Emissions (%)
On-Road Transportation	452,000	48.9
Electricity	274,000	29.6
Natural Gas	137,000	14.8
Solid Waste	36,000	3.9
Off-Road Transportation	15,000	1.6

Water	9,000	<1
Wastewater	3,000	<1
TOTAL	**926,000**	**100**

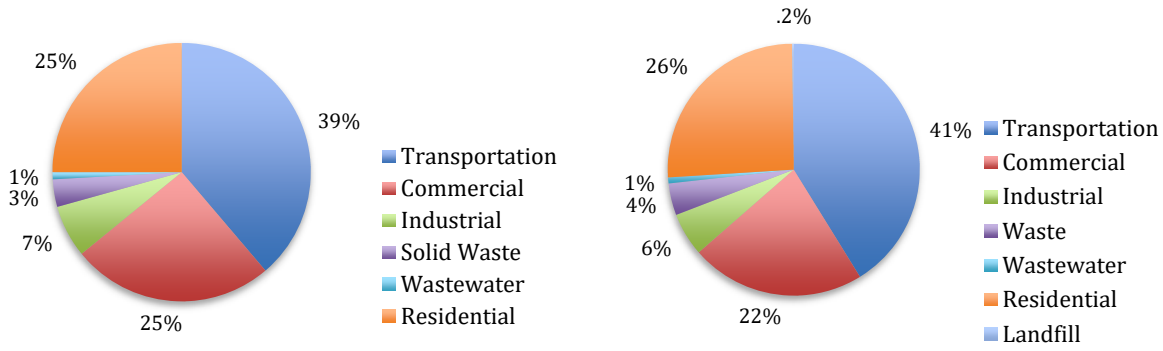
TABLE 3-4: 2035 COMMUNITY FORECAST EMISSIONS BY CATEGORY~~BY SECTOR, 2011, 2020, AND 2035 ($MTCO_2e$)~~

~~Sector~~Emissions Category	GHG Emissions ($MTCO_2e$)~~2035~~	Percentage of Total Emissions (%)
~~Residential~~On-Road Transportation	~~163,881~~445,000	46.5
~~Commercial~~Electricity	~~148,978~~296,000	30.9
~~Industrial~~Natural Gas	~~35,249~~147,000	15.3
~~Transportation~~Solid Waste	~~210,568~~37,000	3.8
~~Solid Waste~~Off-Road Transportation	~~26,002~~19,000	1.9
~~Landfill~~Water	~~558~~9,000	<1
Wastewater	~~4,601~~3,000	<1
TOTAL	**956,000**	**100**
~~**TOTAL**~~	~~**589,837**~~	

The BAU projections of 926,000 $MTCO_2e$ for the Carlsbad community GHG emissions fall below the 2020 target emissions level of 939,000 $MTCO_2e$. Therefore, the next steps in the projections of emissions only include a forecast for 2035.

~~**Figure 3-3: Comparison of Emissions by Sector in 2011, 2020 and 2035**~~

~~**2011**~~ ~~**2020**~~



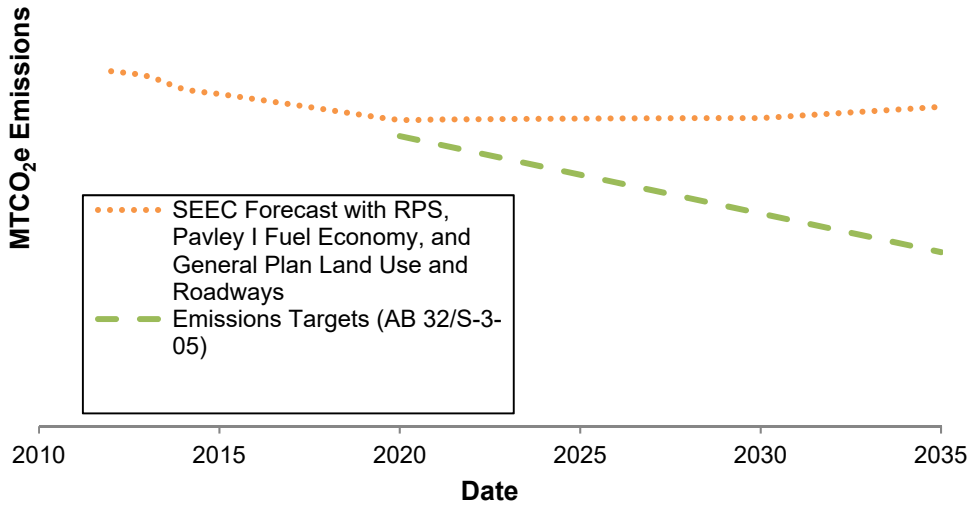
~~2035~~

.1%

~~Figure 3-4 shows the change in SEEC-modeled community forecast emissions over time. Total emissions are projected to decrease from 705,744 $MTCO_2e$ in 2011 to 565,873 $MTCO_2e$ in 2020 (a decrease of 20 percent). The initial drop in emissions is mostly caused by the implementation of the RPS, which causes a decrease in residential, commercial, and industrial emissions, and Pavley I Fuel Economy Standards, which decrease transportation emissions. Over time, the decreases in emissions from an increased amount of renewable power usage and fuel efficiency improvements are canceled out by population growth, which cause emissions to increase from 2020 values to 589,873 $MTCO_2e$ in 2035 (an increase of 4 percent).~~

~~In 2020, the total emissions of 565,873 are about 30,000 $MTCO_2e$ above the AB 32 target emissions. The following section quantifies GHG reductions from State and Federal actions and applies them to the emissions forecast.~~

~~**Figure 3-4: Community Forecast with RPS, Pavley I Fuel Economy Standards, and General Plan Land Use and Roadways**~~



~~3.4~~3.3 Government Operations Forecast

Methodology

The SEEC government operations forecast, which is a subset of the community forecast, covers direct emissions from the sources the City of Carlsbad owns and/or controls. The emissions from government operations are included in the totals shown in Table 3-4 and Figure 3-4 above. This section separates out emissions from government operations for accounting purposes. The government operations forecast includes mobile combustion of fuel for city vehicles and the use of natural gas to heat city buildings. Indirect emissions associated with the consumption of electricity, steam, heating, or cooling for city operations that are purchased from an outside utility are also forecast. All other indirect emissions sources, including employee commute and the decomposition of government-generated solid waste, are not included as part of the local government forecast, but rather are counted in the community forecast. The government operations inventory covers emissions from the following sectors:

- Buildings and Facilities

- Vehicle Fleet
- Public Lighting
- Water Delivery Facilities
- Wastewater Transport

The government operations forecast uses 2005 inventory to represent baseline emissions, and the 2011 inventory to provide an intermediate value to adjust the model.

Within each sector, certain types of emissions are assumed to scale with population growth, projected to grow at 0.9 percent annually through 2035, while other types of emissions are expected to remain constant or decrease with efficiency improvements. The following sections describe the assumptions underlying the forecast growth rates for each government operations sector.

Buildings and Facilities

The 2005 and 2011 inventories of emissions from all buildings and facilities operated by the city were used to determine the future growth for this sector. The natural gas and electricity demands were assumed to scale with population for departments such as Police, Fire, and Parks and Recreation, while others, such as Administration and Utilities, would remain staffed at current levels. These growth rates were then combined to determine an aggregate annual growth rate of 0.7 percent, which was applied to the buildings and facilities sector.

Vehicle Fleet

An estimate of the growth in the number of City employees was used to determine City fleet use. The growth in fleet emissions beyond 2011 was estimated by assuming—similar to the Buildings and Facilities sector—that certain departments would scale with population growth, while others would remain staffed at current levels. These growth rates were then combined to determine an aggregate annual growth rate of 0.6 percent, which was applied to the city fleet sector.

Public Lighting

From 2005 to 2011, electricity use for streetlights decreased approximately 4 percent due to the installation of some energy-saving induction streetlights. Following the completion of the installation of all induction streetlights, the City's electricity demand for streetlights was further reduced, which is reflected in the forecast energy demands for this sector.

Water Delivery and Wastewater

The increased demand for energy usage for water delivery and wastewater was assumed to be proportional to the amount of water delivered by the Carlsbad Municipal Water District (CMWD), as projected in the 2010 Urban Water Management Plan (UWMP). CMWD's service area covers about 85 percent of the City, and it was assumed that water and wastewater usage in the remaining 15 percent of the City, served by Olivenhain Municipal Water District

and Vallecitos Water District, would follow similar water use patterns as outlined in the 2010 UWMP.

Results

The city operations forecast for 2020 and 2035 is shown by sector in Table 3-5. Government operations emissions are projected to decrease from the 2011 inventory total of 8,205 $MTCO_2e$ to 5,185 $MTCO_2e$ in 2020. The decrease in emissions is primarily due to the implementation of the RPS and the fuel efficiency gains from Pavley I standards. Emissions are forecast to then increase at a low rate through the year 2035 to 5,922 $MTCO_2e$, due to projected increases in city staff in select departments to accommodate an increased need for city services.

The relative contribution of each sector to the total city operations emissions is generally constant over time. The two largest emissions sectors are buildings and facilities, comprising about 40 percent of total emissions, and fleet emissions, which are approximately 33 percent of the total emissions. Streetlights are about 15 percent of total emissions, followed by wastewater facilities at 8 percent, and water delivery facilities at 1 percent. Overall, government operations emissions are forecast to remain a small portion of community emissions, about 0.9 percent in 2020 and 1 percent in 2035. Chapter 4 discusses mitigation measures that will reduce government operations emissions.

TABLE 3-5: GOVERNMENT OPERATIONS EMISSIONS INVENTORY (2011) AND 2020, 2035 FORECAST ($MTCO_2e$)

Sector	2011	2020	2035
Building & Facilities	3,410	2,192	2,409
Streetlights	1,747	902	902
Water Delivery Facilities	79	71	76
Wastewater Facilities	716	470	506
Fleet	2,253	2,092	2,029
TOTAL	**8,205**	**5,185**	**5,922**

~~3.5~~3.4 GHG Reductions to Community Forecast from ~~State and~~ Federal and State Actions

Methodology

The next step in projecting GHG emissions is the consideration of GHG reductions from state and federal actions ~~and other trends to the community forecast are quantified in this section~~. This projection is known as the legislatively-adjusted BAU since it still lacks any potential GHG reductions from local policies and programs.

The federal and state actions included in the legislatively-adjusted BAU~~These reductions~~ include the following:

- ~~Renewable Portfolio Standard~~Federal and California Vehicle Efficiency Standards
- ~~Pavley I fuel economy standards~~California Energy Efficiency Standards
- ~~Low Carbon Fuel Standard~~California Solar Policy, Programs and 2019 Mandates
- ~~Title 24 building efficiency improvements~~Renewable Portfolio Standard
- ~~Reductions in VMT from rising gasoline prices[22]~~

~~The GHG reductions from these factors were quantified using the EPIC mitigation calculator. The Energy Policy Initiatives Center (EPIC) at the University of San Diego developed this model to create business as usual projections, set targets, and calculate levels of mitigation measures for all local jurisdictions in the San Diego region. As the EPIC model was developed specifically for cities within San Diego County and the mitigation calculator calculates the effect of the federal and statewide reductions, it was selected to quantify these policies and actions. GHG reductions from the RPS and Pavley I fuel economy standards were accounted for in the SEEC model; however, they are quantified separately in this section for informational purposes.~~

~~Renewable Portfolio Standard (RPS)~~Federal and California Vehicle Efficiency Standards

~~California's RPS, established in 2002 by the California State Senate in Senate Bill 1078, accelerated in 2006 and expanded in 2011, is one of the most ambitious renewable energy standards in the country. The RPS requires that investor-owned utilities like SDG&E supply 33 percent of their electricity from renewable resources by 2020. While a renewable portfolio standard past 2020 has not been established, the assumption used in the EPIC mitigation calculator was that the 33 percent renewable standard would be extended through the year 2035—a conservative assumption, given that this is targeted to already be attained by 2020.~~ . ~~Table 3-6 lists the reductions from the RPS in 2020 and 2035.~~

The federal and California vehicle efficiency standards vary by type of vehicle. For passenger cars and light-duty vehicles, the applicable standards are the Federal Corporate Average Fuel Economy (CAFE) standards and California Advanced Clean Car (ACC) Program. The CAFE standards are developed by the U.S Department of Transportation's National Highway Transportation Safety Administration (NHTSA) and regulate how far vehicles must travel on

[22] ~~The rise in gasoline prices are not a result of any state or federal policy or action, but are included in this section as part of a larger systemic trend forecast to occur regardless of other emission reduction measures.~~

a gallon of fuel. The ACC program was adopted by CARB and combined the control of smog-causing pollutants and GHG emissions into a single coordinated package of regulations.

For heavy-duty vehicles (heavy-duty trucks, tractors, and buses), the applicable regulations are the U.S. Environmental Protection Agency's (US EPA) Phase-I GHG Regulation and CARB Tractor-Trailer GHG Regulation. The US EPA regulation was developed in coordination with the NHTSA and calls for GHG emissions and fuel economy standards. The CARB regulation reduces GHG emissions by improving aerodynamic performance and reducing the rolling resistance of tractor-trailers. The reductions projected from the federal and California vehicle efficiency standards total 113,968 $MTCO_2e$ in 2035.

~~TABLE 3-6: RPS GHG REDUCTIONS~~	
~~Year~~	~~$MTCO_2e$ Reductions~~
~~2020~~	~~48,962~~
~~2035~~	~~36,160~~

~~Pavley I Fuel Economy Standards~~California Energy Efficiency Programs

~~In 2009, CARB adopted amendments to the Pavley regulations to reduce GHG emissions in new passenger vehicles from 2009 to 2016. The standards set became the model for the updated Corporate Average Fuel Economy (CAFE) standards set by the US EPA. The emissions reductions from the improved fuel efficiency standards were calculated using the EPIC mitigation calculator, and were phased in following the 2011 inventory. Table 3-7 lists the emissions reductions from Pavley I fuel economy standards in 2020 and 2035. These reductions are already quantified and applied in the SEEC community forecast, and have been listed separately here for reference purposes.~~ In September 2017, the California Public Utilities Commission (CPUC) adopted energy efficiency goals for ratepayer-funded energy efficiency programs (Decision 17-09-025); these went into effect in 2018. The sources of the energy savings include, but are not limited to, rebated technologies, building retrofits, behavior-based initiatives, and codes and standards. The reductions projected from the California energy efficiency programs total 19,110 $MTCO_2e$ in 2035.

~~TABLE 3-7: PAVLEY I FUEL ECONOMY STANDARD GHG REDUCTIONS~~	
~~Year~~	~~$MTCO_2e$ Reductions~~
~~2020~~	~~40,354~~
~~2035~~	~~48,369~~

~~Low Carbon Fuel Standard~~California Solar Policy, Programs and 2019 Mandates

~~The Low Carbon Fuel Standard, adopted by CARB, is performance based and is designed to reduce the GHG intensity of transportation fuels by 10 percent by 2020. The regulation established annual performance standards that fuel producers and importers must meet beginning in 2011. The Low Carbon Fuel Standard applies to all fuels used for transportation in California, including gasoline, diesel fuel, E85, compressed or liquefied natural gas, biogas, and electricity. The Standard is also "lifecycle" based, meaning the entire extraction, recovery, production and transportation of the fuel is taken into account. The default assumption of 10 percent reduction in GHG intensity was assumed to continue through 2035 for the EPIC mitigation calculator. Table 3-8 shows the reductions from the Low Carbon Fuel Standard in 2020 and 2035.~~ California has several policies and programs to encourage customer-owned, behind-the-meter PV systems, including the California Solar Initiatives, New Solar Home Partnership, Net Energy Metering, and electricity rate structures designed for solar customers. The California Solar Initiative is the solar rebate program for customers of the investor-owned utilities, including SDG&E. The New Solar Home Partnership provides financial incentives and other support to home builders to encourage the construction of new, energy efficient solar homes. This assistance terminates on December 31, 2021. Net Energy Metering provides utility customers a credit for the unused electricity produced by their solar system. The new California 2019 Building Energy Efficiency Standards, which went into effect on January 1, 2020, require all newly constructed single-family homes, low-rise multi-family homes, and detached accessory dwelling units (ADUs) to have PV systems installed, unless the building receives an exception. The reductions projected from the California solar policy, programs and 2019 mandates total 37,125 $MTCO_2e$ in 2035.

~~TABLE 3-8: LOW CARBON FUEL STANDARD GHG REDUCTIONS~~

~~Year~~	~~$MTCO_2e$ Reductions~~
~~2020~~	~~20,545~~
~~2035~~	~~14,906~~

~~Title 24 Building Efficiency Improvements~~Renewable Portfolio Standard

~~Title 24 is California's Building Energy Code, which is updated every three years. In 2010, Title 24 was updated to include the California Green Building Standards Code, referred to as CALGreen. CALGreen requires that new buildings reduce water consumption, increase system efficiencies, divert construction waste from landfills, and install low pollutant-emitting finish materials. CALGreen has mandatory measures that apply to nonresidential and residential construction. The most recent CALGreen code became effective in 2014.~~

~~The Title 24 building efficiency improvements determine the effect of the CALGreen code mandatory measures for new building construction using the 2010 code update.[23] Table 3-9 lists the GHG reductions from building efficiency improvements in new construction calculated using the EPIC mitigation calculator in 2020 and 2035.~~ SB 100, the 100 Percent Clean Energy Act of 2018, adopts a 60% RPS for all of California's retail electricity suppliers by 2030; this increased the RPS standard from 50% to 60%. The legislation also provides goals for the intervening years before 2030 and establishes a State policy requiring that "zero-carbon" resources supply 100% of all retail electricity sales to end-user customers and all State agencies by December 31, 2045. If interpolated linearly between 60% renewable in 2030 and 100% zero-carbon in 2045, the interim 2035 target would be 73% renewable. The reductions projected from the RPS total 186,115 $MTCO_2e$ in 2035.

~~TABLE 3-9: TITLE 24 BUILDING EFFICIENCY IMPROVEMENTS GHG REDUCTIONS~~	
~~Year~~	~~$MTCO_2e$ Reductions~~
~~2020~~	~~1,836~~
~~2035~~	~~3,582~~

~~Reduction in VMT from Rising Gasoline Prices~~

~~The U.S. Energy Information Administration (EIA) collects, analyzes and disseminates independent and impartial energy information, including projections of future gasoline prices. The 2013 EIA gasoline projection estimate a pump price of gasoline of $4.00 per gallon in 2020 and $6.00 in 2035 per gallon in California.[24]~~

~~The EPIC mitigation calculator measures emissions reductions from changes in fuel consumption as a result of gasoline price increases. The reductions in GHG emissions based on the Energy Information Administration gasoline prices are shown in Table 3-10. Although the projected rise in gasoline prices is not the direct result of a federal or state policy, this effect was considered in this section, as it is a larger systemic trend that is forecast to occur regardless of other emissions reductions measures.~~

~~TABLE 3-10: GHG REDUCTIONS FROM RISING GASOLINE PRICES~~	
~~Year~~	~~$MTCO_2e$ Reductions~~
~~2020~~	~~12,201~~
~~2035~~	~~71,316~~

~~[23] The EPIC mitigation calculator is based on the 2010 CALGreen code. The 2014 CALGreen code and subsequent updates will likely result in greater GHG reductions as building efficiency standards improve.~~

~~[24] Both values are listed in 2010 dollars.~~

RESULTS

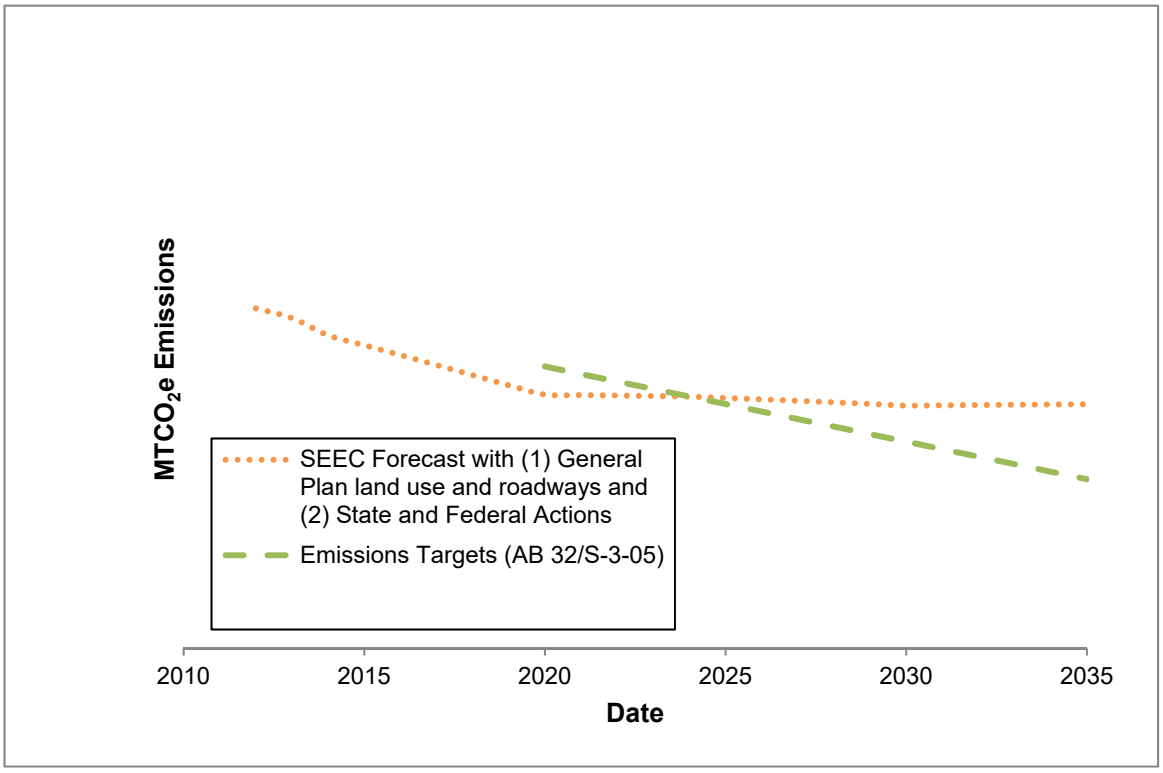
The annual reductions from the above state and federal actions—Federal and California Vehicle Efficiency Standards, California Energy Efficiency Standards, California Solar Policy, Programs and 2019 Mandates, and Renewable Portfolio Standard~~RPS, Pavley I Fuel Economy Standards, Low Carbon Fuel Standard, Title 24 building efficiency improvements, and the reductions in VMT from rising gasoline prices~~—were combined. Table 3-11 ~~lists~~ shows the total ~~SEEC~~ community forecast in ~~2020 and~~ 2035 considering federal and state actions, or legislatively-adjusted BAU.~~, juxtaposed with reductions from state and federal actions not accounted for in the SEEC forecast: the Low Carbon Fuel Standard, Title 24 Building Standards, reductions in VMT from higher gasoline prices, and the assumed continuation of the Renewable Portfolio Standard after the year 2020. Figure 3-5 shows the SEEC Forecast with General Plan land use and new roadways, as well as state and federal actions.~~

TABLE 3-11: COMMUNITY FORECAST WITH STATE AND FEDERAL ACTIONS ($MTCO_2e$)

Year	~~Business-As-~~Usual Community Forecast Emissions ~~with General Plan Land Use and New Roadways~~	~~Low Carbon Fuel Standard Reduction~~Federal and California Vehicle Efficiency Standards	~~Title 24 Building Efficiency Improvements~~California Energy Efficiency Programs	~~Reductions in VMT from Rising Gasoline Prices~~California Solar Policy, Programs and 2019 Mandates	~~Continuation of~~ Renewable Portfolio Standard~~, 2020 to 2035*~~	Total Forecast Emissions ~~with General Plan Land Use and New Roadways &~~with State and Federal Actions
~~2020~~	~~565,873~~	~~20,545~~	~~1,836~~	~~12,201~~	~~48,962~~	~~482,329~~
2035	~~589,837~~956,000	~~14,906~~113,968	~~3,582~~19,110	~~71,316~~37,125	~~36,160~~186,115	~~463,873~~599,682

~~*RPS considered in SEEC forecast through 2020, RPS continuation through 2035 modeled in EPIC~~

~~**Figure 3-5: Community Forecast with (1) General Plan Land Use and New Roadways and (2) State and Federal Actions ($MTCO_2e$)**~~



~~3.6~~3.5 Modified Baseline: GHG Reductions from Additional General Plan Policies and Actions

Methodology

This section describes General Plan policies and actions that reduce GHG emissions, quantifies emissions reductions, and explains how these policies and actions will be implemented. These reductions are from policies and actions in addition to ~~Pavley I, the RPS, and the General Plan land use and circulation system, which incorporate reductions from "No Project" conditions which are already reflected in the SANDAG modeling discussed previously~~BAU and legislatively-adjusted BAU discussed in previous sections. The General Plan policies and actions are organized according to the following categories:

- Bikeway System Improvements
- Pedestrian Improvements and Increased Connectivity
- Traffic Calming
- Parking Facilities and Policies
- Transportation Improvements

The California Air Pollution Control Officers Association's (CAPCOA's) Quantifying Greenhouse Gas Mitigation Measures report was developed as a resource for local governments to assess emissions reductions from GHG mitigation measures. This section uses the methodology outlined in the CAPCOA report for each category to quantify emissions reductions from the General Plan policies and actions.[25] The reductions are applied to the community forecast in the following section to get the "modified baseline" forecast.

Bikeway System Improvements

Bikeway System Improvements	*General Plan Policies:* *2-P.24, 2-P.25, 2-P.45, 2-P.46, 2-P.53; 3-P.8, 3-P.15, 3-P.16, 3-P.17, 3-P.20, 3-P.21, 3-P.22, 3-P.24, 3-P.25, 3-P.26, 3-P.27, 3-P.28, 3-P.29, 3-P.31, 3-P.32, 3-P.33, 3-P.34, 3-P.40; 4-P.40*	~~2020 Reduction: **164 MTCO$_2$e**~~ 2035 Reduction: **608~~147~~ MTCO$_2$e**

Policy/Action Description

The Carlsbad Bikeway Master Plan, referenced in the General Plan, recommends the enhancement of the existing bicycle network with the implementation of new Class I bike paths, new Class II bike lanes, and new Class III bike routes, resulting in a 111.5 mile bikeway system. The planned bikeways include the Coastal Rail Trail, a Class I bike path on Carlsbad

[25] While many of the policies and actions quantified in the report are project-level in nature, much of the supporting literature is from studies on a citywide, countywide, or regional context. The methodology in this section is based on these regional studies, which is therefore applicable to the General Plan policies and actions listed in this section.

Boulevard at Ponto, two Class II bike lanes – one on Hillside Drive and another on Avenida Encinas, and five Class III bike route projects in the northwest quadrant of the city.

In addition to Bikeway Master Plan recommendations, the Mobility Element identifies the following new connections to improve connectivity in the area:

- A new Class I trail at the terminus of Cannon Road and extending eastward toward the City of Oceanside
- A new Class I trail along the Marron Road alignment between El Camino Real and the City of Oceanside
- A new crossing of the railroad tracks at Chestnut Avenue.

Also, CalTrans' North Coast Corridor Public Works Plan includes, among other improvements, a new North Coast Bike Trail and new bicycle/pedestrian connections across Batiquitos and Agua Hedionda Lagoons.

Finally, the city can install new and enhanced bicycle facilities as opportunities arise in conjunction with street maintenance and rehabilitation, and as part of "road diet" projects.

Quantification

An estimated 0.05 percent reduction in transportation GHG emissions is assumed to occur for every two miles of bike lane per square mile in areas with density greater than 2,000 people per square mile.[26] Carlsbad currently has approximately 2,700 people per square mile, greater than the threshold of 2,000 people per square mile.

With the 111.5 miles of bicycle facilities, there would be approximately 2.85 miles of bikeways per square mile, which corresponds to a 0.07 percent reduction in VMT emissions, or about ~~164 $MTCO_2e$ in 2020, and 147~~ 608 $MTCO_2e$ in 2035.[~~27~~]

Implementation

The bikeway system enhancements will occur incrementally (at approximately .6 miles/ year) through the implementation of the General Plan and planned and opportunistic bikeway improvements (e.g., in conjunction with street maintenance and rehabilitation, or as part of a "road diet"). Improvements will be funded and/or installed as conditions on new private development as well as through the city's multi-year CIP and annual operating budget process. Funding sources may include development impact fees, general funds, local, state, and federal grants.

[26] Cambridge Systematics. Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions. Technical Appendices. Prepared for the Urban Land Institute.

[~~27~~] ~~In this chapter, reductions based on a portion of VMT have lower reductions in 2035 than in 2020 because they are assumed to decrease with greater vehicle efficiency standards over time.~~

Pedestrian Improvements and Increased Connectivity

Pedestrian Improvements and Increased Connectivity	*General Plan Policies:* *2-P.24, 2-P.25, 2-P.45, 2-P.46, 2-P.47, 2-P.48, 2-P.50, 2-P.53, 2-P.72, 2-P.79; 3-P.8, 3-P.16, 3-P.17, 3-P.20, 3-P.21, 3-P.22, 3-P.24, 3-P.25, 3-P.26, 3-P.27, 3-P.28, 3-P.29, 3-P.31, 3-P.32, 3-P.33, 3-P.40; 4-P.40*	~~2020 Reduction: **2,341 MTCO$_2$e**~~ 2035 Reduction: **6152,106 MTCO$_2$e**

Policy/Action Description

Pedestrian Improvements

Carlsbad has adopted several programs and plans related to improving the walking environment. The city's Pedestrian Master Plan guides the future development and enhancement of pedestrian facilities to ensure that walking becomes an integral mode of transportation in Carlsbad. The Carlsbad Residential Traffic Management Program provides a mechanism for community members to report issues relating to speeding and traffic volumes on residential roadways, assisting the city in "calming" traffic in these areas to make them more comfortable for pedestrian travel.

Physical barriers to pedestrian access include gaps in sidewalks, high-volume, high-speed streets, a circuitous roadway system in several parts of the city, and regional infrastructure such as freeways and railways that presents barriers to pedestrian mobility. There are four significant concentrations of high pedestrian improvement needs across the City of Carlsbad, including the following locations:

- The entire northwest quadrant, especially the Carlsbad Village area
- The southern coastal area along Carlsbad Boulevard, between Cannon Road and La Costa Avenue
- Several locations along El Camino Real, near Camino Vida Roble, Aviara Parkway/Alga Road and La Costa Avenue
- The southeastern portion of the city, stemming from the intersection of La Costa Avenue and Rancho Santa Fe Road

A range of potential improvement projects exists throughout the city, as identified in the pedestrian master plan, to enhance pedestrian mobility, local connectivity, usage, safety and accessibility. These improvements include filling in gaps in sidewalk connectivity, upgrading substandard sidewalks, creating new connections to pedestrian attracting designations (such as access across the railroad track to the beach at Chestnut Avenue, for example), establishing safe routes to school, enhancing crosswalks, installing pedestrian countdown signals, improving signage, and providing ADA improvements.

Increased Connectivity

Increasing connectivity in the city is critical to achieving the Carlsbad Community Vision. There are a number of improvements described in the General Plan that will enhance connectivity for bicycles and pedestrians, as noted below:

- Cannon Road east of College Boulevard – Provide a bicycle/pedestrian facility that would begin at the current eastern terminus of Cannon Road and continue eastward to the city's eastern boundary.
- Marron Road Connection – Provide a bicycle/pedestrian facility that would begin at the current eastern terminus of Marron Road and extend eastward to the city's eastern boundary.
- Additional crossings of Interstate-5 and the railroad – Continue to look for opportunities to add crossings of these two barriers and improve east-west connectivity to and from the coast. Key connections will include a crossing at Chestnut Avenue (bicycle, pedestrian, and vehicular) under the freeway and (bicycle and pedestrian) across the railroad, and a Chinquapin Avenue connection (bicycle, pedestrian, and vehicular) over the freeway and (bicycle and pedestrian) across the railroad. Additionally, Caltrans is designing a number of new pedestrian and bicyclist connections along and across Interstate-5 and near the lagoons as part of the Interstate-5 North Coast Corridor Public Works Plan. The city will continue to coordinate with Caltrans on these improvements.
- Improved accessibility to the lagoons and to the coast are envisioned to improve connectivity to those areas.

Quantification

Providing an improved pedestrian network and increasing connectivity encourages people to walk more and results in people driving less, causing a reduction in VMT. An estimate of a 1 percent reduction in VMT from pedestrian improvements and connectivity was assumed, which corresponds to a reduction of ~~2,341 $MTCO_2e$ in 2020 and 2,106~~615 $MTCO_2e$ in 2035.[28]

Implementation

Pedestrian improvements and increased connectivity will occur through implementation of the Pedestrian Master Plan, the Residential Traffic Management Program, and the General Plan, and through planned and opportunistic pedestrian improvements (e.g., in conjunction with street maintenance and rehabilitation, or as part of a "road diet"). Improvements will be funded and/or installed as conditions on new private development as well as through the city's multi-year CIP and annual operating budget process. Funding sources may include development impact fees, general funds, local, state, and federal grants.

[28] Center for Clean Air Policy. Transportation Emission Guidebook. http://www.ccap.org/safe/guidebook/guide_complete.html.

Traffic Calming

Traffic Calming	*General Plan Policies:* *2-P.53; 3-P.16, 3.P-17*	~~2020 Reduction: **585 MTCO$_2$e**~~ 2035 Reduction: ~~**526** **969**~~ **MTCO$_2$e**

Policy/Action Description

The Carlsbad Residential Traffic Management Program provides a mechanism for community members to report issues relating to speeding and traffic volumes on residential roadways, assisting the City in "calming" traffic in these areas to make them more safe and comfortable for pedestrian travel. Traffic calming devices include speed tables, speed bumps, roundabouts, and other devices that encourage people to drive more slowly or to walk or bike instead of using a vehicle, especially for short trips in and around residential neighborhoods. The residential traffic management program is implemented by the Transportation Division and funded through the annual budget appropriation process.

Quantification

CAPCOA's "Quantifying Greenhouse Mitigation Measures" was used to quantify the effect of traffic calming devices. A 0.25 percent reduction in VMT was assumed to occur from these improvements, which corresponds to a reduction of ~~585 MTCO$_2$e in 2020 and 526~~ 969 MTCO$_2$e in 2035.

Implementation

The traffic calming improvements will occur through the implementation of the Residential Traffic Management Program and the General Plan.

Parking Facilities and Policies

Parking Facilities and Policies	*General Plan Policies:* *2-P.75, 2-P.83; 3-P.28, 3-P.38, 3-P.39, 3-P.40, 3-P.41*	~~2020 Reduction: **4,682 MTCO$_2$e**~~ 2035 Reduction: **6,618**~~**4,211**~~ **MTCO$_2$e**

Policy/Action Description

Getting parking right is critical to ensuring the success of any urban area. Inadequate parking is inconvenient and frustrating for businesses and residents. Too much parking underutilizes valuable land, results in lower density development, discourages use of other forms of transportation (such as public transit), spreads out land uses, and creates gaps in store fronts; thereby practically requiring the use of the automobile. Additionally, too much parking also requires more driveways for accessibility, introducing conflicts between pedestrians and vehicles. Overly high parking requirements—particularly in downtown areas or urban cores—can impact the ability to renovate or repurpose older buildings and revitalize activity centers that can be better served and connected by enhancing facilities and amenities for bicyclists and pedestrians. Therefore, it is important to "right size" and manage parking such that there is

enough to support the needs generated by the use, but not so much that it wastes land and impairs other ways of getting around.

The city's Zoning Ordinance provides standards for parking facilities based on development types within the city. To promote "right sizing" of parking facilities, the following techniques are included as part of the General Plan Mobility Element:

- Shared Parking – continue to allow uses that have different parking demands at different times of the day to share the same parking facilities. This is an effective way to minimize pavement, allow denser land use, provide for more landscaping, and provide improved walkability within a mixed use area. The best example of shared parking is an office building and an apartment building as office's peak parking demand occurs at 10:00 a.m. and apartment's peak parking demand occurs at 11:00 p.m.
- Collective Parking – allow uses in mixed use projects/areas to utilize up to 50 percent of project site's vacant on-street parking to count toward their parking supply requirements.
- Unbundled Parking – rather than provide free guaranteed parking, "unbundle" the parking from the development and require residents and/or employees to pay for use of a parking space.
- Park Once – a strategy in destination districts to enable visitors to "park once" and visit a series of destinations. Park once strategies work well in areas like the Village and areas that are well connected by pedestrian and bicycle facilities. The creation of centralized parking areas supports this strategy.
- In Lieu Parking Fees – continue strategies in appropriate areas by which developers can contribute fees toward the development of a common parking facility in lieu of providing on-site parking. This works best in downtown or concentrated commercial areas, works well to assist in paying for unified structured parking, and provides developers an opportunity to increase density on their parcels.
- Parking Management Strategies –a business district or businesses manage high demand parking locations and destinations through a number of different strategies including demand pricing, time restrictions, valet parking, and other techniques.
- Public-Private Partnerships –the city, business owners, and developers collaborate to provide both private and public parking opportunities. Instances where this works well include parcels owned by the city, where a private entity comes in and develops, manages, and enforces the parking in these public lots.
- Parking Locater Signs – electronic monitoring devices that identify the available parking in a given facility and utilize changeable message signs to assist travelers in identifying available parking locations. Please note that this may require modifications to the city's zoning ordinance to be implemented in some areas of the city.
- Parking Wayfinding Signs – signs identifying where public parking is available, which support the "park once" concept.

- Reduced Parking Standards – reduce parking standards in areas that are well served by transit, provide shuttle accessibility to the COASTER station, provide parking cash out programs (where employers pay employees to not park on site), or provide other programs that will reduce parking demand.
- Biking Equals Business Program – businesses provide bicycle parking or corrals and provide incentives to encourage their patrons and employees to ride rather than drive.
- Transit Equals Business Program – businesses provide their customers and employees incentives to encourage them to use transit rather than drive.
- Bicycle Corrals in Lieu of Vehicle Parking – for certain businesses, reduce required onsite parking for vehicles if they provide a bicycle corral that accommodates more people.

Although there are additional parking strategies that are available and may become available in the future, most of the strategies work best in smart growth/mixed use development areas and will be necessary to accomplish the goals and visions identified in the General Plan and the General Plan Mobility Element.

Quantification

According to CAPCOA's Quantifying GHG Mitigation Measures, parking strategies have estimated VMT reductions. Reduced parking standards and other policies reducing parking availability have an estimated 5 to 12.5 percent VMT reduction, unbundled parking cost has a 2.6 to 13 percent VMT reduction, and parking management strategies have a 2.8 to 5.5 percent VMT projection.[29] Conservatively assuming the combined effect of these parking reduction strategies would result in the lower end of the strategies results, and considering that the strategies would be most applicable in future growth and infill areas, the cumulative reduction from implementations would result in a 2 percent VMT reduction to give an estimated ~~4,682 $MTCO_2e$ reduction by 2020, and a 4,211~~6,618 $MTCO_2e$ reduction by 2035.

Implementation

The parking strategies will occur through the implementation of the Zoning Ordinance and the General Plan. The city's Planning Division is primarily responsible for developing new ordinances and updating existing ones. Parking policy and ordinance changes would be carried out under the Planning division's annual budget authority.

Transportation Improvements

Transportation Improvements	*General Plan Policies:* *2-P.48, 2-P.72; 3-P.8, 3-P.19, 3-P.20, 3-P.27, 3-P.31, 3-P.32, 3-P.35, 3-P.36*	~~2020 Reduction: **1,475 $MTCO_2e$**~~ 2035 Reduction: **2,085~~1,327~~ $MTCO_2e$**

[29] The maximum reduction provided from the combination of all parking policies in the CAPCOA report is a 20 percent reduction in VMT

Policy/Action Description

Transit in Carlsbad includes bus service, ADA paratransit service, and the COASTER commuter rail; indirectly, transit service is also provided by the Sprinter light rail system, Amtrak rail service, and Metrolink commuter rail. Future transit service in the city will primarily be coordinated by the North County Transit District (NCTD). In addition, there are several planned transit improvements for Carlsbad that are part of San Diego Association of Governments (SANDAG) regional planning efforts. These are reflected in the General Plan Mobility Element:

- Coastal rail improvements are proposed for the tracks serving the COASTER and Surfliner trains in San Diego County along the Los Angeles to San Diego Rail Corridor. These proposed improvements include double tracking, bridge replacements, and station improvements. Improvements to the COASTER service (2020 and 2030) are also proposed and would increase service and reduce headways.
- Route 471 (2020) is a proposed rapid bus providing frequent service between Carlsbad and San Marcos via Palomar Airport Road. This route will operate with 10 minute headways during peak and off-peak hours. In the city, this rapid bus route is envisioned to be supported by signal priority at intersections.
- AMTRAK will add service to Carlsbad.
- As previously described, the above future transit improvements will continue to advance the backbone transit infrastructure. However, one key component to improving transit use is improving the "first mile/last mile" access and experience for transit users. This typically includes end of trip facilities (bike racks, showers, changing rooms, etc.) and better connectivity from the transit stop to the ultimate destination via bicycle facilities, pedestrian facilities, local transit circulators, etc.
- Carlsbad's future transit effectiveness will depend on major employers assisting with providing some of these "first mile/last mile" facilities through transportation demand management (TDM) measures. TDM is envisioned to include shuttle circulators to major employers and destinations, showers and changing rooms at those locations, and a host of other typical TDM techniques that would support transit usage and the connection to the ultimate destination. This Mobility Element also supports TDM through potential incentives (such as reduced parking standards for TDM implementation) to further support transit access to these destinations.
- The final component to improving transit use in the city is working with NCTD to improve the transit experience, particularly along the bus routes. This includes improving bus stops in the city to ensure that they are well lit, have seating, and are covered to protect users from inclement weather.

As part of the FY 2014-2015 capital improvement program, the city initiated work on a Coastal Mobility Readiness Plan. This plan will complement current and planned bicycle and pedestrian improvements by recommending policy and infrastructure investments that will: improve accessibility to transit and para-transit services; fill in transportation gaps ("first mile-last mile" solutions); support and encourage expanded use of low-emission and zero emission vehicles; provide viable alternatives to private, single-occupant vehicle use (such as through

car-sharing, bike-sharing, and local shuttles); and recommend other transportation/parking demand management strategies. The plan will emphasize efficiently connecting residents and visitors among the city's various coastal activity centers, beaches, the state campground, and to and from major hotels and resorts, the Village, major shopping centers, and other significant visitor-serving activity centers. The plan will identify effective, proven tools, and seek out promising and emerging technologies. The plan will also identify potential funding partners such as NCTD (e.g. Cooperative Agreements in accordance with NCTD Board Policy 22), private funding and/or public grants. The plan is expected to be completed at the end of 2015, with implementation beginning in 2016.

The city has also implemented a state-of-the-practice traffic signal management (TSM) system. This system integrates traffic signals in the city to a single access point, allowing city staff to monitor and update signal timings to improve safety and mobility for all users in the city. The Mobility Element supports further implementation of this program and use of other technologies that become available, which have the ability to improve mobility for all users of the city's transportation system.

Quantification

Transportation system improvements can result in VMT reductions. According to CAPCOA's Quantifying Greenhouse Gas Mitigation Measures, transit system improvements can result in the following reductions: 0.02 to 3.2 percent VMT reduction from a bus rapid transit system, 0.1 to 8.2 percent VMT reduction from expanding the transit network, 0.02 to 2.5 percent VMT reduction from increasing transit service frequency and speed, and 0.5 to 24.6 percent VMT reduction from increasing transit accessibility. Reductions from TSM were estimated using Cambridge Systematics' Moving Cooler report as a 0.01 percent VMT reduction. Conservatively assuming the combined effect of these strategies, summing the low end of the VMT reduction ranges gives a 0.63 percent reduction in VMT emissions.

Implementation

Transit improvements will primarily be coordinated by NCTD and will also be implemented by SANDAG regional planning and funding efforts. City-led improvements will be carried out through the city's multi-year CIP and annual operating budget appropriation process.

Results

Table 3-12 shows the GHG reductions from each of the above General Plan policies and actions. The largest reduction comes from parking facilities and policies, followed by transportation improvements, traffic calming, pedestrian improvement and increased connectivity, ~~transportation improvements, traffic calming,~~ and bikeway system improvements. ~~VMT emissions are projected to fall in the future due to higher fuel efficiency standards; however, as the efficiency gains are expected to be largely achieved by 2020 but the VMT is projected to continue climbing in the future, the effect of the VMT reductions are greater in 2020 than in 2035 for all General Plan policies and actions considered in this section. For example, the reductions from traffic calming in 2035 are 526 $MTCO_2e$, which is less than the reduction in 2020 of 585 $MTCO_2e$.~~ The reductions from these policies and actions are incorporated into the community emissions forecast in the following section.

TABLE 3-12: GHG REDUCTIONS FROM ADDITIONAL GENERAL PLAN POLICIES AND ACTIONS

Year	Bikeway System Improvements	Pedestrian Improvements and Increased Connectivity	Traffic Calming	Parking Facilities and Policies	Transportation Improvements	Total GHG Reductions from Additional General Plan Policies and Actions
~~2020~~	~~164~~	~~2,341~~	~~585~~	~~4,682~~	~~1,475~~	~~9,247~~
2035	608~~147~~	615~~2,106~~	~~526~~ 969	~~4,211~~6,618	2,085~~1,327~~	~~8,317~~10,895

~~3.7~~3.6 Modified Baseline and the GHG Emissions "Gap"

Table 3-13 shows the total community emissions with the reductions from the following policies and actions:

- ~~General Plan land use and circulation system~~
- Federal and State ~~and federal~~ actions
- Additional General Plan policies and actions

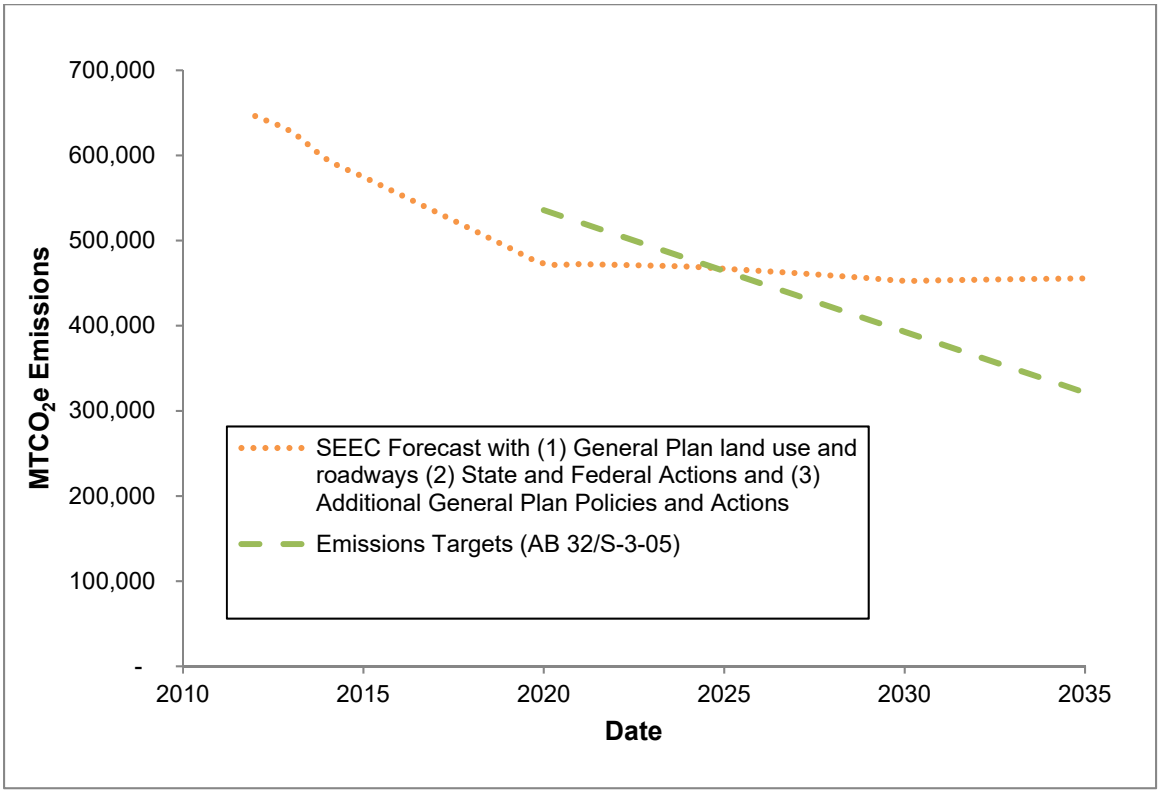
~~Figure 3-6 shows the "modified baseline forecast," which incorporates the reductions discussed thus far in comparison to the emissions targets. Emissions drop steeply to 2020 from the combined effect of GHG reduction policies and actions, continue a gradual decline to 2030, but then start rising again after that, given that no increases in federal or state standards relating to fuel efficiency or renewable energy are assumed, even though these may well occur by that time.~~ The BAU forecast for 2020 already meets the target reduction of four percent below baseline; therefore, no analysis of the effects of federal and state policies and additional General Plan policies was necessary. With the effect of all the GHG reductions considered in this chapter, the total community forecast emissions are ~~473,082 $MTCO_2e$ in 2020, and~~ 455,556 $MTCO_2e$ in 2035. Table 3-13 shows that Carlsbad ~~will meet~~met its target for 2020 without any additional measures. However, by 2035, there is a GHG emissions "gap" of ~~134,098~~116,817 $MTCO_2e$ —approximately ~~one third~~20 percent of the total projected community emissions.

TABLE 3-13: MODIFIED BASELINE FORECAST (FORECAST COMMUNITY EMISSIONS WITH ~~GENERAL PLAN LAND USE AND ROADWAYS,~~ FEDERAL AND STATE ~~AND FEDERAL~~ ACTIONS~~,~~ AND ADDITIONAL GENERAL PLAN POLICIES AND ACTIONS)

Year	~~Total Modified Baseline Forecast ($MTCO_2e$)~~Business-As-Usual Forecast ($MTCO_2e$) ~~473,082~~ ~~467,018~~	Total Modified Baseline Forecast ($MTCO_2e$) ~~452,762~~ ~~455,556~~	GHG Emissions Targets ~~(Linear Scaling of AB 32/S-3-05)~~ ($MTCO_2e$)	Emissions "Gap" ($MTCO_2e$)
2020	**926,000**	**N/A**	~~535,763~~939,000	Target Met

~~2025~~			~~464,328~~	~~2,690~~
~~2030~~			~~392,893~~	~~59,869~~
2035	**~~956,000~~**	**~~588,817~~**	~~321,458~~472,000	~~134,098~~116,817

~~Figure 3-6: Modified Baseline Forecast (Forecast Community Emissions with General Plan Land Use and Roadways, State and Federal Actions, and Additional General Plan Policies and Actions)~~



Conclusion

The emissions targets are met in the year 2020, with BAU forecast emissions of ~~473,082~~926,000 $MTCO_2e$ meeting the target by about ~~63,000~~13,000 $MTCO_2e$. There is an emissions "gap" in the year 2035 of about ~~134,000~~116,817 $MTCO_2e$ between the forecast emissions of ~~455,556~~588,817 $MTCO_2e$ and the emissions target of ~~321,458~~472,000 $MTCO_2e$. Chapter 4 contains CAP GHG reduction measures to close the gap between forecast emissions and emissions targets in the year 2035.

4

CAP GHG Reduction Measures

The forecast emissions in Chapter 3 incorporate reductions from (1) state and federal actions, (2) General Plan land use and roadways, and (3) additional General Plan policies and actions. This chapter describes additional GHG reduction measures to close the emissions "gap" between emissions targets and forecast emissions for 2035. These are:

- ~~Residential,~~ Ceommercial and industrial photovoltaic systems
- ~~Building cogeneration~~
- Single-family, multi-family and commercial efficiency retrofits
- ~~Commercial commissioning~~
- ~~CALGreen building code~~
- Solar water heater/heat pump installation
- Efficient lighting standards
- Increased zero-emissions vehicle travel
- Transportation Demand Management (TDM)
- Citywide renewable projects
- Water delivery and conservation

The sections below describe the GHG reduction measures and explain how they will be implemented. The GHG reductions from these measures were quantified using the Energy Policy Initiatives Center (EPIC) mitigation calculator, a tool developed by the University of San Diego for cities within San Diego County. The EPIC mitigation calculator includes a "business as usual" (BAU) forecast for each measure estimating GHG reductions from trends already underway that will occur without any additional city intervention, based on regional San Diego Gas & Electric (SDG&E) forecasts. For example, under the BAU forecast for residential photovoltaic (PV) systems, the EPIC mitigation calculator estimates that by the year 2035, energy produced by residential PV systems in the City of Carlsbad will be about 15.9 megawatts (MW), which will offset about 6,233 metric tons CO_2e ($MTCO_2e$).

The GHG reduction measures describe goals, amount of reduction in 2035, and actions to meet the target levels. The actions are categorized as **short-term** actions that will be implemented within one to two years of CAP adoption; or **mid-term** actions that will be implemented within two to five years of CAP adoption. Actions identified as **short to long-term**, or **mid to long-term** are those actions that will begin in the short or mid-term, but take longer than five years to fully implement. **Ongoing** actions are those that continue throughout the duration of CAP implementation. The mixture of short-term, mid-term, ~~and~~ long-term, and ongoing actions presented for each measure are intended to meet the goals in a realistic timeframe and provide an effective combination to reach the targets set forth. The "already-projected" amount is based on the forecast BAU emissions reduction, followed by a target level to reach the goal of the measure. The measures are then described in greater detail, as is the method of quantifying the GHG emissions reduction, and the responsibility and implementation of the measure is discussed. Each measure qualitatively describes costs and benefits, both to the city and the private sector. Overall benefits of GHG emissions reductions include decreased costs through energy efficiency, reduced risk to human health and welfare, and less global climate change.

The GHG reduction mitigation measures identified in this chapter are expected to achieve the targeted emission reductions. However, the nature, location, timing, size and other characteristics of future development projects may vary widely and additional project-level mitigation measures may be helpful or necessary to assist individual projects to achieve the targeted reductions. Accordingly, Appendix E to this Climate Action Plan provides a non-exclusive list of mitigation measures to be considered by the City and project applicants during project-level environmental review and adopted as needed to ensure that individual development projects achieve the targeted emission reductions.

Note: CAP Amendment No. 1, approved May 5, 2020, recalculated the anticipated 2035 GHG reductions for all measures, based upon new state and federal policies and the interaction between the existing measures and new Measure P – Community Choice Energy. Four measures, Measures A, C, G and H, were eliminated for reasons described below. CAP Amendment No. 1 also updated the Actions calling for ordinance adoption; however, no other Actions were updated with this amendment. This update will occur with the comprehensive CAP update being processed in 2020-21.

4.1 Residential, Commercial and Industrial Photovoltaic Systems

Measure A: Promote Installation of Residential Photovoltaic Systems – Deleted in CAP Amendment No. 1	
Goal: Promote installation of residential PV systems to produce an additional 9.1 MW above already projected amounts, or the equivalent of 2,682 more homes with PV systems, by 2035.	2035 Reduction: ~~10,136 MTCO$_2$e~~N/A
This Measure is no longer needed due to Section 150.1(c)14 of the 2019 California Energy Code, mandating all new low-rise residential construction include solar photovoltaic energy generation systems. ~~Actions:~~ ~~*A-1: Temporarily for a period of one year suspend residential and commercial PV system permit fees, together with a publicity campaign to promote PV systems installation* (Short-term)~~	

A-2: On a continuing basis, ensure that regulatory provisions - such as complying with regulations for zoning, structure height, permit submittal and review, etc. - do not hinder residential and commercial PV system installation. (Short to Long term)

A-3: Adopt an ordinance, similar to those passed by Lancaster and Sebastopol, which requires new homes to install PV panels to offset a portion of their energy use. (Short-term)

Already-Projected Amount: Solar photovoltaic (PV) systems convert solar energy into electricity. The projected power generation[30] of residential PV systems at 4,685 homes is 15.9 MW[31] in the year 2035, which is enough to fully power these homes.[32]

Target: The target is 25 MW in the year 2035, which is the equivalent amount of production to power 7,367 homes.[33]

GHG Reduction Measure Description: PV systems convert solar energy into electricity. Producing renewable energy locally through residential, commercial, and industrial PV systems reduces the need to construct costly new power plants that produce air pollution, use natural resources, and impact the environment.

The San Diego region has among the highest rates of solar energy production in the nation, producing an annual average of about 6.5 kWh per square meter per day, according to the National Renewable Energy Laboratories. A 2006 estimate found that existing PV technology could supply over 100 percent of the peak electricity demands for San Diego County, and over half of the total energy load.[34] Measure A is to promote the installation of PV systems on single-family and multi-family homes above the already projected amount (4,685 homes) by an additional 2,682 homes, or a total of about 15 percent of homes.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure A.

Responsibility and Implementation: The City of Carlsbad currently participates in three Property Assessed Clean Energy (PACE) programs: CaliforniaFIRST, FigTREE, and

[30] The maximum amount of power produced is also referred to as solar capacity.

[31] Solar capacity (MW) was converted into an annual energy total (kWh per year) as follows: The standard assumption is about 5 hours of production per day per solar system. The capacity was multiplied by 5 hours per day times 365 days per year to get a total production in kWh per year. Therefore, 15.9 MW converts to 29,017,500 kWh per year.

[32] Average household energy use was calculated as follows: The California per capita electricity use in 2010 was 2,337 kWh (source: http://www.eia.gov/state/?sid=CA). The average household size in 2010 was 2.65 people per household (source: http://www.census.gov/newsroom/releases/archives/2010_census/cb11-cn137.html). Therefore, the average household energy use in 2010 was: 6,193.1 kWh per year.

[33] It was assumed that residential PV systems produce the equivalent amount of energy to the amount consumed in each household on an annual basis.

[34] Anders, Scott and Bialek, Tom. 2006. Technical Potential for Rooftop Photovoltaics in the San Diego Region. Available: http://www.sandiego.edu/documents/epic/060309_ASESPVPotentialPaperFINAL_000.pdf.

~~California HERO. PACE programs provide financing to eligible property owners for sustainable energy projects, thereby offering a source of funding for residential PV systems. Property owners can finance PV system installations and energy efficiency improvements through a voluntary assessment on their property tax bills. Several other financing options are available to residents, including Federal Housing Financing Administration (FHFA) insured Energy Efficient Mortgages, HUD Title 1 Home Improvements Loans, and FHA PowerSaver Loans.~~

~~The city will temporarily suspend residential and commercial solar PV system permit fees. The city will also on a continuing basis ensure that regulatory provisions such as complying with regulations for zoning, structure height, permit submittal and review process, etc. do not hinder PV panel installation.~~

~~**Costs and Benefits:**~~

~~Private: Private costs would come from the installation and maintenance of a residential PV system, which can be supported by PACE programs and other incentives. Benefits would accrue from reduced energy bills and increased property values.~~

~~City: City costs would occur from the analysis of potential regulatory barriers and adopting an ordinance requiring new homes to install PV systems. Revenue would be lost when permit fees are temporarily suspended.~~

Measure B: Promote Installation of Commercial and Industrial Photovoltaic Systems	
Goal: Promote installation of commercial and industrial PV systems to produce an additional ~~10.7~~11.24 MW per year above projected amounts~~, or roughly 15 percent of projected commercial and industrial electricity use,~~ by 2035.	2035 Reduction: ~~13,336~~4,457 $MTCO_2e$
Actions: (*See also actions A1 and A2 above*). *B-1:* ~~*Adopt a commercial energy conservation ordinance requiring all new nonresidential developments with more than 50 cars surface parked or on roofs of parking structures to use PV panels over at least half of the surface/roof parked cars, or provide equivalent energy conservation/generation by other means (over and above other requirements).* (Short term)~~*Implement and enforce Title 18, Chapter 18.30, Section 18.30.130 of the Carlsbad Municipal Code, mandating solar photovoltaic energy generation systems on new non-residential buildings.* (Ongoing) *B-2:* *Implement and enforce Title 18, Chapter 18.30, Section 18.30.130 of the Carlsbad Municipal Code, mandating solar photovoltaic energy generation systems on existing non-residential buildings undergoing major renovations.(Ongoing)*~~*Adopt an ordinance requiring existing nonresidential developments to install PV panels to offset a portion of their energy use.* (Mid-term)~~	

Already-Projected Amount: The projected power generation from commercial and industrial PV systems is 22.3 MW in the year 2035, which is about 30 percent of projected commercial and industrial electricity use.

Target: The target is the PV production of 33 MW in the year 2035, which is the equivalent amount of power production to supply about 45 percent of projected commercial and industrial demand.

GHG Reduction Measure Description: Photovoltaic (PV) systems convert solar energy into electricity. Measure B promotes the installation of PV systems on commercial buildings and industrial facilities above the already-projected amount of 22.3 MW, by an additional 11.2~~10.7~~ MW. Together with the already-projected amount of power generation, Measure B would reach the target PV production of 33 MW in 2035.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure B.

Responsibility and Implementation: ~~See Measure A (above) for implementation.~~Property owners engaging in new construction and major renovations will be responsible for providing PV systems. The City is responsible for enforcing the ordinance, as well as encouraging the voluntary installation of non-residential PV systems through the city website and other means.

Costs and Benefits:

Private: Private costs would result from the installation and maintenance of commercial and industrial PV systems. Benefits would accrue from reduced energy bills and increased property values.

City: City costs would occur from ~~removing potential regulatory barriers and preparing and~~implementing and enforcing a nonresidential PV systems ordinance. ~~Revenue would be lost when permit fees are temporarily suspended.~~

4.2 Building Cogeneration

Measure C: Promote Building Cogeneration for Large Commercial and Industrial Facilities – Deleted in CAP Amendment No. 1	
Goal: Promote building cogeneration for large commercial and industrial facilities, with the goal of producing 6.9 MW.	2035 Reduction: ~~1,067 MTCO$_2$e~~N/A
This Measures will no longer result in significant GHG reductions due to the high renewable electricity content associated with SDG&E's RPS and the CEA CCE.~~Actions:~~ ~~*C-1: Promote cogeneration by publicizing grant opportunities and financial incentives, such as the Self-Generation Incentive Program and feed-in tariffs for cogeneration systems, for renovations of existing buildings by posting these on the city's website and by other means.* (Short-term)~~ ~~*C-2: Install cogeneration systems on large city facilities that can benefit from the installation of these systems, and apply for funding through the Energy Efficiency Financing for Public Sector Projects program, or other similar funding sources.* (Mid to Long-term)~~ ~~*C-3: Require cogeneration systems for large commercial and industrial facilities that have on-site electricity production, both for new construction and retrofits.* (Mid-term)~~	

Already Projected Amount: The forecast capacity of building cogeneration systems is 6.9 MW in the year 2035.

Target: The target is to reach the already projected amount.

GHG Reduction Measure Description: Building cogeneration, also known as combined heat and power (CHP), is the use of building power stations to simultaneously generate electricity and heat. Instead of purchasing electricity from a utility and burning fuel in an on-site furnace to produce needed heat, an industrial or commercial user can use building cogeneration to provide both electricity and heat in one energy-efficient step. Examples of facilities able to use building cogeneration include manufacturing plants, hospitals, water and wastewater treatment facilities,[35] and large office buildings.

Building cogeneration reduces building energy costs, provides stability in the face of uncertain electricity prices, and enhances energy reliability. Building cogeneration also provides the opportunity to improve critical infrastructure resiliency, by allowing critical facilities to run without any interruption in service if the electrical grid is impaired. Measure C is to promote the installation of building cogeneration systems on large commercial and industrial facilities to reach the projected capacity of 6.9 MW by 2035.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure C.

Responsibility and Implementation: The City of Carlsbad will apply for funding to install cogeneration systems on city facilities that would benefit from the use of these systems. The city will also publicize incentives for the construction of cogeneration systems, and require cogeneration systems for new construction and retrofits of large commercial and industrial facilities through the permitting process, where the facility has on-site non-renewable electricity generation.

A number of funding sources exist to provide financial support for the installation of cogeneration systems. Funding for cogeneration systems for city facilities is available through the Energy Efficiency Financing for Public Sector Projects program. In addition to city government buildings, the program also applies to schools and other public or institutional facilities. There is no minimum loan amount, but the maximum loan amount per application is $3 million. The interest rate is 1 percent, and loans must be repaid from energy cost savings within 15 years, including principal and interest. As well, the city will consider use of its Infrastructure Replacement Funds (IRF) to install feasible cogeneration systems as part of refurbishment of existing city facilities.

The Self-Generation Incentive Program (SGIP) provides financial incentives for the installation of new qualifying technologies, including cogeneration, that are installed to meet

[35] The Encina wastewater treatment plant operates a cogeneration plant that produces over 60 percent of the electricity used by the facility.

all or a portion of the electric energy needs of a facility.[36] SGIP is funded by the California Public Utilities Commission, and administered by the California Center for Sustainable Energy in SDG&E's service area. San Diego's 2014 share is approximately $10 million per year. Under the SGIP program, cogeneration systems receive an incentive of $1.83 per watt produced. SDG&E also offers seminars on the benefits of cogeneration and fuel cell options for large facilities.

For cogeneration systems that produce electricity in excess of the facility's needs, the state of California has initiated a feed-in tariff, which provides a cost-based price for renewable energy produced.

[36] See the 2014 Self-Generation Incentive Program Handbook. Available: https://www.selfgenca.com/documents/handbook/2014

~~**Costs and Benefits:**~~

~~Private: Private costs would come from the installation and maintenance of building cogeneration systems, and which could be reduced through funding programs, such as SGIP. Benefits would accrue from reduced energy bills and increased property values.~~

~~City: City costs would come from promoting cogeneration systems, and incorporating the consideration of cogeneration into the permitting process for commercial and industrial facilities. Benefits could accrue from reduced energy bills for city facilities that utilize cogeneration systems.~~

4.3 Single-family, Multi-family, Commercial, and City Facility Efficiency Retrofits

Measure D: Encourage Single-Family Residential Energy Efficiency Retrofits	
Goal: Encourage single-family residential efficiency retrofits with the goal of a 50 percent energy reduction compared to baseline in 30 percent of the total single-family homes citywide by 2035 (approximately 10,000 single-family homes out of a total of 35,000).	2035 Reduction: ~~1,132~~7,986 $MTCO_2e$
Actions: *D-1: Publicize available incentive and rebate programs, such as SDG&E's Residential Energy Efficiency Program, on the city's website and by other means.* (Short-term) *D-2: Create a citywide "Energy Challenge," similar to the Department of Energy's Better Buildings Challenge, to promote cost-effective energy improvements, while having residents and building owners commit to reducing energy consumption.* (Short-term) *D-3: ~~Adopt a residential energy conservation ordinance, which requires residential property owners to conduct and disclose an energy audit at the time of major renovations (as defined by the ordinance), to ensure that homes and residential developments meet specified low cost energy efficiency measures—such as requisite ceiling insulation, insulated pipes, water heater blankets and exterior door weather stripping.~~* (~~Short-term~~)*Implement and enforce Title 18, Chapter 18.30, Section 18.30.190, mandating energy efficiency measures in existing residential buildings undergoing major renovations.* (Ongoing)	

Already-Projected Amount: There is no projection for retrofits that would occur without this measure.

Target: The target is a 50 percent energy reduction in 30 percent of single-family homes citywide by the year 2035.

GHG Reduction Measure Description: As single-family homes use a large portion of the city's total energy and older homes are substantially less efficient than newly constructed homes, there is a large opportunity to reduce GHG emissions through the retrofitting of existing homes. When a single-family homeowner seeks to make major improvements, the owner

would be required to ~~conduct an energy audit, and~~ meet low-cost energy efficiency measures—such as changing light bulbs and switches, insulating exposed hot water piping, sealing air ducts, improving insulation, or installing a "cool roof." Additional voluntary energy efficiency measures could include providing weather stripping, promoting natural lighting and ventilation, and using "smart" thermostats to regulate energy use for heating and cooling.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure D.

Responsibility and Implementation: Homeowners would implement this measure. SDG&E offers a Residential Energy Efficiency Program, which offers residential customers rebates to improve the efficiency of appliances, such as water heaters, washers, refrigerators, air conditioners, building insulating, and ceiling fans. The City will publicize this and related programs on its website and by other means.

Costs and Benefits:

Private: Private costs would come from homeowners conducting energy audits and implementing efficiency retrofits. The cost of these retrofits is frequently 1 percent or less of the total renovation cost. Benefits would occur through reduced energy costs. Rebates are available as described above.

City: City costs would come from promoting incentive programs~~, creating an "Energy Challenge" program,~~ and ~~adopting~~ implementing and enforcing a residential energy conservation ordinance.

Measure E: Encourage Multi-Family Residential Efficiency Retrofits	
Goal: Encourage multi-family residential efficiency retrofits with the goal of a 50 percent energy reduction in 30 percent of the projected amount of multi-family homes citywide by 2035 (approximately 5,000 out of a total of 17,000).	2035 Reduction: 3,993~~351~~ $MTCO_2e$
Actions: ~~*See Measure D (above).*~~ *Action D-1: Publicize available incentive and rebate programs, such as SDG&E's Residential Energy Efficiency Program, on the city's website and by other means.* (Short-term) *Action D-2: Implement and enforce Title 18, Chapter 18.30, Section 18.30.190, mandating energy efficiency measures in existing residential buildings undergoing major renovations.* (Ongoing)	

Already-Projected Amount: There is no projection for retrofits that would occur without this measure.

Target: The goal is a fifty percent energy reduction in thirty percent of the projected amount of multi-family homes citywide by the year 2035.

GHG Reduction Measure Description: Multi-family residential retrofits provide an opportunity to reduce building energy use. Multi-family residential retrofits are similar to the

single-family retrofits described in Measure D~~, but can provide increased energy savings; for example, increasing insulation between residential units benefits both units~~. Other examples of potential multi-family residential ~~retrofits~~ energy efficiency improvements include replacing incandescent and halogen lamps with LED or CFL lamps, installing energy-efficient windows and efficient appliances, and using "smart" thermostats to regulate energy use for heating and cooling.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure E.

Responsibility and Implementation: Multi-family residential unit owners would implement this measure. SDG&E offers a Residential Energy Efficiency Program, which offers residential customers rebates to improve the efficiency of appliances, such as water heaters, washers, refrigerators, air conditioners, building insulating, and ceiling fans. The City will publicize this and related programs on its website and by other means.

Costs and Benefits:

Private: Private costs would come from multi-family residential unit owners conducting energy audits and implementing efficiency retrofits. Benefits would occur through reduced energy costs. Rebates are available as described above.

City: City costs would come from promoting incentive programs~~,~~ and implementing and enforcing a residential energy conservation ordinance.~~and creating an "Energy Challenge" program.~~

Measure F: Encourage Commercial and City Facility Efficiency Retrofits	
Goal: Encourage commercial and city facility efficiency retrofits with the goal equivalent to a 40 percent energy reduction in 30 percent of commercial square footage citywide and in city facilities by 2035.	2035 Reduction: 7,579~~18,377~~ $MTCO_2e$
Actions: *F-1:* *Undertake a program of energy efficiency retrofits for city-owned buildings, with the goal of 40 percent reduction in energy use, beginning with retrofits that would result in the most substantial energy savings.* (Short-term) *F-2:* *Promote available incentive and rebate programs, such as SDG&E's Energy Efficiency Business Rebates and Incentives Program, on the city's website and by other means.* (Short-term) *F-3:* *Implement and enforce Title 18, Chapter 18.21, Section 18.21.155, mandating energy efficiency measures in new non-residential buildings and existing non-residential buildings undergoing major renovations.* (Ongoing)~~*Adopt a commercial energy conservation ordinance, which requires property owners to ensure that commercial buildings meet specified energy efficiency measures such as requisite heating, ventilation, and air conditioning improvements, service water system requirements, and improved refrigeration equipment, at the time of conducting major renovations (as defined by the ordinance).* (Short-term)~~	

Already-Projected Amount: There is no projection for retrofits that would occur without this measure.

Target: The target is equivalent to a 40 percent energy reduction in 30 percent of the projected amount of commercial square footage and in city facilities.

GHG Reduction Measure Description: Relatively straightforward fixes to commercial and city-owned buildings can significantly reduce spending on fuel and electricity for commercial buildings. Examples of retrofits include installing efficient boilers and equipment, installation of high-quality windows, efficient lighting, and other building energy improvements.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure F.

Responsibility and Implementation: Building owners would implement this measure for commercial buildings.[37] Funding is available through incentive and rebate programs, such as SDG&E's Energy Efficiency Business Rebates and Incentives Program. SANDAG ~~is~~ prepared~~preparing~~ an Energy Roadmap for the city, which included energy audits for most city facilities and ~~will~~ identifi~~ied~~ energy conservation measures the city can use to reduce energy use in city municipal operations.[38] Funding for city retrofits can be provided through the Energy Efficiency Financing for Public Sector Projects program, described above in Measure C. As well, the city will use its IRF to install energy efficiency retrofits as part of refurbishment of existing city facilities.

Costs and Benefits:

Private: Private costs would come from building owners and business owners implementing efficiency retrofits. Benefits would occur through reduced energy costs. Costs could be offset through incentive and rebate programs.

City: City costs would come from retrofitting city facilities, providing resources to help guide building owners to implement this measure, promoting available incentive and rebate programs, and ~~adopting~~ implementing and enforcing a commercial energy conservation ordinance.

[37] AB 802~~1103, the California Nonresidential Building Energy Use Disclosure Program,~~ requires an owner of a nonresidential building 50,000 square feet or larger to benchmark the building's energy use data and annually disclose the energy use to the state.~~prior to the sale of the building, or the lease and financing of the entire building. This benchmark data can be used to guide implementation of efficiency measures for buildings renovated after a recent sale.~~

[38] SANDAG. 2014. "Energy Roadmap for Local Governments." Available: http://www.sandag.org/index.asp?classid=17&projectid=373&fuseaction=projects.detail. Accessed: February 25, 2014.

4.4 Commercial and City Facility Commissioning

Measure G: Promote Commercial and City Facility Commissioning – Deleted in CAP Amendment No. 1	
Goal: Encourage commercial and city facility commissioning, or improving existing and new building operations, with the goal equivalent to a 40 percent energy reduction in 30 percent of commercial square footage citywide and in city-owned buildings by 2035.	2035 Reduction: ~~18,377 $MTCO_2e$~~N/A
This measure is now administered through the utility energy efficiency programs and accounted for in the legislative business-as-usual projection for state policy and programs~~Actions:~~ ~~*G-1: Promote commissioning programs on the city's website such as San Diego RCx, and similar programs for commercial buildings.* (Short-term)~~ ~~*G-2: Commission city facilities to improve building operations and reduce energy costs, with a goal of 40 percent energy reduction in 30 percent of city facility square footage. (Mid-term)*~~	

~~**Already Projected Amount:** There is no projection for commercial commissioning that would occur without this measure.~~

~~**Target:** The target is equivalent to a 40 percent energy reduction in 30 percent of existing and new commercial square footage citywide and in city facilities.~~

~~**GHG Reduction Measure Description:** Commercial commissioning is a systematic process of ensuring that a building performs according to its design and the occupant's operational needs. Commissioning allows the design developed to be successfully constructed and operated. Examples includes measuring temperatures and flow rates from heating, ventilation, and air conditioning (HVAC) systems to calibrate to a known standard, as well as reviewing operations to verify that controls are properly functioning.~~

~~**Quantification of GHG Emissions Reductions:** The EPIC mitigation calculator was used to quantify emission reductions for Measure G.~~

~~**Responsibility and Implementation:** The City is responsible for commissioning city facilities. Building owners would implement this measure for commercial buildings. Programs exist to offer assistance with the commissioning. San Diego RCx, a SDG&E program, provides a free engineering study to qualified buildings to identify opportunities to save energy. After opportunities are identified, the program offers financial assistance to help pay the cost of implementing measures, which are typically low or no cost. Once implementation is complete, energy savings are confirmed with the utility, and the program pays the building owner the cost of the improvements. Commissioning of existing city facilities can occur concurrently with the 10-year master refurbishments schedule, using IRF.~~

~~**Costs and Benefits:**~~

~~Private: Private costs would come from building owners paying for building commissioning, which may be offset entirely through commissioning programs. Benefits would occur through reduced energy costs.~~

~~City: City costs would come from commissioning city facilities and from promoting commissioning programs to help guide building owners to implement this measure. Benefits would occur through reduced energy costs.~~

4.5 Green Building Code

Measure H: Implement Green Building Measures – Deleted in CAP Amendment No. 1	
Goal: Implementation of a 5 percent improvement in energy efficiency above the City of Carlsbad residential green building code (based on CALGreen, the statewide green building code), for new construction.	2035 Reduction: ~~179 MTCO$_2$e~~N/A
This Measure is no longer needed because new and future building codes are already more efficient than the 2013 CALGreen code.~~Action:~~ ~~*H 1: Adopt residential and commercial energy conservation ordinances requiring a 5 percent improvement in energy efficiency for residential and nonresidential new construction, above the existing City of Carlsbad green building code.* (Short term)~~	

~~**Already Projected Amount:** There are no projections for this measure.~~

~~**Target:** The target is a five percent improvement in energy efficiency above the mandatory requirements set in CALGreen.~~

~~**GHG Reduction Measure Description:** CALGreen, also known as Title 24, is California's Building Energy Code. CALGreen requires that new buildings reduce water consumption, increase system efficiencies, divert construction waste from landfills, and install low pollutant-emitting finish materials. CALGreen has mandatory measures that apply to nonresidential and residential construction. The most recent CALGreen code was adopted in 2013 and became effective in 2014. This measure applies a five percent improvement in energy efficiency above CALGreen as part of a local Green Building Code.~~

~~**Quantification of GHG Emissions Reductions:** The EPIC mitigation calculator was used to quantify emission reductions for Measure H.~~

~~**Responsibility and Implementation:** The City of Carlsbad shall adopt a Green Building Code with a standard of five percent improvement in energy efficiency above CALGreen, which would also apply to any subsequent updates of the CALGreen Building Code. The Green Building Code would apply to new construction within the city.~~

~~**Costs and Benefits:**~~

~~Private: Private costs would occur in implementing the improvements in energy efficiency above the CALGreen code in new construction.~~

~~City: There is no cost to the City of Carlsbad, other than adopting the ordinance.~~

4.6 Efficient Lighting Standards

Measure I: Promote Replacement of Incandescent and Halogen Bulbs with LED or Other Energy Efficient Lamps	
Goal: Replace 50 percent of incandescent and halogen light bulbs citywide with LED or similarly efficient lighting by 2035.	2035 Reduction: ~~21,900~~22 $MTCO_2e$
Actions: *I-1:* *Replace 50 percent of incandescent or halogen light bulbs in city facilities with LED or similarly efficient lighting, or follow SANDAG Energy Roadmap recommendations for lighting in city facilities, whichever results in greater energy savings.* (Short-term) *I-2*: *Promote the use of LED or other energy efficient lamps by publicizing rebate programs and information from SDG&E on the benefits of the use of LED or other energy efficient lighting on the city's webpage.* (Short-term) *I-3:* *Evaluate the feasibility of adopting a minimum natural lighting and ventilation standard, developed based on local conditions. Demonstrate natural lighting and ventilation features in future city facility upgrade or new construction.* (Mid-term)	

Already-Projected Amount: There are no projections for this measure.

Target: The target is to replace 50 percent of incandescent and halogen bulbs citywide with LED bulbs or similarly efficient lighting by 2035.

GHG Reduction Measure Description: Replace inefficient incandescent and halogen light bulbs with more efficient light bulbs to reduce the amount of energy needed to power the bulbs, which will reduce the demand for electricity and thus the amount of GHG emissions created by the electrical power generation. In November 2019, the California Energy Commission (CEC) voted to ban the sale of inefficient light bulbs, effective January 2020. Inefficient light bulbs are defined as any general service lamps with a efficacy of less than 45 lumens per watt. ~~Under AB 1109 (2007), minimum energy efficiency standards are structured to reduce statewide electrical consumption by 50 percent or greater from 2007 levels for indoor residential lighting and by 25 percent or greater from 2007 levels for indoor commercial and outdoor lighting by 2018. The improved efficiency standards from AB 1109 will help to meet the goals of this measure.~~ SANDAG ~~is preparing~~prepared an Energy Roadmap for the city, ~~which may include lighting replacement recommendations for city facilities. Either the measures in the Energy Roadmap or the goal of 50 percent of incandescent and halogen light bulbs will be followed for city facilities, whichever results in greater energy savings.~~which included energy audits for most municipal facilities and energy conservation measures the city can use to reduce energy use in city municipal operations. ~~For existing city facilities, t~~The city

has, and will continue to, implement the ~~will also time the~~ lighting efficiency replacements with the master refurbishment schedule.

Quantification of GHG Emissions Reductions: ~~An estimated 17 percent of residential and commercial energy nationwide[39] and about 25 percent in California[40] is used for lighting. Applied to citywide energy use, 25 percent corresponds to about 78,000 $MTCO_2e$ of forecast emissions in 2035 (from the SEEC community forecast with General Plan land use and roadways).~~ LED light bulbs reduce energy consumption and therefore GHG emissions by 75 percent compared to incandescent lighting.[41] ~~This measure assumes that about 75 percent of the bulbs citywide are currently incandescent or halogen, and sets the target of replacing half of these bulbs with more efficient ones by 2035.[42] New construction could set at a goal of 75 percent of bulbs to be LED or similarly efficient. This would overall lead to a 28 percent decrease in emissions compared to halogen/incandescent bulbs, which equates to emissions reductions of 21,900 $MTCO_2e$.[43]~~ Promotions and rebates, outreach and education, and the recent CEC decision have all contributed to lighting efficiency replacements in both the residential and commercial sectors. Therefore, the GHG reductions from this measure are not significant.

Responsibility and Implementation: Carlsbad's street lights were replaced in 2011 with energy-saving induction units, leading to a reduction of approximately 1,240 $MTCO_2e$ per year (already taken into account). The City has been and will continue to replace light bulbs within City facilities with LED or similarly efficient lighting~~, as facilities are upgraded~~. For residential and commercial customers, SDG&E currently does not offer rebates for the purchase of LED or similarly efficient lighting, but the City will promote rebates as they come available on its website and by other means. The City will also provide information on the benefits of the use of LED and efficient lighting from SDG&E and other sources.

Costs and Benefits:

Private: Private costs would be from purchasing LED light bulbs for new construction, and replacing existing light bulbs over time. Benefits would be from reduced energy costs and reduced cost to replace light bulbs (as LED lights last substantially longer).

City: City costs would come from replacing existing inefficient lighting in City facilities with more efficient light bulbs over time, providing information to homeowners and business

~~[39] http://www.eia.gov/tools/faqs/faq.cfm?id=99&t=3~~

~~[40] California Public Utilities Commission; http://www.cpuc.ca.gov/NR/rdonlyres/6234FFE8-452F-45BC-A579-A527D07D7456/0/Lighting.pdf~~

[41] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=LB

~~[42] It is estimated that 75 percent of lighting within the City is currently incandescent, halogen, or linear fluorescent. U.S. Department of Energy, 2010 U.S. Lighting Market Characterization, January 2012, Table 4.1; http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf~~

~~[43] 75 percent reduction in energy use in half of the 75 percent total incandescent bulbs is (75 percent)*(75 percent)*(50 percent)= 28 percent reduction~~

owners to encourage a switch to LED or other efficient lamps, and evaluating the feasibility of a natural lighting and ventilation ordinance.

4.7 Solar Water Heater/Heat Pump Installation

Measure J: New Construction Residential and Commercial Solar Water Heater Installation	
Goal: Install solar water heaters or heat pumps on all new residential and commercial construction. Retrofit up to 30 percent of existing homes and commercial buildings to include solar water heaters or heat pumps.	2035 Reduction: ~~11,604~~2,813 $MTCO_2e$
Actions: *J-1: Promote the installation of solar water heaters and heat pumps by publicizing incentive, rebate and financing programs, such as PACE programs and the California Solar Initiative for renovations of existing buildings by posting this information on the city's website and by other means. (Short-term)* *J-2: ~~Adopt residential and commercial energy conservation ordinances requiring new residential and commercial buildings to install solar water heaters or heat pumps, or use alternative energy (such as PV-generated electricity) for water heating needs. (Short-term)~~Implement and enforce Title 18, Chapter 18.30, Sections 18.30.150 and 18.30.170, mandating alternative water heating requirements in new residential and non-residential buildings.* (Ongoing)	

Already-Projected Amount: There are no solar water heaters/heat pumps projected to be installed.

Target: The target is to install solar water heaters or heat pumps on all new residential and commercial construction, and retrofit up to 30 percent of existing homes and commercial buildings to include solar water heaters or heat pumps.

GHG Reduction Measure Description: Solar water heaters use water heated by the sun to provide domestic and commercial hot water. Solar water heaters reduce the demand for energy used to heat water. A solar water heater can contribute 30 to 80 percent of the energy needed for residential water heating.[44] Heat pumps are devices that use a small amount of energy to move heat from one location to another.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure J.

Responsibility and Implementation: The City of Carlsbad currently participates in three Property Assessed Clean Energy (PACE) programs: CaliforniaFIRST, Ygrene, and California HERO. PACE programs provide financing to eligible property owners for sustainable energy projects, including ~~The three PACE programs described in Measure A also provide financing for~~ the installation of solar water heaters and heat pumps to improve residential energy

[44] California Energy Commission. 2009. Go Solar California: A Step by Step Tool Kit for Local Governments to Go Solar. Available: http://www.energy.ca.gov/2009publications/CEC-180-2009-005/CEC-180-2009-005.PDF.

efficiency. ~~The California Solar Initiative has a low-income solar water heating rebate program and solar thermal program, which offers rebates for solar water heaters.~~ Installation of solar water heaters on all new residential and commercial water heaters could occur through city ordinance. Retrofit of existing homes could occur through a combination of additional encouragement and incentives.

Costs and Benefits:

Private: Private costs would occur through the installation of residential and commercial solar water heaters, which would be passed onto building owners. Benefits would occur through reduced water heating costs.

City: City costs would occur from ~~adopting~~ implementing and enforcing an ordinance requiring new homes and commercial buildings to install solar water heaters or heat pumps.

4.8 Transportation Demand Management

Measure K: Promote Transportation Demand Management Strategies	
Goal: Promote Transportation Demand Management Strategies with a goal of achieving a 10 percent increase in alternative mode use by workers in Carlsbad, for a total of 32 percent alternative mode use.	2035 Reduction: ~~23,549~~6,325 $MTCO_2e$
Actions: *K-1:* ~~*Adopt a*~~*Implement the citywide transportation demand management (TDM) plan~~*, as described in the General Plan Mobility Element, detailing a mix of strategies to reduce travel demand, specifically of single occupancy vehicles. SANDAG's 2012 "Integrating Transportation Demand Management Into the Planning and Development Process"*[45] *provides a guide to designing and implementing a TDM plan and will be used as a reference document to develop the city's TDM plan. TDM and strategies evaluated in the plan include parking ordinances, subsidized or discounted transit programs, transit marketing and promotion, carsharing, bikesharing, parking pricing, and bike parking*. (~~Short-term~~Ongoing) *K-2:* ~~*Adopt a TDM ordinance, defining a minimum trip generation threshold for nonresidential development projects. The city will set performance requirements for minimum alternative mode use based on project type. All projects above the threshold shall submit a TDM plan, which includes a description of how the minimum alternative mode use will be achieved and maintained over the life of the project. Potential TDM trip reduction measures can include carpool and vanpool ridematching services; designated employees as contacts for trip reduction programs; providing a direct route to transit in coordination with NCTD; developing public-private transit partnerships; passenger loading zones; pedestrian connections; showers and clothes lockers; carsharing, bikesharing long-term bicycle parking and shuttle programs.* (Mid-term)*Implement and enforce Title 18, Chapter 18.51, mandating TDM improvements and strategies for non-residential development.* (Ongoing)	

Already-Projected Amount: There are no projections for this measure. As of 2012, alternative (non-single occupancy vehicle use—such as working at home, carpooling, transit, walking and biking) mode use by Carlsbad workers is 22 percent.[46] Of these alternative uses, most workers work at home (44 percent) and carpool (36 percent), followed by public transit (10 percent), other means (including biking, 6 percent), and walking (5 percent).

Target: The Carlsbad General Plan promotes the use of Transportation Demand Management (TDM), but does not specify a target goal. This measure specifies a goal of achieving an additional 10 percent use of alternative modes, for an overall 32 percent alternative mode use by workers employed in Carlsbad. This is projected to be achieved through 40 percent alternative mode use by workers in new nonresidential buildings, and 30 percent alternative mode use by workers in existing (as of 2013) nonresidential buildings.

[45] ~~Available: http://www.icommutesd.com/documents/tdmstudy_may2012_webversion_000.pdf.~~

[46] American Community Survey. 2012. Selected Economic Characteristics for Carlsbad, California. Available: http://factfinder2.census.gov/.

GHG Reduction Measure Description: Chapter 3 quantifies emissions reductions from the Carlsbad General Plan due to bikeway system improvements, pedestrian improvements, traffic calming, parking facilities and policies, and transportation improvements. This measure is distinct from these reductions because it focuses on TDM, or the application of strategies and policies to reduce travel demand, or redistribute it in time and space. This measure reduces VMT by shifting single occupancy vehicle use to alternative modes, reducing the average commute length, promoting an alternate work schedule, and promoting telecommuting.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure K.

Responsibility and Implementation: The City of Carlsbad will ~~develop~~ implement a TDM plan describing strategies to reduce travel demand. The city will also ~~develop~~ implement an ordinance applying to nonresidential developments meeting a specified minimum trip generation threshold, providing connections to public transportation whenever possible. The city will facilitate a coordinated effort between local businesses and NCTD to develop a route expansion and ridership plan wherever feasible. SANDAG's iCommute program assists commuters by providing free carpool and ridematching services, a subsidized vanpool program, the Guaranteed Ride Home program, SchoolPool carpooling programs for parents, and information about teleworking, all of which can support the city's TDM goals.

Costs and Benefits:

Private: Private costs could include need for a TDM coordinator for private businesses, providing on-site facilities (showers, lockers), and shuttle programs. Benefits would accrue from reduced spending on gasoline, and reduced traffic from less employee commute.

City: City costs would result ~~from developing,~~ implementing~~,~~ and enforcing a TDM plan and ordinance. Implementation costs would include conducting an outreach and education campaign to promote the benefits of TDM.

4.9 Increased Zero-Emissions Vehicle (ZEV) Travel

Measure L: Promote an Increase in the Amount of Zero-Emissions Vehicle Travel	
Goal: Promote an increase in the amount of ZEV[47] miles traveled from a projected ~~15~~ 4.5 percent to 25 percent of total vehicle miles traveled by 2035.	2035 Reduction: ~~54,158~~49,912 $MTCO_2e$
Actions: *L-1: Working with industry partners, construct a "PV to EV" pilot project to install a PV charging station at a city facility (such as the Faraday Center), to charge city ZEVs. The purpose of the pilot project would be to evaluate the feasibility of incorporating more ZEV into the city's fleet. (*Short-term*)* *L-2: Prepare a community-wide charging station siting plan, which evaluates site visibility and exposure, EV driving ranges, high volume destinations, locations with high ownership or interest in EVs, and cost of construction.* (Short-term) *L-3: Construct ZEV charging stations based on the community-wide charging station siting plan described in L-2 above. The ZEV charging stations will be funded by grant funds when available, and the city will post signage directing ZEVs to charging stations.* (Mid-term) *L-4: Offer dedicated ZEV parking, and provide charging stations adjacent to ZEV parking as identified in the community-wide charging station siting plan.* (Mid-term) *L-5: Adopt requirements for ZEV parking for new developments.* (Short-term) *L-6: Implement and enforce Title 18, Chapter 18.21, Sections 18.21.140 and 18.21.150, mandating electric vehicle charging infrastructure in new residential and non-residential building and existing residential and non-residential buildings undergoing major renovations.* (Ongoing)~~*Adopt a residential energy conservation ordinance, similar to Palo Alto, requiring the installation of EV chargers or pre-wiring in new residential construction and major renovations.* (Short-term)~~ *L-7: Update the city's Fleet Management Program to include a low and zero-emissions vehicle replacement/purchasing policy. Increase the proportion of fleet low and zero–emissions vehicle miles traveled to 25 percent of all city-related VMT by 2035.* (Short-term)	

Already-Projected Amount: According to the EPIC mitigation calculator, ~~15~~ 4.5 percent of the vehicle miles traveled in 2035 are projected to be from ZEVs.

Target: The target is to increase the proportion of vehicle miles traveled from ~~15~~ 4.5 percent to 25 percent by the year 2035.

GHG Reduction Measure Description: Driving ZEVs reduces carbon emissions by eliminating direct tailpipe emissions of carbon dioxide and other GHGs. The production of electricity used to power electric vehicles generates GHGs; however, SDG&E electricity generates much less GHGs than the direct combustion of fossil fuels. Furthermore, electric vehicles can be charged at home or the workplace using energy produced by PV panels,

[47] Zero-Emissions Vehicle (ZEV) is a vehicle that emits no tailpipe pollutants from the onboard source of power. ZEVs include electric vehicles, fuel cell vehicles, and plug-in hybrids, when in electric mode.

eliminating GHG emissions completely, at least for the months when PV panels produce the full amount of electricity needed for operations. The ability to provide entirely emissions-free transportation through the use of PV panels to charge ZEVs should be capitalized on whenever possible.

Quantification of GHG Emissions Reductions: The EPIC mitigation calculator was used to quantify emission reductions for Measure L.

Responsibility and Implementation: The city will promote an increase in the amount of electric vehicle travel by constructing ZEV charging stations using the community-wide station siting plan. Grant funding for the construction of the ZEV charging stations can come from the California Energy Commission's Electric Vehicle Charging Infrastructure grant, or other similar grant programs. The city would be responsible for operating (including electricity provision, for stations not using PV panels) and maintaining charging stations.

The city ~~will~~ is also promote~~e~~ing the use of ZEVs by ~~offering~~ requiring dedicated ZEV parking and ~~adopting requirements for ZEV parking~~charging infrastructure for new development and major renovations. ~~The city will create an ordinance requiring the installation of ZEV chargers or pre-wiring in new residential construction and major renovations.~~[48] Through its Fleet Vehicle Replacement Fund, the City of Carlsbad ~~will~~ is increasing~~e~~ the city fleet mix of ZEVs, hybrids, and other low- or zero-emissions vehicles to increase low and zero–emissions vehicle miles traveled to 25 percent by 2035.

Costs and Benefits:

Private: The private cost would be the purchase of an electric vehicle and the cost of electricity to power the electric vehicle, for community members who elect to purchase an electric vehicle. Costs may also occur from installing EV chargers or pre-wiring into new residential construction or major renovations. Benefits would accrue from reduced spending on gasoline.

City: City costs would be from planning for, constructing, operating (including providing electricity, for stations not using PV panels) and maintaining ZEV charging stations, which may be offset by potential user fees or grants from the California Energy Commission, or other similar agencies. City costs ~~may occur from developing~~would also be from implementing ordinances to require the installation of ZEV chargers ~~in new residential construction and major renovations~~.. City costs may also occur from fleet purchases of ZEV vehicles. Benefits would accrue from reduced spending on gasoline.

[48] ~~Assembly Bill 1092 (2013) requires the Department of Housing and Community Development to propose minimum building standards for the installation of future electric vehicle charging infrastructure for parking spaces in multi-family dwellings and nonresidential development.~~

4.10 Citywide Renewable Projects

Measure M: Develop More Citywide Renewable Energy Projects	
Goal: Produce the equivalent amount of energy to power 2,000 homes (roughly equivalent to a 5 percent reduction) by 2035 from renewable energy projects.	2035 Reduction: ~~4,580~~2,774 $MTCO_2e$
Actions: *M-1: Conduct a feasibility study to evaluate citywide renewable energy projects and prioritize accordingly. (Short-term)* *M-2: Incorporate renewable energy measures such as PV system installation on city buildings and parking lots, or microturbine installation on city facilities, with the goal of producing approximately 12,000 megawatt-hours per year.* (Mid to Long-term) *M-3: Pursue available funding sources for the construction of renewable energy projects by the city, such as Energy Efficiency Financing for Public Sector Projects and SGIP.* (Mid to Long-term)	

Already-Projected Amount: There is no projected amount for this measure.

Target: The target is the production of 12,341 megawatt-hours per year, approximately the energy required to power 2,000 homes.

GHG Reduction Measure Description: The City of Carlsbad has a number of renewable energy projects in various stages of planning and development. The Maerkle Reservoir Hydropower Project, which has been permitted by the Federal Energy Regulatory Commission (FERC), is estimated to produce about 833 MWh per year. In 2014, Alga Norte Community Park was outfitted with a PV system in the parking area, which will generate some 360 MWh of electricity per year. Other planned projects include a second pressure-reducing hydroelectric generator, similar to the Maerkle Reservoir Hydropower Project, and a potential large PV system at the Maerkle Reservoir property.

Quantification of GHG Emissions Reduction: The production of 12,341 megawatt-hours per year ~~was converted into $MTCO_2e$ using the 2010 SDG&E coefficient of 742.2 lb CO_2e per megawatt-hour. This~~ corresponds to a reduction of ~~4,580~~2,774 $MTCO_2e$.

Responsibility and Implementation: The City of Carlsbad would be responsible for conducting a feasibility study, determining suitable renewable technologies, siting renewable projects, and constructing and maintaining the renewable energy projects. Funding sources include the Energy Efficiency Financing for Public Sector Projects, which includes renewable energies such as PV systems and other distributed generation technologies, as well as the Self-Generation Incentive Program (SGIP)~~, as described above in Measure C~~. As well, the city will use IRF to install renewable energy systems as part of refurbishment of existing city facilities, where it is feasible to do so.

Costs and Benefits:

Private: There are no direct private costs from this measure.

City: City costs are planning (including a feasibility study), constructing and maintaining the renewable facilities, some of which may be offset through the funding sources described above. Benefits accrue from electricity savings to City through net energy metering.

4.11 Water Utilities System Improvements

Measure N: Reduce GHG Intensity of Water Utilities Supply Conveyance, Treatment, and Distribution [49]	
Goal: Reduce the intensity of GHG emissions from water utilities (including water supply, wastewater, and recycled water) conveyance, treatment, and distribution by 8 percent by 2035.	2035 Reduction: ~~5,968~~713 $MTCO_2e$
Action: *N-1: Improve water utilities (including water supply, wastewater, and recycled water) conveyance, treatment and distribution, and other system improvements.* (Mid to Long-term)	

Already-Projected Amount: The goal of an 8 percent reduction by 2035 is the default value in the EPIC mitigation calculator.

Target: The target is to achieve the already-projected amount.

GHG Reduction Measure Description: This measure estimates emissions reductions from changes in the efficiency of water utilities (including water supply, wastewater, and recycled water) conveyance, treatment, and distribution facilities within the City of Carlsbad.[50] This combines improvements in overall system efficiency, the reduction in GHG intensity of electricity used to move water, wastewater, and recycled water, and replacing potable water needs with expanded recycled water supply. Carlsbad's Sewer Master Plan, for example, calls for eliminating several sewer lift stations and replacing them with gravity pipelines, which would reduce energy usage.[51] The Encina Water Pollution Control Facility exemplifies GHG reductions from water treatment; the facility currently is able to satisfy 60 percent of its energy needs through methane capture and cogeneration and has a long-term goal of energy independence from purchased energy. The 2012 Carlsbad Municipal Water District Recycled Water Master Plan estimates that, by 2030, recycled water demand could double from 4,100 acre-feet/year to about 9,100 acre-feet/year. Expanding the recycled water system would appreciably reduce the need for more expensive imported water needs in the future.

[49] For purposes of this measure, water utilities include potable water treatment and conveyance, sewer conveyance, and recycled water treatment and conveyance systems.

[50] Note: The GHG reductions from water conservation measures detailed in the 2010 Carlsbad Municipal Water District Urban Water Management Plan (UWMP) have already been considered in the GHG forecasts. Further GHG reductions may be possible through greater conservation efforts than those outlined in the UWMP, including Ordinance No. 44 (2009); however, these have not been quantified in this CAP.

[51] The City is replacing three sewer lift stations, which use a combined total of approximately 6,200 kWh of electricity per year with gravity pipelines, in addition to other planned rehabilitation upgrades included in the Sewer Master Plan.

Quantification of GHG Emissions Reduction: The EPIC mitigation calculator was used to quantify emission reductions for Measure N, which estimates wastewater emissions reductions from methane capture, reductions from water treatment and distribution facilities, and changes in the supply network, including greater use of recycled water.

Responsibility and Implementation: The City of Carlsbad would be responsible for making the improvements to water supply conveyance, treatment, and distribution, which could occur through improvements to the Carlsbad Municipal Water District's system.

Costs and Benefits:

Private: There would be no private costs for this measure.

City: Costs to the City of Carlsbad are from implementing the improvements to the water utilities system. Benefits occur by reducing energy costs and having newer water delivery infrastructure.

Measure O: Encourage the Installation of Greywater and Rainwater Collection Systems	
Goal: Encourage the installation of greywater and rainwater collection systems with a goal of 15 percent of homes by 2035.	2035 Reduction: ~~1,205~~137 $MTCO_2e$
Actions: *O-1:* *Host workshops on greywater and rainwater collection systems through the Carlsbad Municipal Water District, or partner with existing workshop providers, for homeowners interested in installing systems suitable for their property.* (Mid-term) *O-2:* *Create a design reference manual, or provide links to an existing one, for the design of greywater and rainwater collection systems.* (Mid-term) *O-3:* *Evaluate the feasibility of offering a rebate for residential greywater systems that require a permit to cover the cost of obtaining a permit.* (Mid-term)	

Already-Projected Amount: There is no projection for this measure.

Target: The target is for 15 percent of single-family homes to have greywater and rainwater collection systems installed by 2035.

GHG Reduction Measure Description: Greywater is wastewater generated from hand washing, laundry machines, and showers and baths that have not been contaminated by any toilet discharge. Greywater can be recycled onsite for toilet flushing and subsurface (below ground) landscape irrigation using a greywater system. The regulations for the design, construction and use of greywater systems are in Chapter 16A of the California Plumbing Code. Some small greywater systems that involve laundry machines or single fixtures only are exempt from permits. More complicated greywater systems require building permits from the City. Rainwater harvesting is the practice of collecting rainwater from hard surfaces, such as

roofs, and storing it in barrels or cisterns, which can be used for landscape irrigation. Measure O is to promote the use of on-site greywater and rainwater collection systems for residences.

Quantification of GHG Emissions Reductions: Nationwide, about seven percent of U.S. GHG emissions are from water and wastewater service provision to urban populations.[52] For this measure, it was assumed that seven percent of the citywide emissions are from water provision and wastewater services.[53] Therefore, about 32,000 $MTCO_2e$ of 2035 emissions are from water provision and wastewater services.

If maximally pursued, the use of greywater and rainwater collection systems could reduce water demands by 25 percent on a statewide scale.[54] For this measure, it was assumed the 25 percent reduction in water demand would scale to individual houses that implement greywater and rainwater collection systems. A goal of 15 percent of homes with greywater and rainwater harvesting systems was chosen. A 25 percent reduction of water use in 15 percent of homes corresponds to a GHG reduction of about ~~1,205~~137 $MTCO_2e$.

Responsibility and Implementation: Homeowners would be responsible for the installation of greywater and rainwater collection systems. The City of Carlsbad will, through the Carlsbad Municipal Water District, host greywater and rainwater harvesting workshops, or partner with existing workshop providers. The City will also reference or develop a greywater and rainwater collection system design manual and consider offering a rebate for residential greywater systems that require a permit to cover the cost of obtaining a permit.

Costs and Benefits:

Private: Costs to homeowners would be from constructing and maintaining greywater and rainwater collection systems. Benefits would accrue over time through water savings.

City: Costs to the City of Carlsbad are from hosting workshops and developing or reviewing greywater and rainwater collection manuals to adopt.

4.13 Clean Electricity

Measure P: Increase the Proportion of Clean Electricity in Community Energy Consumption

[52] Source: V. Novotny. 2010. "Urban Water and Energy Use: From Current US Use to Cities of the Future." *Cities of the Future/Urban River Restoration*. Water Environment Federation. 9: 118-140.

[53] The 7 percent estimate was used for the purpose of this reduction measure because the Chapter 2 inventory did not directly quantify all emissions associated with water use, but rather included those as part of commercial, industrial and residential energy use (e.g. heating water).

[54] Source: J. Loux, R. Winer-Skonovd, E. Gellerman. 2012. "Evaluation of Combined Rainwater and Greywater Systems for Multiple Development Types in Mediterranean Climates." *Journal of Water Sustainability*. 2(1): 55-77.

Goal: Achieve 100% renewable electricity by 2030 for 95% of the residential bundled load and 85% commercial + industrial bundled load.	2035 Reduction: 56,207 $MTCO_2e$
Action: *P-1: Continue participation in the Clean Energy Alliance Community Choice Energy program* (Ongoing). *P-2 Explore the purchase of renewable energy credits if Community Choice Energy program is not reaching 2035 goal.*	

Already-Projected Amount: There is no projection for this measure.

Target: The target is for 95 percent of the bundled residential load and 85 percent of the bundled commercial plus industrial load to use 100% renewable electricity.

GHG Reduction Measure Description: California Assembly Bill 117 allows local governments to form Community Choice Aggregations, commonly referred to as Community Choice Energy (CCE) program. These programs offer an alternative electric power option to customers with the area currently served by an investor-owned utility. CCEs allow local jurisdictions to increase the proportion of renewable energy available to customers that, in turn, lowers the GHG emissions from electricity consumption. Another means to lower electricity-related GHG emissions is to purchase renewable energy credits as an offset to the consumption of electricity from non-renewable generation sources.

Quantification of GHG Emissions Reductions: The GHG emissions reductions anticipated with this measure are derived from the Community Choice Energy Technical Feasibility Study (prepared by EES Consulting, Inc. and dated March 28, 2019), which was prepared for the cities of Carlsbad, Del Mar, Encinitas and Oceanside. The study evaluates three renewable energy portfolio scenarios: an SDG&E equivalent; 100% renewable by 2030; and, 100% renewable upon inception. The GHG emissions reductions associated with this measure are beyond the reductions assumed by the state mandated renewable portfolio standard.

Responsibility and Implementation: The Clean Energy Alliance Joint Powers Authority and its staff are responsible for implementing the Community Choice Energy program. Electricity customers can choose the proportion of renewable energy they consume (50% or 100%). City staff will monitor the program participation rates and renewable proportions, amount of renewable energy procured, and the resulting GHG emissions reductions to determine the need for purchasing renewable energy credits to meet the 2035 reduction target.

Costs and Benefits:

Private: Costs to electricity customers will be a function of the Clean Energy Alliance rate structure and the proportion of renewable energy purchased through the program.

City: Costs to the City of Carlsbad are from staff and financial contributions to the Clean Energy Alliance Joint Powers Authority and, if needed, the purchase of renewable energy credits.

~~4.12~~4.14 Combined Effect of CAP GHG Reduction Measures and Forecast with CAP

Table 4-1 shows a summary of the CAP GHG reduction measures. While the individual measures may be implemented over different timescales, for the purposes of calculating their impact in this section, it was assumed that the effect of all measures would begin in the mid-term time frame and increase linearly to reach the full reduction potential in the year 2035. ~~Table 4-2 shows proposed residential energy conservation, commercial energy conservation, and transportation demand management ordinances adjacent to the applicable reduction measures.~~

As a whole, the CAP GHG reduction measures were designed to enable Carlsbad to achieve its GHG reduction target in the year 2035. The combined GHG reductions from these measures is ~~185,919~~142,918 $MTCO_2e$ in 2035, which covers the emissions "gap" identified in Chapter 3. Table 4-~~2~~3 adds the effect of the CAP GHG reduction measures to the community forecast, and compares the resulting forecast with CAP GHG reduction measures to emission targets. As proposed, this CAP meets the emissions targets for both 2020 and 2035. ~~Interim "milestone" years 2025 and 2030 are presented in Table 4-3 in order for the city to check its progress towards meeting the 2035 target.~~ Figure 4-1 shows the forecast with CAP reduction measures compared to the emissions targets to demonstrate that both 2020 and 2035 targets will be met with the implementation of this CAP.

For this CAP to successfully be implemented, the City of Carlsbad must play a prominent role in implementing the CAP GHG reduction measures. In addition to responsibility and implementation covered for each measure in this chapter, the following chapter discusses how the CAP will be revised and updated in the future to ensure that the targets are met.

TABLE 4-1: CAP GHG REDUCTION MEASURES SUMMARY

Measure Letter	GHG Reduction Measures	GHG Reduction in 2035 ($MTCO_2e$)
A	Install residential PV systems	~~10,136~~N/A
B	Install commercial and industrial PV systems	~~13,336~~4,457
C	Promote building cogeneration for large commercial and industrial facilities	~~1,067~~N/A
D	Encourage single-family residential efficiency retrofits	~~1,132~~7,986
E	Encourage multi-family residential efficiency retrofits	~~351~~3,993
F	Encourage commercial and city facility efficiency retrofits	~~18,377~~7,579
G	Promote commercial and city facility commissioning, or improving building operations	~~18,377~~N/A
H	Implementation of Green Building Code	~~179~~N/A
I	Replace Incandescent bulbs with LED bulbs	~~21,900~~22
J	New construction residential and commercial solar water heater/heat pump installation & retrofit of existing residential	~~11,604~~2,813
K	Promote Transportation Demand Management	~~23,549~~6,325
L	Increase zero-emissions vehicle travel	~~54,158~~49,912
M	Develop more citywide renewable energy projects	~~4,580~~2,774
N	Reduce the GHG intensity of water supply conveyance, treatment and delivery	~~5,968~~713
O	Encourage the installation of greywater and rainwater systems	~~1,205~~137
P	Implement Community Choice Energy	56,207
Total GHG Reductions		~~185,919~~142,918

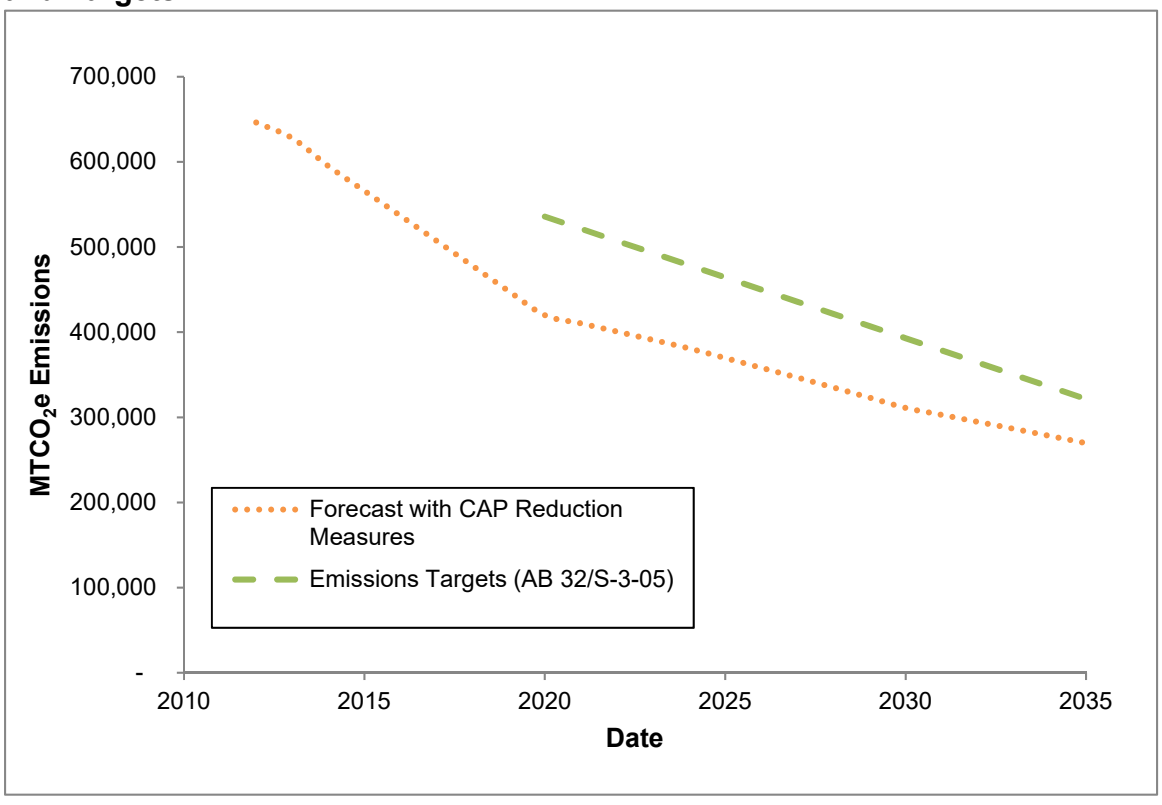
~~**TABLE 4-2: LIST OF PROPOSED ORDINANCES AND APPLICABLE MEASURES**~~

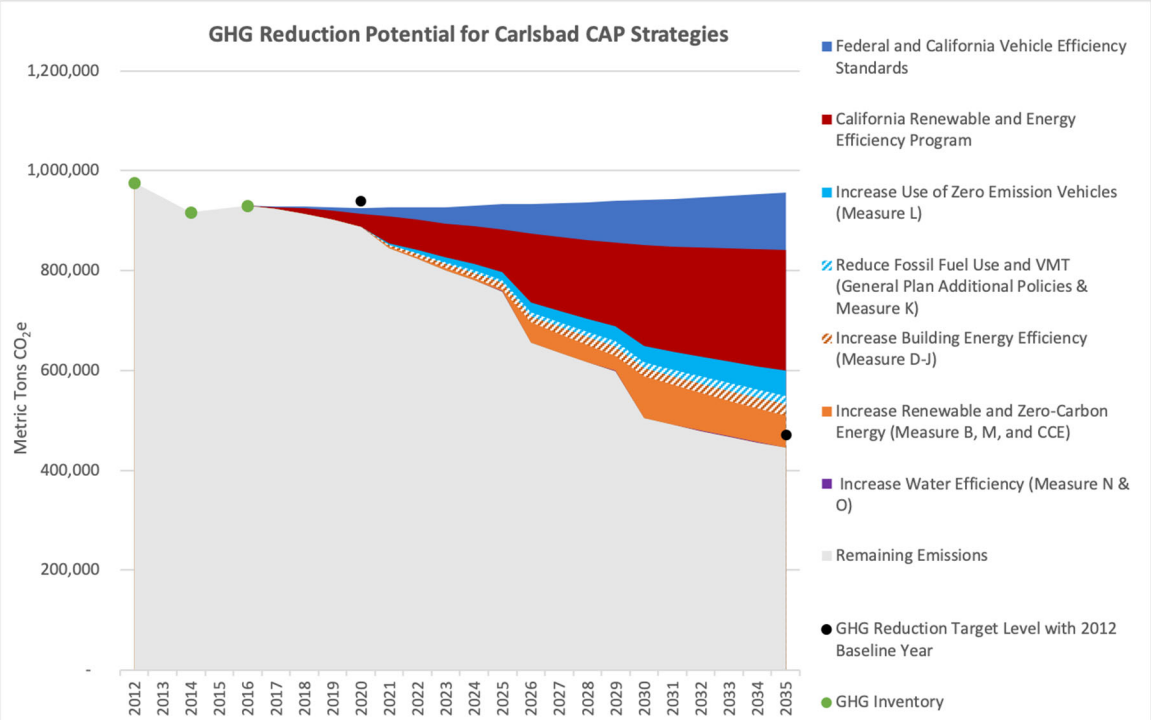
~~PROPOSED ORDINANCES~~	~~Applicable Measures~~
~~Residential Energy Conservation Ordinance~~	~~A, D, E, H, I, J, L~~
~~Commercial Energy Conservation Ordinance~~	~~B, F, H, I, J, L~~
~~Transportation Demand Management Ordinance~~	~~K~~

TABLE 4-~~2~~3: FORECAST COMMUNITY EMISSIONS WITH CAP GHG REDUCTION MEASURES AND TARGETS

Year	~~Modified Baseline Forecast~~Business-As-Usual Forecast ($MTCO_2e$)	Total Modified Baseline Forecast ~~(From Chapter 3)~~ ($MTCO_2e$)	CAP GHG Reduction Measures ~~(Phased in Linearly to 2035)~~ ($MTCO_2e$)	Forecast Community Emissions with CAP GHG Reduction Measures	GHG Emission Targets ~~(Linear Scaling of AB 32/S-3-05)~~ ($MTCO_2e$)	Emission Target Met?
2020	~~473,082~~926,000	N/A	~~53,120~~N/A	~~419,962~~N/A	~~535,763~~939,000	Yes
~~2025~~	~~467,018~~		~~97,386~~	~~369,632~~	~~464,328~~	
~~2030~~	~~452,762~~		~~141,654~~	~~311,108~~	~~392,893~~	
2035	~~455,556~~956,000	588,817	~~185,919~~142,918	~~269,637~~445,899	~~321,458~~472,000	Yes

Figure 4-1: Forecast Community Emissions with CAP Reduction Measures and Targets





Energy Policy Initiatives Center 2020

5

Implementation, Monitoring and Reporting

Chapters 3 and 4 identify a comprehensive set of goals and specific, enforceable measures and actions that the city will take in order to meet its GHG emissions targets. Implementation and monitoring are key to ensuring that the city is successful in reaching those targets. The city will use an adaptive management approach to CAP implementation. Adjustments to management actions will be made as needed to support continuous improvement based on measured results, monitoring effectiveness, new technology, or in response to deficiencies in program assessment results. This chapter describes how the City of Carlsbad will implement the CAP and monitor and report on its effectiveness, consistent with State CEQA Guidelines Sections 15183.5(b)(1)(D) and (E).

For discretionary projects seeking to use CEQA streamlining provisions, in an environmental document the city shall refer to the required measures in this CAP as mandatory conditions of approval or as mitigation. This will enable projects to benefit from CEQA streamlining provisions, while ensuring that the city can achieve the reduction targets outlined in this plan.

5.1 Implementation

Table 5-1 lists all of the measures and actions identified in Chapters 3 and 4 along with the following information:

Responsible Department: The city department(s) that will be primarily responsible for implementing, monitoring, and reporting on the progress for each measure.

Annual GHG Reduction Goal: The estimated annual emission reductions anticipated by the 2035 target years ~~2020 and 2035, and interim milestone years 2025 and 2030~~.

Performance Target: The expected quantified outcome of the GHG reduction measure.

Progress Indicators: The types of data that will be collected to measure progress toward the performance target and correlate to GHG emissions reductions. Progress indicators will be

confirmed as part of the implementation of each measure. If a recommended progress indicator is found to be infeasible to collect or track, an alternative indicator will be identified.

Unit of Measure: Input units used to calculate GHG emissions reductions ($MTCO_2e$), whereby:

Gallons of water = water consumption
kWh/MWh = electricity consumption in kilowatt-hours or megawatt-hours
$MTCO_2e$ = metric tons of CO2 equivalent emissions
Therm = natural gas consumption in therms
VMT = vehicle miles traveled

Implementation Timeframe: The schedule by which each action is to be implemented, beginning from the year the CAP is adopted, as follows:

Short-term – one to two years
Mid-term – two to five years
Short to Long-term, or Mid-to Long-term – actions that will begin in the short or mid-term, but take longer than five years to fully implement.

Ongoing - continue for the duration of CAP implementation

TABLE 5-1: CAP IMPLEMENTATION MATRIX					
Measure / Actions	**Responsible Department(s)**	**Annual GHG Reduction Goals ($MTCO_2e$)**	**Performance Target** ○ **Progress Indicators**	**Unit of Measure**	**Implementation Timeframe**
General Plan Measures (see Section 3.6 for complete descriptions)					
Bikeway system improvements	Public Works, Community ~~& Economic~~ Development	~~**2020: 164**~~ ~~2025: 159~~ ~~2030: 153~~ **2035: 608~~147~~**	Achieve 2.85 miles of bike lanes per square mile, corresponding to .07% VMT reduction ○ Miles of bikeways added ○ Miles of bikeways enhanced	VMT	Short to Long-term
Pedestrian improvements and increased connectivity	Public Works, Parks & Recreation, Community ~~& Economic~~ Development	~~**2020: 2,341**~~ ~~2025: 2,268~~ ~~2030: 2,194~~ **2035: 615~~2,106~~**	1% VMT reduction ○ Miles of pedestrian and trail improvements ○ Number of new connection points	VMT	Short to Long-term
Traffic calming	Public Works, Community ~~& Economic~~ Development	~~2020: 585~~ ~~**2025: 567**~~ ~~**2030: 548**~~ **2035: ~~526~~969**	.25% VMT reduction ○ Number of traffic calming devices installed ○ Vehicle travelway width reduction ○ Pedestrian crossing width reduction	VMT	Short to Long-term
Parking facilities and policies	Public Works, Community ~~& Economic~~ Development	~~**2020: 4,682**~~ ~~2025: 4,535~~ ~~2030: 4,388~~ **2035: 6,618~~4,211~~**	2% VMT reduction ○ % reduction in parking standards ○ Number of projects with alternative parking provisions (shared parking, unbundled parking cost, valet, etc.) ○ Number of EV parking spaces installed	VMT	Short to Long-term
Transportation improvements	Public Works,	~~**2020: 1,475**~~	.63 VMT reduction	VMT	

TABLE 5-1: CAP IMPLEMENTATION MATRIX					
Measure / Actions	**Responsible Department(s)**	**Annual GHG Reduction Goals ($MTCO_2e$)**	**Performance Target** **○ Progress Indicators**	**Unit of Measure**	**Implementation Timeframe**
	Community ~~& Economic~~ Development	~~2025: 1,429~~ ~~2030: 1,383~~ **2035:** **2,085~~1,327~~**	○ Transit ridership counts	$MTCO_2e$	Short to Long-term
CAP Measures (see Sections 4.1 - 4.11 for complete descriptions)					
A – Promote installation of residential photovoltaic systems		~~**2020: 2,896**~~ ~~2025: 5,309~~ ~~2030: 7,723~~ ~~**2035: 10,136**~~**N/A**	~~Promote installation of residential PV systems to produce an additional 9.1 MW above already projected amounts, or the equivalent of 2,682 more homes with PV systems, by 2035~~N/A		
~~A-1: Temporarily suspend PV system permit fees~~	~~Community & Economic Development, Communications~~		~~○ Number of promotional events~~ ~~○ MW installed PV~~	~~kWh~~	~~Short term~~
~~A-2: Review local regulations for constraints on PV~~	~~Community & Economic Development~~		~~n/a~~		~~Short to Long-term~~
~~A-3: Adopt ordinance requiring PV in new residential construction~~	~~Community & Economic Development~~		~~○ Ordinance adoption~~ ~~○ MW installed PV~~	~~kWh~~	~~Short term~~

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
B - Promote Installation of commercial and industrial photovoltaic systems		~~**2020: 3,810**~~ ~~2025: 6,986~~ ~~2030: 10,161~~ **2035:** ~~**13,336**~~**4,457**	Promote installation of commercial and industrial PV systems to produce an additional 10.7 MW per year above projected amounts, or roughly 15 percent of projected commercial and industrial electricity use, by 2035		
B-1: Implement and enforce Title 18, Chapter 18.30, Section 18.30.130 of the Carlsbad Municipal Code, mandating solar photovoltaic energy generation systems on new non-residential buildings. ~~Require PV on large new nonresidential construction~~	Community ~~& Economic~~ Development		~~○ Ordinance adopted~~ ○ MW installed PV	kWh	~~Short-term~~Ongoing
B-2: Implement and enforce Title 18, Chapter 18.30, Section 18.30.130 of the Carlsbad Municipal Code, mandating solar photovoltaic energy generation systems on existing non-residential buildings undergoing major renovations~~Adopt an ordinance requiring existing nonresidential developments to install PV panels to offset a portion of their energy use~~	Community ~~& Economic~~ Development		~~○ Ordinance adopted~~ ○ MW installed PV	kWh	~~Mid-term~~Ongoing

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
C - Promote building cogeneration for large commercial and industrial facilities		~~**2020: 305**~~ ~~2025: 559~~ ~~2030: 813~~ ~~**2035: 1,067**~~**N/A**	~~Promote building cogeneration for large commercial and industrial facilities, with the goal of producing 6.9 MW~~N/A		
~~C-1: Promote cogeneration~~	~~Public Works, Communications~~		~~○ Promotional activities conducted~~ ~~○ Number and/or sq. footage of SGIP-funded projects~~	~~kWh/therms~~	~~Short-term~~
~~C-2: Install cogeneration systems for large city facilities where beneficial~~	~~Public Works~~		~~○ MW installed co-generation systems~~	~~kWh/therms~~	~~Mid to Long-term~~
~~C-3: Require cogeneration systems for large commercial and industrial facilities that have on-site electricity production~~	~~Community & Economic Development~~		~~○ MW installed co-generation systems~~	~~kWh/therms~~	~~Mid-term~~
D - Encourage single-family residential efficiency retrofits		**2020: 323** 2025: 593 2030: 862 **2035: 1,132**	Encourage single-family residential efficiency retrofits with the goal of a 50 percent energy reduction compared to baseline in 30 percent of the total single-family homes citywide by 2035 (approximately 10,000 single-family homes out of a total of 35,000)		
D-1: Promote residential energy efficiency incentive and rebate programs	Public Works, Communications		○ Promotional activities conducted	kWh/therms	Short-term
D-2: Create a citywide "Energy Challenge"	Public Works, Communications		○ Program launch ○ Promotional activities conducted ○ Number of program participants and/or sq. footage of buildings in program	kWh/therms	Short-term

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
D-3: Implement and enforce Title 18, Chapter 18.30, Section 18.30.190, mandating energy efficiency measures in existing residential buildings undergoing major renovations. ~~Require residential energy audits/retrofits~~	Community ~~& Economic~~ Development		~~○ Ordinance adopted~~ ○ Number and/or sq. footage of existing homes retrofitted	kWh/therms	~~Short-term~~Ongoing
E - Encourage multi-family residential efficiency retrofits		~~**2020: 100**~~ ~~2025: 184~~ ~~2030: 267~~ **2035: ~~351~~3,993**	Encourage multi-family residential efficiency retrofits with the goal of a 50 percent energy reduction in 30 percent of the projected amount of multi-family homes citywide by 2035 (approximately 5,000 out of a total of 17,000)		
E-1 and E-2: ~~(~~See Measures D-1 and D-2 above~~)~~	Public Works, Communications, Community ~~& Economic~~ Development		○ See Actions D-1 through D-~~3~~2 above	kWh/therms	Short-term
E-3: Implement and enforce Title 18, Chapter 18.30, Section 18.30.190, mandating energy efficiency measures in existing residential buildings undergoing major renovations.			○ Number and/or sq. footage of existing homes retrofitted	kWh/therms	Ongoing

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
F - Encourage commercial and city facility efficiency retrofits		~~**2020: 5,251**~~ ~~2025: 9,626~~ ~~2030: 14,002~~ **2035:** ~~**18,377**~~**7,579**	Encourage commercial and city facility efficiency retrofits with the goal of a 40 percent energy reduction in 30 percent of commercial square footage citywide and in city facilities by 2035		
F-1: Install energy efficiency retrofits for city-owned buildings	Public Works		○ Sq. footage of buildings retrofitted ○ % energy use reduction	kWh/therms	Short-term
F-2: Promote nonresidential energy efficiency incentive and rebate programs	Public Works, Community ~~& Economic~~ Development, Communications		○ Promotional activities conducted ○ Number of program participants and/or sq. footage of buildings retrofitted ○ % energy use reduction	kWh/therms	Short-term
F-3: Implement and enforce Title 18, Chapter 18.21, Section 18.21.155, mandating energy efficiency measures in new non-residential buildings and existing non-residential buildings undergoing major renovations.~~Require nonresidential energy audits/retrofits~~	Community ~~& Economic~~ Development		~~○ Ordinance adopted~~ ~~○ Number and/or sq. footage of existing buildings retrofitted~~ ○ % energy use reduction	kWh/therms	~~Short-term~~Ongoing
G - Promote commercial and city facility commissioning		~~**2020: 5,251**~~ ~~2025: 9,626~~ ~~2030: 14,002~~ ~~**2035:**~~ ~~**18,377**~~**N/A**	~~Encourage commercial and city facility commissioning, or improving existing and new building operations, with the goal of a 40 percent energy reduction in 30 percent of commercial square footage citywide and in city-owned buildings by 2035~~N/A		

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
~~G-1: Promote commercial commissioning~~	~~Public Works, Community & Economic Development, Communications~~		~~○ Promotional activities conducted~~ ~~○ Number and/or sq. footage of commissioned buildings~~ ~~○ % energy use reduction~~	~~kWh/therms~~	~~Short-term~~
~~G-2: Commission city facilities~~	~~Public Works~~		~~○ Number and/or sq. footage of commissioned buildings~~ ~~○ % energy use reduction~~	~~kWh/therms~~	~~Mid-term~~
H - Implement green building measures		~~**2020: 51**~~ ~~2025: 94~~ ~~2030: 136~~ ~~**2035: 179**~~**N/A**	~~Implementation of a 5 percent improvement in energy efficiency above the City of Carlsbad residential green building code (based on CALGreen, the statewide green building code), for new construction~~construction/A		
~~H-1: Increase Green Building Code requirements by five percent.~~	~~Community & Economic Development~~		~~○ Ordinance adopted~~ ~~○ Number and/or sq. footage of buildings with enhanced GBC features~~	~~kWh/therms~~ ~~$MTCO_2e$~~	~~Short-term~~
I - Promote replacement of incandescent and halogen bulbs with LED or other energy efficient lamps		~~**2020: 6,257**~~ ~~2025: 11,471~~ ~~2030: 16,686~~ **2035:** ~~**21,900**~~**22**	Replace 50 percent of incandescent and halogen light bulbs citywide with LED or similarly efficient lighting by 2035		
I-1: Replace incandescent and halogen light bulbs in city facilities	Public Works		○ Building sq footage upgraded ○ Number of fixtures replaced	kWh	Short-term
I-2: Promote the use of LED rebate programs	Public Works, Communications		○ Promotional activities conducted	kWh	Short-term

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
I-3: Develop natural lighting and ventilation standards; install city facility demonstration project	Community ~~& Economic~~ Development Public Works		○ Feasibility study conducted ○ Number of buildings with natural lighting and ventilation features ○ % energy use reduction	kWh/therms	Mid-term
J - New construction residential and commercial solar water heater/heat pump installation & retrofit of existing residential		~~**2020: 3,315**~~ ~~2025: 6,078~~ ~~2030: 8,841~~ **2035:** ~~**11,604**~~**2,813**	Install solar water heaters or heat pumps on all new residential and commercial construction. Retrofit up to 30 percent of existing homes and commercial buildings to include solar water heaters or heat pumps		
J-1: Promote ~~-~~residential solar water heaters and heat pump retrofit incentive, rebate and financing programs	Public Works, Communications		○ Promotional activities conducted ○ Solar heater/heat pump installations	kWh/therms	Short-term
J-2: Implement and enforce Title 18, Chapter 18.30, Sections 18.30.150 and 18.30.170, mandating alternative water heating requirements in new residential and non-residential buildings.~~Solar water heater and heat pump ordinance for new nonresidential construction~~	Community ~~& Economic~~ Development		~~○ Ordinance adopted~~ ○ Solar heater/heat pump installations ○ MW installed PV	kWh/therms	~~Short-term~~Ongoing

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
K - Promote transportation demand management strategies		~~**2020: 6,728**~~ ~~2025: 12,335~~ ~~2030: 17,942~~ **2035:** ~~**23,549**~~**6,325**	Promote Transportation Demand Management Strategies with a goal of achieving a 10 percent increase in alternative mode use by workers in Carlsbad, for a total of 32 percent alternative mode use		
K-1: ~~Adopt~~ Implement citywide transportation demand management (TDM) plan	Community ~~& Economic~~ Development, Public Works		○ TDM plan adopted ○ TDM participation rates ○ % VMT reduced	VMT	Short-term
K-2: Implement and enforce Title 18, Chapter 18.51, mandating TDM improvements and strategies for non-residential development. ~~Adopt TDM ordinance~~	Community ~~& Economic~~ Development, Public Works		~~○ TDM ordinance adopted~~ ○ TDM participation rates ○ % VMT reduced	VMT	~~Mid-term~~Ongoing
L - Promote an increase in the amount of zero-emissions vehicle travel		~~**2020: 15,474**~~ ~~2025: 28,368~~ ~~2030: 41,263~~ **2035:** ~~**54,158**~~**56,207**	Promote an increase in the amount of ZEV miles traveled from a projected 15 percent to 25 percent of total vehicle miles traveled by 2035		
L-1: Construct a “PV to EV” pilot project	Public Works, Community ~~& Economic~~ Development		○ kW installed PV ○ Number of ZEV charging units	VMT kWh	Short-term

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
L-2: Prepare a community-wide charging station siting plan	Public Works, Community ~~& Economic~~ Development		○ Siting Plan prepared		Short-term
L-3: Construct ZEV charging stations based on the community-wide charging station siting plan	Public Works		○ Number of charging stations installed ○ kWh charging sessions	VMT	Mid-term
L-4: Offer dedicated ZEV parking and charging stations	Public Works, Community ~~& Economic~~ Development		○ Number of installed ZEV parking spaces/charging stations ○ kWh charging sessions	VMT	Mid-term
L-5: Adopt requirements for ZEV parking for new developments.	Community ~~& Economic~~ Development		○ Number of installed ZEV parking spaces/charging stations ○ kWh charging sessions	VMT	Short-term
L-6: Implement and enforce Title 18, Chapter 18.21, Sections 18.21.140 and 18.21.150, mandating electric vehicle charging infrastructure in new residential and non-residential building and existing residential and non-residential buildings undergoing major renovations.~~Require EV chargers or pre-wiring in new residential construction and major renovations.~~	Community ~~& Economic~~ Development		~~○ Ordinance adopted~~ ○ Number of EV chargers installed	VMT	~~Short-term~~Ongoing

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
L-7: Increase the proportion of city fleet low and zero–emissions vehicle miles traveled to 25 percent of all city-related VMT	Public Works		○ % LEV and ZEV fleet VMT	VMT	Short-term
M - Develop more citywide renewable energy projects		~~**2020: 1,309**~~ ~~2025: 2,399~~ ~~2030: 3,490~~ **2035:** ~~**4,580**~~**2,774**	Produce the equivalent amount of energy to power 2,000 homes (roughly equivalent to a 5 percent reduction) by 2035 from renewable energy projects		
M-1: Conduct a feasibility study to evaluate citywide renewable energy projects and prioritize accordingly.	Public Works		○ Feasibility study conducted		Short-term
M-2: Incorporate renewable energy measures such as PV system installation on city buildings and parking lots, or microturbine installation on city facilities	Public Works		○ MW installed renewable energy systems	MWh	Mid to Long-term
M-3: Pursue available funding sources for the construction of municipal renewable energy projects	Public Works		○ Number of EEFP or SGIP-funded projects	MWh	Mid to Long-term
N - Reduce the GHG intensity of water supply conveyance, treatment and distribution		~~**2020: 1,705**~~ ~~2025: 3,126~~ ~~2030: 4,547~~ **2035: ~~5,968~~713**	Reduce the intensity of GHG emissions from water utilities (including water supply, wastewater, and recycled water) conveyance, treatment, and distribution by 8 percent by 2035		

TABLE 5-1: CAP IMPLEMENTATION MATRIX

Measure / Actions	Responsible Department(s)	Annual GHG Reduction Goals ($MTCO_2e$)	Performance Target ○ Progress Indicators	Unit of Measure	Implementation Timeframe
N-1: Improve water utilities (including water supply, wastewater, and recycled water) conveyance, treatment and distribution, and other system improvements.	Public Works, Carlsbad Municipal Water District		○ Number of water system improvement projects ○ % energy use reduction	kWh	Mid to Long-term
O - Encourage the installation of greywater and rainwater systems		~~**2020: 344**~~ ~~2025: 631~~ ~~2030: 918~~ **2035: ~~1,205~~137**	Encourage the installation of greywater and rainwater collection systems with a goal of 15 percent of homes by 2035		
O-1: Conduct greywater and rainwater collection systems workshops	Carlsbad Municipal Water District, Communications		○ Number of workshops conducted ○ % water use reduction	Gallons of water	Mid-term
O-2: Create a greywater design reference manual	Community ~~& Economic~~ Development, Carlsbad Municipal Water District		○ Reference manual created ○ % water use reduction	Gallons of water	Mid-term
O-3: Evaluate the feasibility of offering a rebate for residential greywater systems that require a permit to cover the cost of obtaining a permit.	Carlsbad Municipal Water District		○ Feasibility study conducted ○ Number of permit rebates issued ○ % water use reduction	Gallons of water	Mid-term
P – Clean Electricity		**2035: 56,207**	Achieve 100% renewable electricity by 2030 for 95% of the residential bundled load and 85% commercial + industrial bundled load.		

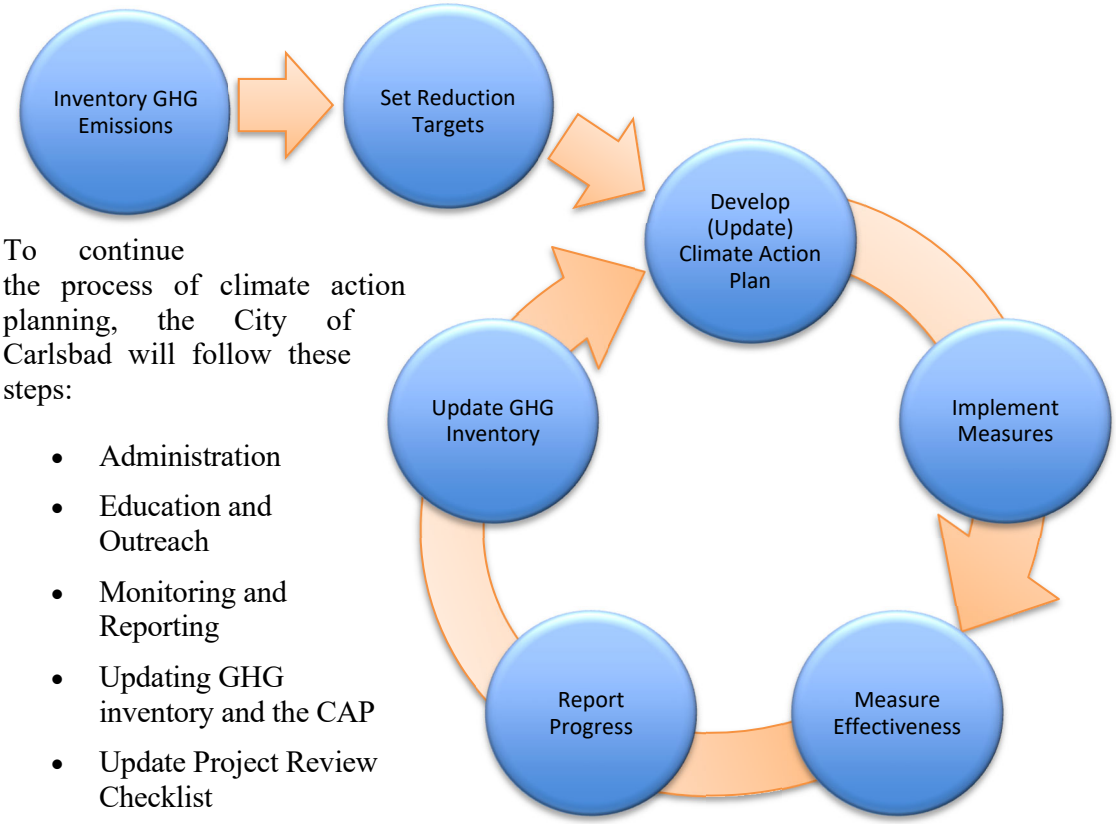
TABLE 5-1: CAP IMPLEMENTATION MATRIX					
Measure / Actions	**Responsible Department(s)**	**Annual GHG Reduction Goals ($MTCO_2e$)**	**Performance Target** ○ **Progress Indicators**	**Unit of Measure**	**Implementation Timeframe**
P-1: Continue participation in Clean Energy Alliance Community Choice Energy program	City Manager		○ Continued participation	N/A	Ongoing
P-2: Explore the purchase of renewable energy credits if Community Choice Energy program is not reaching 2035 reduction target	Public Works Finance		○ CCE participation rates and percentage of customers at 100% renewable energy.	kWh	Ongoing

5.2 Monitoring and Reporting

This CAP serves as a toolkit for the City of Carlsbad to reduce community-wide GHG emissions and meet emissions targets. Climate action planning, however, is an iterative and adaptive management process: it requires administration, public outreach, monitoring progress and measuring results, periodically revisiting assumptions and adjusting provisions when necessary. Through regular monitoring and measuring the performance of CAP activities, the city will learn what is working and what is not. This will enable the city to make timely adjustments to existing measures, replace ineffective actions, and/or add new measures as changes in technology, federal and state programs, or other circumstances warrant.

Figure 5-1 shows the steps in the process of climate action planning.

Figure 5-1: Process of Climate Action Planning



To continue the process of climate action planning, the City of Carlsbad will follow these steps:

- Administration
- Education and Outreach
- Monitoring and Reporting
- Updating GHG inventory and the CAP
- Update Project Review Checklist

Administration

Following adoption of this CAP, the city will designate a CAP administrator and form an interdisciplinary CAP implementation team from within the city organization. The administrator, in conjunction with the implementation team, will be responsible for initial program start-up activities and for overseeing implementation, monitoring and reporting of all actions described in the CAP. The composition of the implementation team may vary from time to time as needed, but it is expected that core members will include staff from Public

Works, Community and Economic Development, Finance, and Communications departments. As some of the monitoring and reporting activities will require coordination with other agencies, the implementation team will need to foster effective partnerships accordingly.

Operating resources for administering the CAP will be provided through the city's annual budget process. To maximize efficiency and maintain costs, the city will integrate CAP implementation activities into existing workloads and programs whenever possible. Potential private and public funding resources for individual GHG reduction measures are identified in the measure descriptions in Chapter 4. However, since program incentives and funding sources change over time, the CAP administrator and Implementation Team will need to keep current on available resources as GHG reduction measures are implemented.

Education and Outreach

A program of this scope and consequence will require substantial community support in order to succeed. Key to garnering this support is to raise the level of community awareness through education and outreach. Most of the individual GHG reduction measures in Chapter 4 include a promotion and education component. Appendix A provides a listing of internet resources on a variety of climate change-related topics. In addition to these features built into the CAP, the city will utilize its website, social media, and other communications channels to provide information about climate change science and anticipated impacts, and by providing residents and businesses with information and resources to help them take action. The city's website already has a good deal of information related to energy and water efficiency programs, and other environmental sustainability efforts. This Climate Action Plan is also available on the city's website. The city will build upon this base of resources by providing current information and links to various local, state and federal incentive programs to reduce one's carbon footprint, and provide assistance to homeowners, businesses, and contractors seeking to make energy efficiency improvements.

Monitoring and Reporting

The City of Carlsbad will annually monitor and report on CAP implementation activities. The annual monitoring report will include implementation status of each action and progress towards achieving the performance targets of the corresponding emissions reduction measure. The annual monitoring report will also include information on the status of the federal and state level emissions reductions measures identified in Chapter 3 of this CAP, as well as any new efforts that may emerge in the reporting year. The annual report will be presented to the City Council at a public meeting during which interested parties may comment on the report.

Updating GHG Inventory and the CAP

The city will update the community and government operations inventories for calendar year 2014 for inclusion in the first annual report, and then will update the inventories every three years thereafter. For continuity, the inventory updates will tally emissions from the same sectors analyzed in Chapter 2 of this CAP. If an updated inventory reveals that the plan is not making adequate progress toward meeting the GHG target, or that new technologies and programs emerge that warrant inclusion in the CAP, the city will adjust the CAP by modifying, adding, and/or replacing measures as necessary. New opportunities for GHG reductions,

including new funding sources and the ability to link city reduction actions to the city's Capital Improvement Plan, Infrastructure Replacement and Fleet Vehicle Replacement schedules, and other programs can also be incorporated into future updates of the CAP. Interim "milestone" targets for years 2025 and 2030 as shown in Table 4-3 will be used to gauge whether the city is making adequate progress toward meeting the 2035 target. Recommendations to adjust the CAP may be presented to the City Council as part of the annual report or at any other time throughout the year as necessary to ensure effective CAP implementation.

5.3 Project Review Thresholds and Checklist

Compliance with CAP

During the course of project review, city will evaluate whether a project is subject to provisions of this CAP, using the screening criteria below. Once this is established, a project shall comply with the CAP in one of two ways:

- **Checklist Approach.** The Project Review Checklist below provides direction about measures to be incorporated in individual projects, which will be used during the normal development review process. Project features that help a project meet the provisions of the CAP shall then become part of project conditions of approval.
- **Self-Developed Program Approach.** Rather than use the standard checklist, project proponents can develop their own program that would result in the same outcome as the checklist. Appendix E provides a non-exclusive list of potential mitigation measures that can be applied at the project level to reduce project-level greenhouse gas emissions. Other measures not listed in the Appendix may be considered, provided that their effectiveness in reducing greenhouse gas emissions can be demonstrated. The self-developed program approach and selection of mitigation measures shall be subject to city review and approval.

CEQA Streamlining

Project Screening Thresholds

The California Air Pollution Control Officers Association (CAPCOA) published various screening thresholds to guide lead agencies in determining which projects require greenhouse gas analysis and mitigation for significant impacts related to climate change. Utilizing this guidance, the City has determined that new development projects emitting less than 900 $MTCO_2e$ annual GHG would not contribute considerably to cumulative climate change impacts, and therefore do not need to demonstrate consistency with the CAP.

The city prepared a "Climate Action Plan Consistency Checklist" and "Guidance to Demonstrating Consistency with the Climate Action Plan For Discretionary Projects Subject to CEQA," which lists the types and sizes of projects that correspond to the 900 MTCO2e screening threshold. The documents were revised to reflect adoption of CAP ordinances. For proposed projects above the screening threshold, project proponents shall complete the Checklist. ~~Table 5-2 lists types and sizes of projects that correspond to the 900 $MTCO_2e$~~

screening threshold; projects equal to or exceeding these thresholds would be subject to CAP measures.[55]

TABLE 5-2: PROJECT REVIEW THRESHOLDS	
Project/Plan Type	**Screening Threshold**
Single-Family Housing	50 dwelling units
Multi-family Housing	70 dwelling units
Office	35,000 square feet
Retail Store	11,000 square feet
Grocery Store	6,300 square feet
Source: Adapted from California Air Pollution Control Officers Association (CAPCOA). CEQA and Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act (January 2008).	
Note: For project types not listed in this table, the need for GHG analysis and mitigation will be made on a project-specific basis, considering the 900 $MTCO_2e$ screening threshold.	

Project Review Checklist

For proposed projects above the screening thresholds, project proponents shall complete the CAP Project Review Checklist (similar to that shown in Table 5-3). For each item on the checklist, project proponents shall indicate whether or not the measure is included as part of the project, or if it is not applicable. The checklist is designed to meet the targets set for the measures presented in Chapter 4. The checklist shown in Table 5-3 is preliminary and illustrative of the items that will be included in the finalized checklist. The city will provide a final checklist incorporating requirements in ordinances drafted for the CAP.

TABLE 5-3: PRELIMINARY CAP PROJECT REVIEW CHECKLIST		
RENEWABLE ENERGY PRODUCTION		
1. For new nonresidential projects with more than 50 cars surface parked or on roofs of parking structures, would the project include PV panels over at least half of the surface/roof-parked cars or other equivalent renewable energy production?	☐ Included	☐ Not Applicable
Explanation: *Describe the measures taken to meet this requirement, if applicable.*		

[55] If a proposed project is below the screening criteria, GHG emissions would still be reduced through compliance with applicable City of Carlsbad General Plan goals and policies, ordinances and regulations.

TABLE 5-3: PRELIMINARY CAP PROJECT REVIEW CHECKLIST		
COGENERATION		
2. For the construction or retrofit of a large commercial or industrial facility with an on-site electricity production, would the proposed project include a building cogeneration system?	☐ Included	☐ Not Applicable
Explanation:		
ENERGY CONSERVATION ORDINANCES		
3. For residential and commercial construction or major renovations, would the proposed project meet the requirements in the applicable energy conservation ordinance?	☐ Included	☐ Not Applicable
Explanation:		
GREEN BUILDING CODE		
4. Would the proposed project meet the energy efficiency standard of 5 percent above Title 24 standards (CALGreen)?	☐ Included	☐ Not Applicable
Explanation:		
SOLAR WATER HEATERS/HEAT PUMPS		
5. For residential and commercial projects, does the project include solar water heaters to reduce the energy needed for residential water heating by 50 percent, or heat pumps to reduce the heating/cooling load by 50 percent?	☐ Included	☐ Not Applicable
Explanation:		

TABLE 5-3: PRELIMINARY CAP PROJECT REVIEW CHECKLIST		
TRANSPORTATION DEMAND MANAGEMENT		
6. For proposed projects that meet the minimum trip generation thresholds set in the City of Carlsbad Transportation Demand Management (TDM) ordinance, does the project include a TDM plan, containing a description of how minimum alternative mode use will be achieved and maintained over the life of the project?	☐ Included	☐ Not Applicable
Explanation: *Include TDM plan if applicable.*		
ZERO-EMISSIONS VEHICLES		
7. For proposed projects subject to the City of Carlsbad off street parking requirements, does the proposed project provide preferential parking for electric vehicles and/or charging stations for electric vehicle use?	☐ Included	☐ Not Applicable
Explanation:		
OTHER GHG REDUCTION MEASURES AND/OR FEATURES		
8. Describe other GHG reductions measures and/or features of the proposed project:	☐ Included	☐ Not Included
Explanation:		

A completed CAP Project Review Checklist, including supporting documentation for applicable measures, demonstrates a proposed project complies with the CAP.

As an alternative to utilizing the Project Review Checklist, a project proponent may develop a project-specific GHG emissions reduction program that would achieve the same required GHG reductions. Appendix E to the CAP provides a non-exclusive list of mitigation measures which may be considered by a project proponent for inclusion in a project-specific GHG emissions reduction program. The reduction measures identified in the CAP and Appendix E are non-exclusive, and other effective reduction measures may be available or become available in the future. The type, character, and level of mitigation would depend on the project type, size, location, context, and other factors. The availability of mitigation measures changes over time, as well, with new technologies, building materials, building design practices, and other

~~changes. Therefore, in developing project specific reductions measures, the city recommends that a project proponent refer to current guidance from CAPCOA, ARB, OPR, California Attorney General, and SANDAG to determine applicable mitigation measures and estimate their effectiveness (see references in Appendix C).~~

~~Updating Project Review Checklist~~

~~The Project Review Checklist will be finalized by the City of Carlsbad during the first year of CAP implementation, and updated as necessary to reflect lessons learned through project streamlining. Federal, state, and San Diego Air Pollution Control District actions will be monitored to identify future changes to federal or state standards or guidelines that affect implementation of the CAP. Any changes to California Environmental Quality Act (CEQA) and CEQA Guidelines will also be integrated into the Project Review Checklist.~~