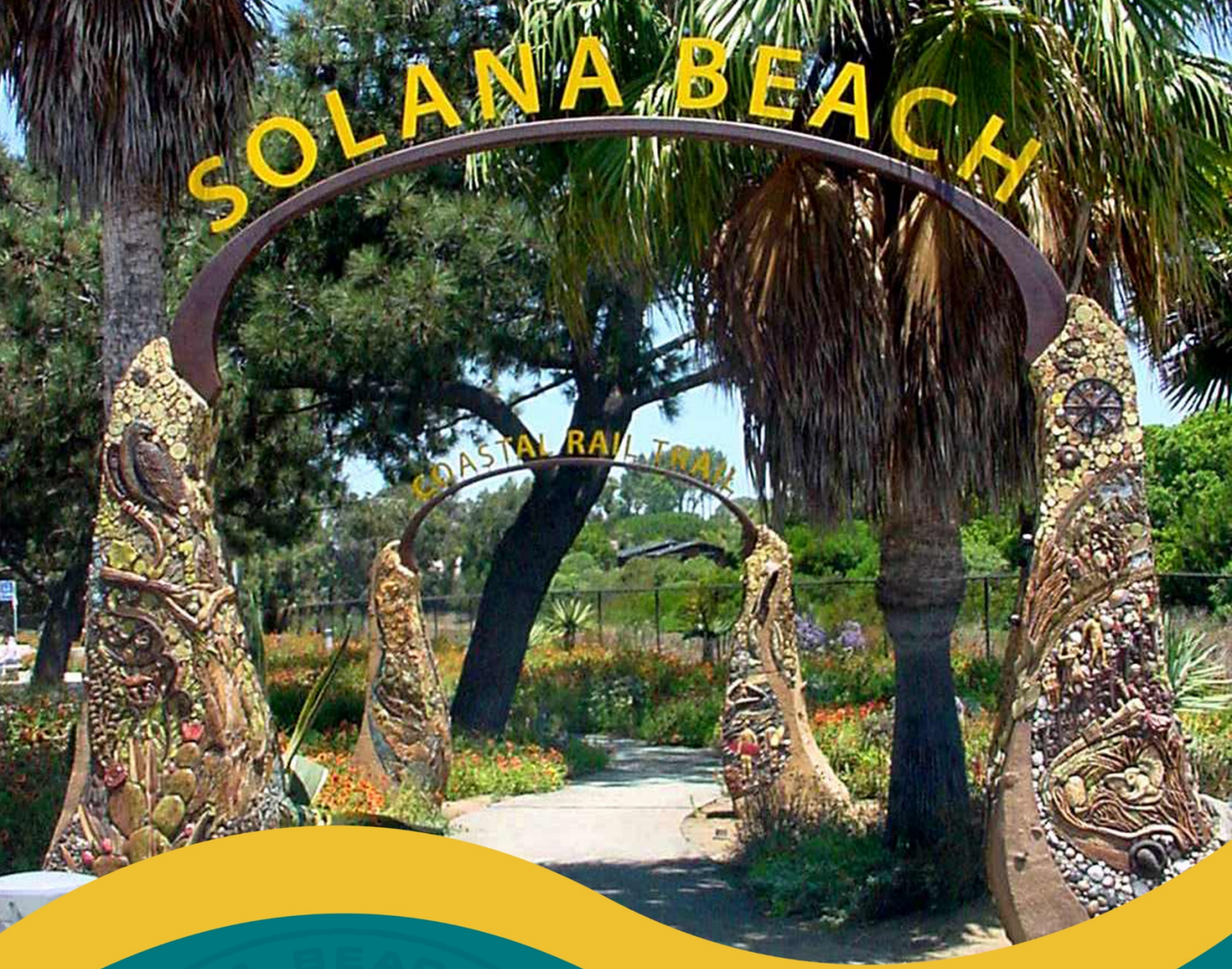

City of Solana Beach

Climate Action Plan

City of Solana Beach
Climate Action Plan

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Acronyms and Abbreviations

AFV	alternative fuel vehicle
AB	Assembly Bill
BAU	business-as-usual
BRT	Bus Rapid Transit
ARB	California Air Resources Board
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CNRA	California Natural Resources Agency
CSI	California Solar Initiatives
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CFCs	chlorofluorocarbons
City	City of Solana Beach
CAA	Clean Air Act
CAP	Climate Action Plan
CCA	community choice aggregation
CAFE	Corporate Average Fuel Economy
^oC	degrees Celsius
^oF	degrees Fahrenheit
DOC	Department of Conservation
EV	electric vehicle
EEM	Energy Efficient Mortgages
EPIC	Energy Policy Initiatives Center
EO	Executive Order
GWP	global warming potential
GHG	greenhouse gas
HERO	Home Energy Renovation Opportunity
HFC	hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
ICLEI	International Council for Local Environmental Initiatives
KPI	Key Performance Indicator
LED	Light-emitting diode
LGC	Local Government Commission
CH_4	methane

MT	metric ton
MPO	Metropolitan Planning Organization
MW	megawatt
MMT	million metric ton
NCTD	North County Transit District
N_2O	nitrous oxide
OBF	On-Bill Financing
O_3	ozone
ppm	parts per million
%	percent
PFCs	perfluorocarbons
PV	photovoltaic
PPA	Power Purchase Agreements
PACE	Property Assessed Clean Energy
RTP	Regional Transportation Plan
SANDAG	San Diego Association of Governments
SDG&E	San Diego Gas & Electric
MTS	San Diego Metropolitan Transit System
SB	Senate Bill
SHW	solar hot water heater
SGC	Strategic Growth Council
SF_6	sulfur hexafluoride
SCS	Sustainable Communities Strategy
TDM	Transportation Demand Management
VMT	vehicle miles traveled

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Executive Summary

This Climate Action Plan (CAP) provides a comprehensive roadmap to address the challenges of climate change in the City of Solana Beach (City). Acting on climate change means both reducing greenhouse gas (GHG) emissions from activities within the City and helping the community to adapt to climate change and improve its resilience over the long term. The City takes issues related to climate change and the effects of climate change seriously, and has dedicated resources to create a CAP that strives to achieve GHG reductions. The City is undertaking preparation of this CAP to implement its General Plan policies by establishing GHG emission targets and identifying achievable actions to reduce GHG emissions based on the technical analysis provided in this CAP.

The CAP aims to address climate change by reducing GHG emissions from activities within the City, and by identifying threats and strategies for adapting to future environmental conditions caused by climate change.

The scientific consensus is that it is "extremely likely" that global climate change is caused by GHG emissions associated with human activities, and that significant reductions in human-caused GHG emissions are needed by the mid-21st century to prevent the most catastrophic effects of climate change. The Intergovernmental Panel on Climate Change (IPCC) defines "extremely likely" as a 95 percent probability of occurrence/outcome. Additionally, multiple studies published in peer-reviewed scientific journals show that 97 percent or more of actively publishing climate scientists agree that climate change trends over the past century are "extremely likely" due to human activities. To this end, in 2006, the California Global Warming Solutions Act (Assembly Bill [AB] 32) established the State's first target to reduce GHG emissions, which established a goal of lowering emissions to 1990 levels by 2020. California has been making steady progress and is expected to achieve the 2020 target; however, ongoing reductions in GHG emissions are needed as noted above.

As directed by AB 32 and SB 32, the State aims to reduce annual GHG emissions to:

- 1990 levels by 2020; and
- 40 percent below 1990 levels by 2030.

The State's longer-term goal is to reduce emissions down to 80 percent below 1990 levels by 2050.

In 2016, Governor Brown signed Senate Bill (SB) 32 into law, which established a new mid-term GHG reduction target of 40 percent below 1990 levels by 2030. This target aligns with those of leading international governments such as the 28-nation European Union which adopted the same target in October 2014. The new 2030 target places California on a trajectory towards meeting its longer-term goal, which is to bring emissions down to 80 percent below 1990 levels by 2050. Many climate experts believe that eventually a reduction of greater than 80 percent will be required to achieve climate stabilization.

Over the last decade, the City has taken several steps to begin addressing climate change and achieving reductions in GHG emissions, both in the City's operations as well as the broader community. Dating as far back as 2005, the City has been involved in various efforts to quantify GHG emissions sources and formulate reduction strategies at both a City-specific and larger, regional level.

The top five emitting sectors in 2010 are:

1. Transportation (63%)
2. Electricity (20%)
3. Natural Gas (11%)
4. Solid Waste (3%)
5. Water Consumption (2%)

The key components of the climate action planning process represented in this CAP are briefly summarized below:

1. A baseline GHG emissions inventory was prepared for 2010, consistent with the City of San Diego's CAP 2010 baseline year.

- Approximately 139,216 metric tons of carbon dioxide equivalent ($MTCO_2e$) were emitted by communitywide sources in the City in 2010. The term CO_2e accounts for contributions from carbon dioxide, methane and nitrous oxide based on their varying global warming potentials.

- The largest source of emissions was the transportation sector, which accounted for 63 percent of the annual GHG emissions as determined from the annual inventory; while the electricity sector accounted for approximately 20 percent. Transportation emissions are based on the origin-destination analysis, where pass-through trips with no end point in the City are excluded.

The top five GHG reduction measures will reduce City emissions by a total of 40,019 $MTCO_2e$ by 2035.

2. GHG emissions forecasts and reduction targets were identified for 2020 and 2035, consistent with the targets recommended by the 2008 AB 32 Scoping Plan and with the State targets. A 2030 statewide target was not available when the CAP process was initiated by the City. The 2030 target would lie along with trajectory to meet 2035 targets.

- Without any future actions (i.e., "business-as-usual" conditions), GHG emissions are expected to increase by 2020 and 2035.

- GHG emissions reduction targets for the CAP were established consistent with State guidance (the AB 32 Scoping Plan and the trajectory to meet 2050 goals):

  - 15 percent below 2010 levels by 2020; and
  - 50 percent below 2010 levels by 2035.

Source: City of Solana Beach

- Legislative actions by State or federal agencies help to reduce emissions in the future, but are not enough to achieve the targets.

- Achieving the 2035 target will require local action to help close the gap between legislative-adjusted emissions forecasts and the emissions limits established by the CAP's targets.

3. Local GHG emissions reduction strategies and measures were identified to help the City achieve the 2035 target.

- GHG reduction strategies in the CAP are aligned with each of the GHG inventory sectors and contain a total of 30 specific local GHG reduction measures that will achieve GHG reductions.

Climate change is a global problem, but one that must be addressed on a local level through partnerships and individual actions.

- The top five measures in the CAP that will the achieve the most local GHG emissions reductions include:

  - Measure T-1: Increasing electric vehicles and alternative fuel vehicles in the region will reduce emissions by 17,495 $MTCO_2e$ by 2035.
  - Measure E-1: Implementing Community Choice Aggregation, subject to City Council approval, to achieve the goal of 100 percent renewable electricity by 2035 will reduce emissions by 10,466 $MTCO_2e$ by 2035.

- Measure E-2: Installing 10.8 megawatts of residential rooftop solar photovoltaic systems will reduce emissions by 5,858 $MTCO_2e$ by 2035.
- Measure W-1: Diverting 90 percent of solid waste from landfills, with an 85 percent capture rate will result in the reduction of 3,389 $MTCO_2e$ by 2035.
- Measure E-4: Installing solar hot water heaters at commercial spaces in the City will result in an reduction of 2,811 $MTCO_2e$ by 2035.

Co-benefits are the collateral positive side effects that result from strategies and measures identified in the CAP.

- While the measures included in the CAP are generally geared towards reducing GHG emissions, many will also result in health and quality of life, environmental, or economic "co-benefits," including climate adaptation co-benefits.

4. Climate change vulnerability is addressed through climate adaptation measures to improve community sustainability resilience.

- Specific adaptation measures are included in Chapter 4 to address these effects. Many of the measures require the City and other partnering agencies to address climate-related risks as part of existing planning processes, as well as to move towards incremental changes in the way that City services and infrastructure are maintained and operated. Community education and awareness-building are also important components of the adaptation strategies.

Local governments play an important role in achieving the State's long-term GHG targets for 2030 and 2050. Action and collaboration are needed at all levels to complement and support State level actions.

5. Implementation and monitoring mechanisms are identified that will help the City to ensure that the measures and targets are achieved.

- Implementation of the measures in the CAP will require the City to develop and implement new ordinances, programs, and projects, or modify existing ones. This will require careful consideration of the operational and capital resources needed, as well as the timing and phasing of implementation. Chapter 5 outlines these considerations.

- Monitoring is an important aspect of the CAP to ensure that the City is on track to achieve the GHG reduction targets and desired outcomes for increasing resilience in the face of a changing climate. To this end, the City will need to review and update the GHG emissions inventory periodically (every two years), track the community's progress on the implementation status of each measure in the CAP, and conduct a CAP update periodically (every five years).

- Local action on climate change cannot be addressed insularly by one agency or community, but requires active and ongoing partnerships between residents, businesses, the City, and other agencies and organizations in the region. On a community-wide level, individuals and businesses can play an important role in combating climate change. By changing habits to consume less energy; producing less waste through recycling, organics processing, and conserving water; and driving less by choosing to carpool, take transit, or walk and bike more frequently, individuals and businesses can work towards reducing their carbon footprint. The combination of these small efforts can lead to better outcomes for the environment and the City.

The CAP contains a total of 30 local GHG reduction measures. The combination of all measures contributes towards achieving the 2035 target.

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Chapter 1
Introduction

The City of Solana Beach (City) has a long history of environmental stewardship and planning for a sustainable future for all persons living and working here. For example, the City was the first in San Diego county to ban single-use plastic bags and polystyrene containers because of their lasting environmental effects. The City has also been working with stakeholders and residents to plan for ways to reduce its impacts on climate change, as well as to adapt to future climate change.

The CAP provides the City with a roadmap to address two climate change challenges: to reduce GHG emissions from activities within the City and to improve its resilience to climate change over the long term.

The City Council authorized the City to sign onto the U.S. Mayors Climate Protection Agreement committing to 12 steps for environmental sustainability in 2007. The Solana Beach Clean and Green Team (or Committee) was formed in 2007 at the urging of local citizens to provide the impetus for signing the agreement and implementing its goals. On November 18, 2015, the City signed onto the Compact of Mayors (Compact), which was launched at the 2014 United Nations Climate Summit. The Compact is a global coalition of mayors and city officials committing to reduce local GHG emissions, enhance resilience to climate change and track their progress publicly.

This Climate Action Plan (CAP) builds upon past and current City efforts in combating global climate change. It also enables the City to meet State legislative and regulatory mandates. The City takes issues related to climate change and the effects of climate change seriously, and has dedicated resources to create a CAP that strives to achieve GHG reductions. This CAP is intended to implement the City's General Plan policies by establishing GHG emissions targets, and identifying achievable actions to reduce GHG emissions based on the technical analysis provided.

There is strong consensus among the scientific community that global climate change is occurring; seasons are shifting, average temperatures are increasing, precipitation levels are changing, and sea levels are rising (Melillo et al. 2014). These changes have the potential to adversely affect human health and safety, economic prosperity, provision of basic services, and the availability of natural resources in the City.

Climate change is the greatest environmental challenge of the 21st century. It poses a serious threat not only to our region's natural resources, but to our jobs and health. Climate change also presents big opportunities. Large amounts of money will be saved and made during the transition to a low-carbon economy.

Climate change is already negatively impacting the City. Without concerted actions, conditions will worsen. As discussed in Chapter 4, the effects of climate change on the City may be severe. Possible impacts include sea-level rise up to 4.6 feet by 2100, increased annual average temperatures up to 5.8 degrees Farenheit (ºF) by 2090, prolonged droughts, and increased unpredictable weather patterns.

The City will monitor, review, and update the CAP to ensure continued effectiveness and relevance of the document.

The CAP sets a course of action for the City to address global climate change. The CAP, consistent with and complimentary to Statewide legislation and actions, provides a feasible roadmap for the City to both reduce greenhouse gas (GHG) emissions from activities within the City and to address the challenges of a changing climate by helping to adapt to climate change and improve its resilience over the long term.

While the CAP uses the best information, research, and techniques available today, technologies and markets are constantly changing. Thus, strategies identified in the CAP may become obsolete considering the development of new technologies that do not yet exist, or new State and federal laws passed. The overarching goals of the CAP, however, remain the same: to reduce GHG emissions and prepare for and adapt to climate change.

1.1 Introduction to Climate Change Science

The greenhouse effect, as outlined below in Figure 1-1, results from a collection of atmospheric gases called GHGs that insulate the Earth and help regulate its temperature. These gases, mainly water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and chlorofluorocarbons (CFCs) all act as effective global insulators, reflecting Earth's visible light and infrared radiation to keep temperatures on Earth conducive to life as we know it. Without the greenhouse effect, Earth would not be able to support life as we know it.

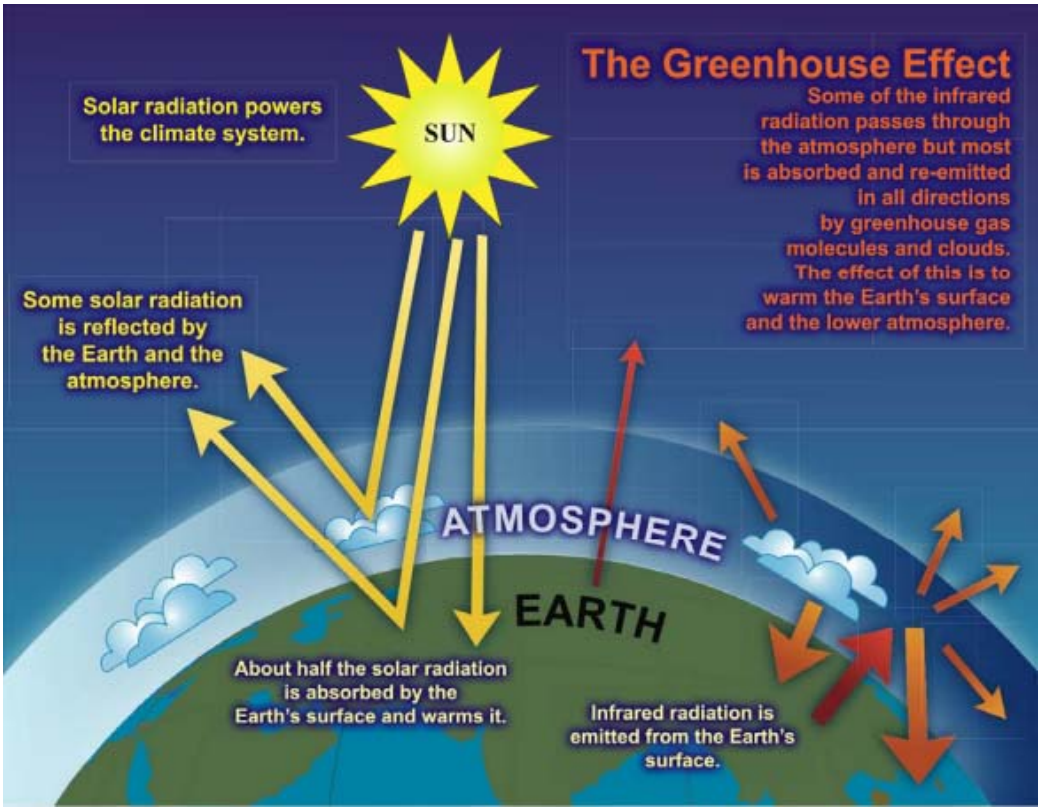


Figure 1-1: The Greenhouse Effect

(Source: IPCC 2007.)

It is "extremely likely" that in the last 50 years, most of the changes in the world's climate are a result of anthropogenic, or human-generated, activities.

However, human activities (e.g., burning of fossil fuels for transportation and energy, increasing rates of deforestation and development) have contributed to the elevated concentration of these gases in the atmosphere. Human-caused (i.e., anthropogenic) emissions of these GHGs above natural ambient concentrations are responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the Earth's climate, known as global climate change, or global warming. There is strong scientific consensus that it is "extremely likely" that most of the changes in the world's climate during the last 50 years are a result of anthropogenic GHG emissions (Intergovernmental Panel on Climate Change [IPCC] 2014:3, 5). IPCC defines "extremely likely" as a 95 percent probability of occurrence/outcome. Additionally, multiple studies published in peer-reviewed scientific journals show that 97 percent or more of actively publishing climate scientists agree that climate change trends over the past century are "extremely likely" due to human activities. Global climate change, in turn, is the driver behind changes in precipitation patterns, shrinking polar ice caps, an increase in sea level, and other impacts to biological resources and humans. Chapter 2 of the CAP summarizes the City's GHG emissions that are contributing to global warming.

For over twenty years, the world's nations have recognized that climate change is a global problem and can lead to significant fluctuations in regional climates. While there is consensus that global climate change is occurring, and is influenced by human activity, there is less certainty as to the timing, severity, and potential consequences of climate change phenomena, particularly at specific locations. Chapter 4 of the CAP discusses the predicted climate change effects in the City and strategies to adapt to the changing climate.

The CAP represents an important step in acknowledging global climate change effects on the City. Chapters 3, 4 and 5 of the CAP include strategies, specific measures, and implementation programs and monitoring mechanisms to reduce GHG emissions and plan for climate change impacts.

1.2 Regulatory Background

In response to the threat of global climate change, the State and City have already taken several steps to both reduce GHG emissions and adapt to climate change. These efforts, briefly summarized below, provide important policy direction and context for the CAP.

(Source: City of Solana Beach)

Virtually every nation signed the Paris Agreement in 2015, to limit global temperature rise to a maximum of 2 degrees Celsius ([ºC], 3.7 ºF) from pre-industrial levels. A further reduction to a maximum increase of 1.5ºC was determined to be needed and desirable, although it is a very aggressive target. On June 1, 2017, President Trump announced that the U.S. would withdraw from the Paris Climate Agreement. Since then, over 1,200 governors, mayors, businesses, investors and colleges and universities from across the U.S. declared their intent to continue to ensure the U.S. remains a global leader in reducing carbon emissions. The Solana Beach City Council officially confirmed its commitment to the Paris Climate Agreement on June 28, 2017.

1.2.1 California

In 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05, which directed California to reduce GHG emissions to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. A year later, in 2006, the Global Warming Solutions Act (Assembly Bill [AB] 32) was passed, establishing regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions. AB 32 put a cap on GHG emissions, setting a target of reducing GHG emissions to 1990 levels by 2020. As part of its implementation of AB 32 and Executive Order S-3-05, the California Air Resources Board (ARB) developed a Scoping Plan in 2008. The Scoping Plan, along with its Update in 2014, describes the approach California will take to reduce GHGs to achieve reduction targets and goals. California is currently on track to meet or exceed the AB 32 current target of reducing GHG emissions to 1990 levels by 2020.

On April 20, 2015, Governor Edmund G. Brown Jr. signed Executive Order B-30-15, establishing a new GHG emissions reduction target of 40 percent below 1990 levels by 2030. This target aligns with those of leading international governments such as the 28-nation European Union which adopted the same target in October 2014. Executive Order B-30-15 also directed ARB to update the AB 32 Scoping Plan to reflect the path to achieving the 2030 target. In September 2016, Governor Brown also signed Senate Bill (SB) 32, which codified into statute the mid-term 2030 target established by Executive Order B-30-15. The new 2030 GHG

emissions reduction target places California on a trajectory towards meeting the goal of reducing statewide emissions to 80 percent below 1990 levels by 2050.

On January 20, 2017, ARB released *The 2017 Climate Change Scoping Plan Update* (proposed 2017 Scoping Plan Update), which lays out the framework for achieving the 2030 reductions as established in Executive Order B-30-15 and SB 32. The proposed 2017 Scoping Plan Update identifies GHG reductions by emissions sector to achieve a statewide emissions level that is 40 percent below 1990 levels by 2030. The proposed 2017 Scoping Plan Update is currently in draft form and has not been adopted by ARB as of this writing.

In addition to legislation setting statewide GHG reduction targets, SB 375, signed by Governor Schwarzenegger in 2008, better aligned regional transportation planning efforts, regional GHG emissions reduction targets, and land use and housing allocations. SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy, showing prescribed land use allocations in each MPO's Regional Transportation Plan (RTP). ARB, in consultation with the MPOs, provides each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in their respective regions for 2020 and 2035. SANDAG adopted *San Diego Forward: The Regional Plan* that integrates the RTP and SCS in October 2015.

As directed by AB 32, SB 32, and Executive Orders B-30-15 and S-3-05, the State aims to reduce annual GHG emissions to:

- 1990 levels by 2020;
- 40 percent below 1990 levels by 2030; and
- 80 percent below 1990 levels by 2050.

On February 16, 2005 the Kyoto Protocol, the international agreement to address climate disruption, became law for the 141 countries that have ratified it to date. On that day, Seattle Mayor Greg Nickels launched the U.S. Conference of Mayors' Climate Protection Agreement, to advance the goals of the Kyoto Protocol through leadership and action by at least 141 American cities. Back in 2007, the City Council authorized the City to sign onto the U.S. Mayors Climate Protection Agreement committing to 12 steps for environmental sustainability.

To effectively address the challenges that a changing climate will bring, the State also prepared the 2009 California Climate Adaptation Strategy, which highlights climate risks and outlines possible solutions that can be implemented throughout the State. This Strategy was updated in 2014 and is now known as *Safeguarding California*. In 2015, the State also developed the Safeguarding California Implementation Action Plans.

Other relevant federal and State regulations relevant to the CAP are identified below:

Table 1-1	Relevant Federal and State Regulations	
Federal	Federal Clean Air Act (CAA)	In 2007, the U.S. Supreme Court ruled that CO_2 is an air pollutant as defined under the CAA, and the U.S. Environmental Protection Agency has the authority to regulate emissions of GHG.
Federal	Corporate Average Fuel Economy (CAFE) Standards	The federal CAFE Standards determine the fuel efficiency of certain vehicle classes in the U.S.
State	SB 97	The State Office of Planning and Research prepared and the Natural Resources Agency adopted amendments to the State California Environmental Quality Act (CEQA) Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. Effective as of March 2010, the revisions to the CEQA Environmental Checklist Form (Appendix G) and the Energy Conservation Appendix (Appendix F) provide a framework to address global climate change impacts in the CEQA process; State CEQA Guidelines Section 15064.4 was also added to provide an approach to assessing impacts from GHGs.
State	Executive Order S-21-09	Executive Order S-21-09 directed ARB, under its AB 32 authority, to adopt a regulation by July 31, 2010 that sets a 33 percent renewable energy target as established by Executive Order S-14-08.
State	Executive Order S-01-07	Executive Order S-01-07 set forth a low carbon fuel standard for California, whereby the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by 2020.
State	California Building Efficiency Standards Title 24 Part 6	The California Code of Regulations Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods.
State	AB 1493	AB 1493 (Pavley) required ARB to develop and adopt regulations that reduce GHGs emitted by passenger vehicles and light-duty trucks.
State	AB 197	AB 197 creates a legislative committee to oversee ARB and requires ARB to take specific actions when adopting plans and regulations pursuant to SB 32 related to disadvantaged communities, identification of specific information regarding reduction measures, and information regarding existing GHGs at the local level.
State	SB 350	SB 350 requires the State to set GHG emission reduction targets for the load serving entities through Integrated Resource Planning. SB 350 requires an increase in the Renewable Portfolio Standard to 50 percent by 2030 and doubling energy savings in electricity and natural gas end uses.
State	Advanced Clean Cars Program	In January 2012, ARB approved the Advanced Clean Cars program, which combines the control of GHG emissions and criteria air pollutants, as well as requirements for greater numbers of zero-emission vehicles, into a single package of standards for vehicle model years 2017 through 2025.
State	SB X1-2	SB X1-2 of 2011 requires all California utilities to generate 33 percent of their electricity from renewables by 2020. SB X1-2 mandates that renewables supplied to the California grid from sources within, or directly proximate to, California make up at least 50 percent of the total renewable energy for the 2011-2013 compliance period, at least 65 percent for the 2014-2016 compliance period, and at least 75 percent for 2016 and beyond.

1.2.2 City of Solana Beach

Over the last decade, the City, with the assistance of the community volunteer group the Clean and Green Team, has taken several steps to begin addressing climate change, sustainability, and reductions in GHG emissions. Dating as far back as 2005, the City has been involved in various efforts to quantify GHG emissions sources and formulate reduction strategies at both a municipal and community level. This CAP consolidates these past efforts by establishing a new baseline GHG inventory for 2010 and forecasting emissions to 2020 and 2035 to comply with State goals. Other notable City efforts are highlighted below.

- The City's General Plan outlines steps to become a more sustainable community by furthering the use of green techniques, reducing GHG emissions, improving water quality, promoting alternative modes of transportation, reducing energy and water consumption, and increasing energy efficiency and availability of renewable resources.
- One of the City's four overall strategic objectives is environmental sustainability. This includes actions to reduce and adapt to the effects of climate change.

(Source: City of Solana Beach)

- The City has continued its GHG emissions reduction efforts through the establishment of the Solana Beach Clean and Green Team. Since 2007, the team, comprised of local residents and business owners, has been working to help preserve the City's environment through coastal cleanups, support of a mandatory construction and demolition debris recycling ordinance, and participation in the GHG emissions inventory process. Along with City staff, the team has engaged in public outreach and education to help implement the City's ban on single-use plastic bags and food-related polystyrene initiatives. Throughout development of the CAP, the Climate Action Commission has provided input and comments on recommended implementation and adaptation measures to meet the goals of the City.
- Other notable City achievements include:
  - First in San Diego county to establish the single-use plastic bag ban;
  - First in San Diego county to establish the polystyrene ban at food establishments;
  - First in San Diego county to complete a Community Choice Aggregation Feasibility Study;
  - Adoption of Green Building Codes;
  - Streamlined online permitting for rooftop solar photovoltaic and solar hot water heating;
  - Adoption of mandatory Construction and Demolition Debris Recycling ordinance;
  - Adoption of mandatory recycling requirement for all commercial businesses in Solana Beach;
  - Adoption of Water Efficient Landscape Ordinance to promote water conservation;

- First in San Diego county to install and convert all City-owned streetlights to LEDs and be approved by San Diego Gas & Electric for rate reductions;
- Implementation of a City employee Commuter Incentive Program that provides monetary incentives for employees to use alternative modes of transportation (bike, walk, public transit, electric vehicles, etc.) or carpool to get to work;
- Won four Beacon Awards in consecutive years from the Local Government Commission (LGC) for Community GHG Reductions and Sustainability Best Practices;
- Signatory to the U.S. Mayor's Climate Protection Agreement in 2007;
- Installed three electric vehicle charging stations at City Hall in 2011; and
- Energy efficiency retrofits to all City facilities.

- The City of Solana Beach General Plan includes goals, objectives, and policies that address climate change, sustainability, and GHG reduction efforts, such as:

Land Use Element
Goal LU-3.0 To be a leader in efforts to reduce greenhouse gas emissions.
Policy LU-3.2 Enable residents to reduce their commutes by allowing and encouraging the creation of live/work units for artists, craftspeople, and other professions, promoting home occupations and telecommuting, and supporting other means of achieving jobs/housing balance.
Policy LU-3.5 Reduce urban heat island effect through sustainable design and building practices, cool roofs, green roofs, light colored pavement, shade trees, shading, and other means.
Policy LU-3.6 Promote the use of solar panels, solar hot water heaters, and other green energy sources in conjunction with new development and retrofits to existing structures.
Conservation and Open Space Element
Objective 2.0 Establish a master plan of hiking/jogging, bicycle, and equestrian trails.
Policy 2.a The city shall adopt a master plan of trails and shall develop at least one mile of trails annually until completion of the planned system. This trail system shall link the city's greenbelts, parks, and open space to the greatest extent possible.

- Solana Beach has been a member of the International Council for Local Environmental Initiatives (ICLEI) since 2008, demonstrating a commitment toward continued action toward sustainability. As a member, the City benefits from the toolsets provided by the Local Governments for Sustainability. These include the Clear Path California Software (ClearPath), and the Local Government and Community protocols and reference guides to help guide the City in preparing a CAP.
- The City also joined the Compact of Mayors in 2015, agreeing on a set of climate change measures in concert with other members.

1.3 Climate Action Plan Purpose and Objectives

The CAP outlines a course of action for the City to reduce community-wide GHG emissions, as well as prepare for and adapt to climate change. Goals for addressing climate change were developed in consideration of the built-out nature of the City and the limited potential for new development.

The overarching goals for the City's CAP are to:

- Reduce GHG emissions; and
- Identify adaptation measures for City government, businesses, and residential sustainability.

The GHG reduction targets for the City are established based on State goals embodied in AB 32, SB 32, and Executive Orders B-30-15 and S-3-05. The CAP aims to achieve the following local community-wide GHG reduction targets:

- 15 percent below 2010 levels by 2020; and
- 50 percent below 2010 levels by 2035.

To achieve these objectives, the CAP identifies the following:

- A summary of baseline GHG emissions and the potential growth of these emissions over time;
- The expected climate change effects on the City;
- GHG emissions reduction targets and goals to reduce the community's contribution to global warming; and
- Identification and evaluation of strategies and specific measures to comply with statewide GHG reduction targets and goals, along with measures to help the community adapt to climate change impacts.

AB 32, SB 32, and Executive Orders B-30-15 and S-3-05 use 1990 levels as a benchmark to identify statewide reduction targets. Because the City's 1990 emissions level were not estimated, proportional targets for the City's CAP were developed for 2010.

As part of CAP implementation, each strategy and measure should be continually assessed and monitored. Reporting on the status of implementation of these strategies, periodic updates to the GHG emissions inventory, and other monitoring activities will help to ensure that the CAP is making progress. See Chapter 5 for more information on administering, implementing, and monitoring the CAP.

1.4 Co-Benefits

While the measures included in the CAP are generally geared towards reducing GHG emissions, many will also result in environmental or economic "co-benefits." Environmental co-benefits include improvements to air quality, water supplies, and biological resources, public health outcomes, and beneficial outcomes for other resources. For example, a significant co-benefit of implementing CAP measures related to reductions in motor vehicle use and associated fuel combustion will result in fewer toxic air contaminants, leading to better air quality and improved health for everyone. Other strategies focus on improving energy and water-use efficiency in new and existing buildings, lowering overall housing and operation costs for residents and businesses.

Co-benefits are the complementary, positive side effects that result from strategies and measures identified in the CAP.

The benefits of the CAP include:

- **Local Control.** The CAP allows the City to maintain control over GHG reduction strategies that are most advantageous to the City, while promoting economic competitiveness and prepositioning to obtain funding for CAP implementation.
- **Energy and Resource Efficiency.** Increased energy efficiency reduces energy consumption and GHG emissions. Renewable energy technology reduces fossil fuel reliance by using alternative sustainable sources of energy to reduce GHG emissions.

Co-Benefits identified in the CAP:
- Improved Air Quality
- Improved Public Health
- Increased Non-Motorized Transportation
- Reduced Fossil Fuel Reliance
- Energy Efficiency/Reduced Energy Demand
- Increased Renewable Energy
- Water Conservation
- Increased Resiliency

- **Improved Public Health.** Several reduction measures encourage alternative commuting transportation modes that allow people to drive less, save money, and enjoy a better quality of life.
- **Demonstrating Consistency with State GHG Reduction Targets.** The CAP demonstrates that the City is aligned with the State targets for reducing GHG emissions.

More detailed discussion of reduction measures, along with their co-benefits, can be found in Chapter 3, Greenhouse Gas Emissions Reduction Strategies and Measures.

1.5 Community Action and Public Involvement

1.5.1 Community Action

Climate change is a global problem, but one that must also be addressed on a local level through partnerships and individual actions.

While global change is happening worldwide, local efforts to reduce human-induced GHG emissions and build resilience in the face of adverse climate change effects can make a difference. Local action on climate change cannot be addressed insularly by one agency or community, but requires active and ongoing partnerships between residents, businesses, the City, and other agencies and organizations in the region. By beginning to plan now and engage in more sustainable practices, communities will be better suited to adapt to climate change and be more resilient in the future.

At the regional and local scale, individuals and businesses can play an important role in combating climate change. By changing habits to consume less energy, producing less waste through recycling, conserving water, composting, and driving less by choosing to carpool, take transit, or walk and bike more frequently, individuals and businesses can work towards reducing their carbon footprint. The combination of these small efforts can lead to better outcomes for the environment and the City.

Effective and long-term climate action and resiliency in the City can only be achieved through efforts that continue to change the way individuals interact with the environment. The CAP serves as a resource and starting point to support long term sustainability efforts. The City is committed to implementing the actions in the CAP to advance equality and reduce disparities. Opportunities to participate and share the benefits of the City's actions will be inclusive for all City residents.

1.5.2 Summary of Public Involvement

The CAP was developed with input from the City's Climate Action Commission. The Climate Action Commission meets monthly to discuss the City's GHG emissions inventory, set emission reduction targets, explore reduction measures, and review periodic monitoring and evaluations. The Commission was formed by City Council action in November 2015 and held its first meeting in March 2016. The Commission has held monthly meetings since, for a total of 15 regular meetings. A Community Choice Aggregation (CCA) discussion has been a standing agenda item at every meeting.

Preceding the formation of the Climate Action Commission, the Clean & Green Team discussed climate action and reduction measures in open meetings from 2006-2016.

The City and the Climate Action Commission held two CAP Workshops in November 2016 and May 2017, engaging the community and presenting the CAP methodology, GHG reduction targets, and proposed reduction measures to assist the City in achieving the State GHG reduction targets. The Draft CAP was circulated for public review from May 19th to June 12th, 2017 . Public comments were received, reviewed, and discussed at the public workshop in May 2017 and the Climate Action Commission meeting in June 2017. The City will continue to engage the community during and after CAP adoption.

(Source: City of Solana Beach)

Chapter 2

Greenhouse Gas Emissions Inventory, Forecasts and Reduction Targets

2.1 Introduction

This chapter summarizes the community's contribution to global warming by offering a detailed accounting of greenhouse gas (GHG) emissions within the City of Solana Beach (City). It includes a discussion of the primary sources and annual levels of GHG emissions from 2010 (i.e., baseline inventory), describes likely trends if emissions are not reduced for 2020 and 2035 (i.e., forecasts), and sets a path forward to reduce emissions for 2020 and 2035 (i.e., targets). Emissions from community activities are discussed in Sections 2.2 through 2.4.

2.1.1 Why Prepare a Greenhouse Gas Emissions Inventory?

Recent changes in global weather patterns and temperatures are highly correlated with elevated GHG emissions resulting from human activities. Per the scientific community, to avoid "dangerous climate change" in the Earth's climate system, GHG emissions will need to be stabilized so that global temperatures do not increase more than 3.6 degrees Fahrenheit (°F) (2 degrees Celsius [°C]) above pre-industrial levels. To achieve this outcome, global carbon dioxide (CO_2) emissions must be stabilized at 450 parts per million (ppm).

One of the main objectives of this climate action plan (CAP) is to identify and reduce local contributions to global GHG emissions. This chapter is intended to serve as a foundation for the strategies and measures that will implement the commitment of the City to reducing GHG emissions. Measuring GHG emissions is a critical first step in developing the CAP for several reasons. First, the GHG inventory identifies major sources and quantities of GHG emissions associated with the activities and choices currently made by residents, businesses, and public institutions. Second, the inventory provides the baseline that is used to forecast emissions trends and to develop an accurate near-term reduction target and interim goals consistent with State objectives. Finally, the inventory sets the baseline for the City to develop, evaluate, and implement strategies and measures to achieve its near-term target and interim goals.

The inventory baseline is used to:
- forecast emissions;
- develop reduction targets; and
- develop, evaluate, and implement strategies to achieve the targets.

The GHG emissions inventory also plays a role in ensuring that the City stays on course to meet the GHG reduction targets. After the CAP is adopted, the City will prepare regularly updated GHG emissions inventories that will be compared to the baseline inventory and be used to track progress in reducing emissions as CAP measures are implemented.

The inventory establishes 2010 as the baseline year from which the City determines GHG reduction targets.

The emissions inventory is limited to gases that are generated by activities in the City from a defined set of sources (e.g., transportation, electricity use, waste) that can be readily monitored and reduced through City actions.

2.2 Inventory

The first step in the City's climate action planning process is to understand the sources and amounts of GHG emissions generated from activities within the City. A GHG emissions inventory is an estimate of a defined set of gases (e.g., CO_2, methane [CH_4], nitrous oxide [N_2O]) that contribute to climate change. The emissions inventory prepared for this CAP is limited to emissions that are generated due to activities within the City from a defined set of sources (e.g., transportation, electricity use, waste). These include emissions that can be readily estimated, monitored and reduced by City measures that support the efforts of residents and businesses, and are within local jurisdictional control.

AB 32, SB 32, and Executive Orders B-30-15 and S-3-05 use 1990 levels as a benchmark to identify statewide reduction targets. Because the City's 1990 emissions level was not estimated, proportional targets for the City's CAP were developed from the 2010 baseline that are consistent with direction in the 2008 Scoping Plan.

The City's 2010 inventory of GHG emissions is broken down into the following sectors, shown in decreasing order by level of contribution:

The City's 2010 GHG Emissions Inventory has Six Sectors:
1. Transportation
2. Electricity
3. Natural Gas
4. Solid Waste
5. Water
6. Wastewater

- **Transportation:** On-road transportation emissions associated with gasoline and diesel consumption from driving that occurred on roadways.
- **Electricity:** Building energy use emissions associated with electricity in residential and commercial buildings.
- **Natural Gas:** Building energy use emissions associated with combustion of natural gas in residential and commercial buildings.
- **Solid Waste:** Waste emissions associated with the disposal of organic waste in landfills and community-generated mixed waste generated by residents and businesses in the City.
- **Water:** Emissions associated with the water supplied, conveyed, distributed, and treated to residents and businesses within the City.
- **Wastewater:** Wastewater treatment emissions associated with both the energy consumed during treatment and fugitive emissions resulting from the treatment process for domestic sewage.

Further details on the methodology for the inventory can be found in Appendix A.

It should be noted that residents, businesses, and organizations make choices daily that produce GHG emissions that may be beyond the influence of the City and the CAP. This does not mean that individual residents or business in the City should feel limited to only those measures identified in this CAP, which are focused primarily on the City's inventoried emissions. Rather, members of the community can still make climate-friendly choices, such as buying locally-grown foods and locally-manufactured products that reduce electricity and energy use, to further reduce the local carbon footprint and further contribute to helping reverse global warming trends on a global scale.

Source: City of Solana Beach

2.2.1 City of Solana Beach 2010 GHG Emissions

An important aspect of GHG accounting is the unit of measurement used to inventory and estimate emissions. CO_2 is the largest contributor to global warming and the most recognized GHG; however, there are five other primary GHGs that must be addressed to meet State reduction targets, including: CH_4, N_2O, sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). To simplify discussion and comparison of these emissions collectively, climate action plans use a measurement known as carbon dioxide equivalent (CO_2e).

CO_2e measurement translates each GHG to an equivalent volume of CO_2 by weighting it by its relative global warming potential (GWP). For example, per the Intergovernmental Panel on Climate Change (IPCC), CH_4 and N_2O are 25 and 298 times more potent, respectively, than CO_2 in their ability to trap heat in the atmosphere (IPCC 2007). Converting these gases into "carbon dioxide equivalents (CO_2e)" allows consideration of all the gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to global warming. A metric ton of CO_2e ($MTCO_2e$) is the standard measurement of the amount of GHG emissions produced and released into the atmosphere.

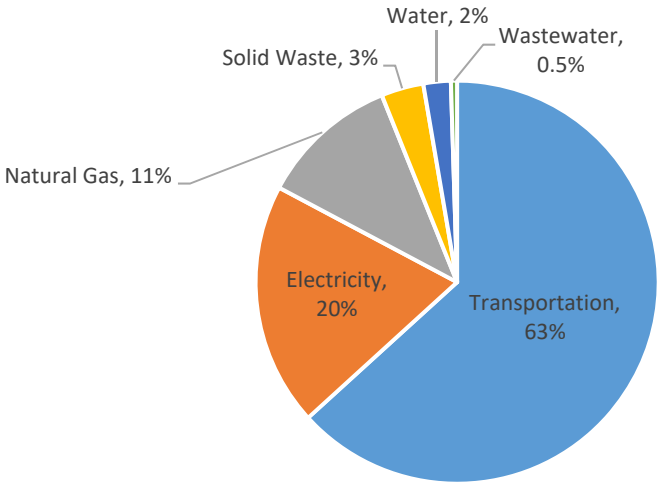
Breakdown of Emitting Sectors in 2010:
1. Transportation (63%)
2. Electricity (20%)
3. Natural Gas (11%)
4. Solid Waste (3%)
5. Water (2%)
6. Wastewater (0.5%)

Note: Values may not add to totals due to rounding.

In 2010, community activities in the City accounted for 139,216 $MTCO_2e$. A large proportion of emissions were due to on-road vehicle activity and building energy use. Emissions from gasoline and diesel consumption related to vehicles on local and regional roads accounted for 63 percent of the City's emissions in 2010, while electricity consumption accounted for 20 percent of the emissions.

The City's 2010 emissions are equal to the emissions of a car driving 334 million miles, or driving to the moon and back 699 times.

To put the City's emissions into perspective, 139,216 $MTCO_2e$ is equivalent to combusting 15.7 million gallons of gasoline, combusting 74,278 tons of coal, or a year's worth of carbon sequestration from 131,782 acres of U.S. forests. Assuming an average car gets about 25 miles to the gallon, the City's 2010 emissions is the same as a single car driving 334 million miles, or driving to the moon and back 699 times (U.S. Environmental Protection Agency 2016).



Source: EPIC 2016.

Figure 2-1: City of Solana Beach 2010 GHG Emissions

Additional details related to the specific emission sectors, data sources, assumptions, and methodology can be found in Appendix A. Figure 2-1 above and Table 2-1 below show the breakdown of the City's GHG emissions in 2010.

Table 2-1 2010 City of Solana Beach Greenhouse Gas Inventory

Emissions Sector	$MTCO_2e$	Percent (%)
Transportation	88,049	63
Electricity	27,182	20
Natural Gas	15,504	11
Solid Waste	4,736	3
Water	3,052	2
Wastewater	693	0.5
Total	139,216	100

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2016.

2.3 Forecasts

GHG emissions forecasts provide an estimate of future emission levels based on a continuation of current trends in activity, while also accounting for known regulatory actions by State or federal agencies (i.e., "legislative" actions) that could reduce emissions in the future. Forecasts provide insights into the scale of local reductions needed to achieve the GHG emissions reduction targets, in addition to legislative actions.

The BAU GHG emissions forecasts in the CAP assume a continued increase in population, housing units, employment and vehicle activity. Projections are based on SANDAG's Series 13 Regional Growth Forecast.

The first step in preparing GHG emissions forecasts is the preparation of a "business-as-usual" (BAU) forecast, which assumes that no additional efforts or legislative actions beyond what have already been adopted will be made to reduce GHG emissions in the future. The BAU forecast also assumes that population, housing, employment, and transportation activity will grow over time, consistent with City projections. Finally, the BAU forecast does not account for GHG emissions reductions associated with implementation of the CAP or legislative actions.

Details on how the forecasts were developed and the indicators used to estimate each sector can be found in Appendix B.

2.3.1 Demographic Trends

GHG emission forecasts were estimated for 2020 and 2035 using City-specific demographic and vehicle activity projections through 2035 from the San Diego Association of Governments (SANDAG) Series 13 Regional Growth Forecast. In general, the City is anticipated to experience modest growth by 2020 and 2035, as reflected in the emissions forecasts. Based on data used by the Energy Policy Initiatives Center (EPIC) to estimate projections, the City's population is expected to increase by 4 percent by 2020 and 6 percent by 2035 from 2010 levels. Total occupied housing units is expected to increase by 1 percent by 2020 and 6 percent by 2035 from 2010 levels. Furthermore, employment is expected to increase by 7 percent in 2020 and 12 percent by 2035 from 2010 levels. Further details on the underlying SANDAG data used for emissions forecasts can be found in Appendix A.

From 2010 levels, population in the City is expected to increase by:
- 4 % by 2020, and
- 6 % by 2035.

Legislative Reductions

The City's GHG forecasts account for a variety of legislative actions that will reduce future emissions in the City, without any additional local government action called for in this CAP. The applied legislative reductions include:

- Federal and State Vehicle Efficiency Standards;
- California Tire Pressure Program;
- California Renewables Portfolio Standards;
- California Utility Energy Efficiency Program;
- 2013 Building Energy Efficiency Standards; and
- Additional Achievable Energy Efficiency Savings from California Energy and Appliance Standards.

A detailed description and analysis of how specific legislative reductions are included in the City's BAU GHG emissions inventory and forecast can be found in Appendix A and B. Table 2-2 and Figure 2-2 below show the summary of the City's forecasted BAU GHG emissions.

Table 2-2 City of Solana Beach Emissions Forecasts ($MTCO_2e$/year)

Emissions Sector	2010	2020		2035	
		BAU Forecast	Legislative-Adjusted Forecast	BAU Forecast	Legislative-Adjusted Forecast
Transportation	88,049	82,849	76,750	90,927	77,176
Electricity	27,182	26,483	17,875	27,905	15,954
Natural Gas	15,504	13,444	13,120	14,217	12,895
Solid Waste	4,736	5,231	5,231	5,556	5,556
Water	3,052	3,244	3,244	3,446	3,446
Wastewater	693	617	617	656	656
Total	**139,216**	**131,868**	**116,837**	**142,707**	**115,683**
Percent change from 2010 (%)	-	-5%	-16%	3%	-17%

Notes: Columns may not add to totals due to rounding.
BAU = business as usual
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2017.

2.3.2 BAU GHG Emissions Forecasts with Legislative Reductions

The legislative actions listed above will help to lower GHG emissions in the City, as shown in Table 2-2. By 2020, total emissions will decrease by 16 percent below 2010 levels. The overall decrease in emissions is primarily due to State and federal policies in place in 2010. Furthermore, emissions will decrease by 17 percent in 2035 from 2010 levels.

Taking legislative reductions into account, emissions are projected to decrease in the BAU forecast in 2020 to meet the State goals. Legislative actions are expected to reduce the BAU forecast in 2035; however, reductions in emissions in 2035 are not, in and of themselves, enough to meet State goals.

2.4 Reduction Targets

This CAP focuses on reducing emissions by 15 percent below 2010 levels by 2020 and 50 percent below 2010 levels by 2035.

As directed in Assembly Bill (AB) 32, Senate Bill (SB) 32, and Executive Orders B-30-15 and S-3-05, the State aims to reduce annual statewide GHG emissions to:

The City's reduction targets are consistent with recommended community targets in ARB's Scoping Plan.

- 1990 levels by 2020;
- 40 percent below 1990 levels by 2030; and
- 80 percent below 1990 levels by 2050.

The California Air Resources Board (ARB) released *The 2017 Climate Change Scoping Plan Update* (proposed 2017 Scoping Plan Update) pursuant to AB 32 and SB 32. It indicated that reducing the State's emissions to 80 percent below 1990 levels by 2050 would be consistent with the IPCC's analysis. IPCC's analysis specified the global emissions trajectory needed to stabilize atmospheric concentrations at 450 ppm or less, to reduce the likelihood of catastrophic global climate change (ARB 2017).

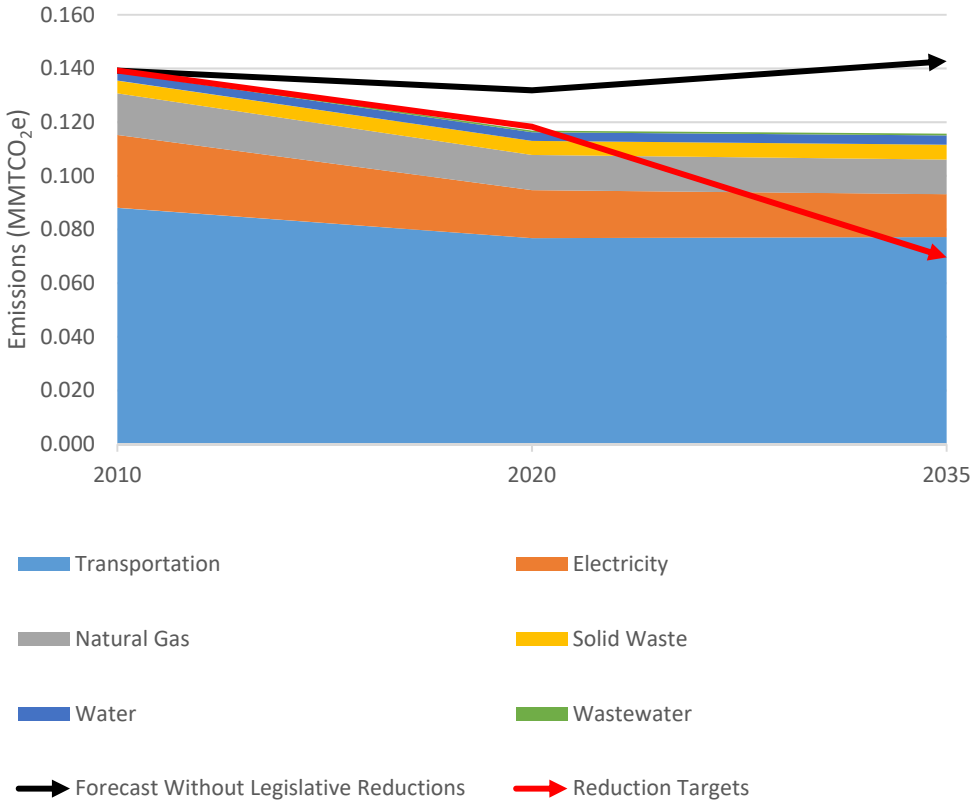
Pursuant to AB 32, ARB's 2008 Climate Change Scoping Plan recommended local governments to adopt a goal for local emissions reduction by 15 percent from current levels by 2020. In accordance with ARB's recommendation, the City's CAP includes a target to achieve a 15 percent reduction from 2010 baseline by 2020. In the 2014 update to the Climate Change Scoping Plan, ARB recommended local governments to chart a reduction trajectory that is consistent with, or exceeds, the Statewide goals to meet 80 percent below 1990 levels by 2050. The City set a 2035 target based upon the trajectory for meeting the State's 2050 reductions. Thus, consistent with State goals, the following reduction targets should be achieved in the City:

To meet reduction targets, the City will need to reduce emissions to:
- 118,334 $MTCO_2e$/year in 2020; and
- 69,608 $MTCO_2e$/year in 2035.

- 15 percent below 2010 levels by 2020, and
- 50 percent below 2010 levels by 2035.

Attaining a 15 percent reduction in GHG emissions will require that emissions be reduced to approximately 118,334 $MTCO_2e$/year in 2020, which is about 13,534 $MTCO_2e$/year lower than 2010 levels.

To achieve long-term GHG reductions, the City will need to reduce emissions to 69,608 $MTCO_2e$/year by 2035, or about 73,099 $MTCO_2e$ (50 percent) below 2010 GHG emissions levels. The City achieves the 2020 target through State and federal legislative measures; however, reductions in emissions in 2035 are not, in and of themselves, enough to meet the reduction target consistent with State goals. A detailed technical analysis of the City's emissions reduction target and goals can be found in Appendix B. Figure 2-2 below shows the GHG reduction targets alongside the breakdown of the City's emissions over time, discounting any actions and measures proposed in this CAP.



Note: $MMTCO_2e$ = million metric tons of carbon dioxide equivalent

Source: EPIC 2017.

Figure 2-2: City of Solana Beach Business-as-Usual GHG Emissions Forecasts and Targets

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Chapter 3

Greenhouse Gas Reduction Strategies and Measures

3.1 Introduction

This chapter outlines strategies and specific measures to be implemented by the City of Solana Beach (City) to achieve its greenhouse gas (GHG) reduction targets over the coming decades. The strategies and measures focus on locally-based actions to reduce GHG emissions in various sectors as a complement to legislative actions taken by the State and federal government.

The strategies mainly focus on community-scale strategies, but also include municipal operations strategies to address both public and private responsibility for climate change. Through partnerships with and among residents, businesses, and other organizations, these measures will provide net benefits for everyone, such as an improved environment, long-term cost savings, conserved resources, a strengthened economy, and greater quality of life, to contribute to a healthier planet.

Strategies are organized under four GHG emissions sector-based strategies. Measures identify specific locally-based actions to reduce GHG emissions.

In addition to defining new measures, the Climate Action Plan (CAP) accounts for existing plans, programs, and activities that the City has already undertaken to reduce GHG emissions. The CAP acknowledges these efforts and, in some cases, builds or expands on them.

Many of the strategies and measures to reduce GHG emissions will also have important co-benefits, which are discussed in this chapter. Climate change adaptation is an important co-benefit of many GHG reduction measures, and this is discussed in further detail in Chapter 4, Climate Adaptation.

Co-benefits are the additional, beneficial effects that will result from implementation of strategies and measures identified in the CAP.

3.2 Summary of Greenhouse Gas Reduction Strategies

As described in Chapter 2, the City has established a 2020 GHG emissions reduction target (15 percent below 2010 levels) and 2035 target (50 percent below 2010 levels) to reduce annual emissions levels, consistent with State goals. If community emissions in the City were to continue growing under business-as-usual (BAU) practices and activities, the City's GHG emissions will meet and exceed the 2020 reduction target by just over 10,000 metric tons of carbon dioxide equivalent ($MTCO_2e$), but would fall short of the 2035 target by 73,099 $MTCO_2e$. Detailed reduction measures are focused in 2035 because the 2020 targets are achieved by the City through State and federal measures. After legislative reductions and proposed reduction strategies and measures in this CAP, there is a gap of approximately 51 $MTCO_2e$ to reach the 2035 target. The City may present the purchase of carbon offsets as an option for the City Council to consider and decide on to close this gap.

Table 3-1 below shows the GHG reductions attributable to the measures included in this CAP. Table 3-2 shows how the anticipated reductions will help the City meet its GHG reduction targets. Detailed calculations and descriptions of the calculation methodologies are provided in Appendix B.

The City aims to reduce annual GHG emissions to:

- 15% below 2010 levels by 2020, and
- 50% below 2010 levels by 2035.

Table 3-1 GHG Reductions from Proposed Reduction Strategies and Measures ($MTCO_2e$)	
Strategy	2035
Legislative Reductions	27,021
Transportation	19,644
Renewable Energy and Buildings	21,213
Waste and Water	4,183
Carbon Sequestration (Urban Tree Planting Program)	986
Total Reductions	73,047

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2017.

Table 3-2 Effect of Plan Measures on City of Solana Beach Emissions and Target ($MTCO_2e$)	
Emissions	2035
BAU Emissions Forecast	142,707
Legislative Reductions	27,021
Legislative-Adjusted BAU Emissions Forecast (BAU Forecast – Legislative Reductions)	115,683
Baseline Emissions (2010)	139,216
City of Solana Beach GHG Reduction Target (Percent below 2010)	50%
Target Emissions	69,608
Reductions from CAP Measures	46,026
City of Solana Beach Emissions with CAP (Legislative-Adjusted BAU – CAP Reductions)	69,659
Additional GHG Reductions Needed to meet Target (Target Emissions – CAP Reductions)	51

Notes: Columns may not add to totals due to rounding.
BAU = Business-As-Usual
CAP = Climate Action Plan
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2017.

3.3 Strategies and Measures to Reduce Greenhouse Gases

To help close the gap between the City's future BAU emissions and State targets, the CAP proposes 30 GHG-reducing measures that are organized under four GHG emissions sector-based strategies.

There are 30 GHG-reducing measures, organized under four GHG emissions sector-based strategies.

The measures were developed based on a combination of factors, including:

- the feasibility of the measure to be implemented by the City;

- the need for greater reductions in the sectors with the most emissions;
- existing policies, actions, or programs that can be expanded or proposed policies yet to be adopted;
- feedback from community and other stakeholders; and
- technological innovations.

The discussion below describes each strategy, measure, and associated GHG emissions reductions. Additional detail and calculations can be found in Appendix B. Chapter 5 further describes how individual measures will be implemented.

3.3.1 Solana Beach General Plan

The Solana Beach General Plan represents the City's vision for its future. The General Plan also includes goals and policies that would serve to implement the City's vision. Implementation and maintenance of a CAP is a policy in the General Plan Land Use Element (Policy LU-3.11). The Land Use Element is intended to complement and maintain consistency with the San Diego Association of Governments (SANDAG) Regional Transportation Plan (RTP) and Sustainable Communities Strategy (SCS). Most of the redevelopment, infill, and new growth is expected to occur within the "downtown" or "town center" area of the City. These areas are intended to accommodate compact, mixed-use, and walkable areas that are connected to the regional transportation system.

3.3.2 Transportation

Transportation is a significant contributor to GHG emissions in the City, accounting for 63 percent of total emissions in 2010. Most of these emissions, as well as congestion on City streets, come from personal driving. Getting people out of their single occupancy vehicles and electrifying vehicles that are driven, will significantly reduce GHG emissions and congestion on City streets. Transportation-related emissions were estimated based on the origin-destination method, whereby trips that originate and end within the designated boundary are included in their entirety, while pass-through trips that do not have an end point in the City are excluded. Trips that either originate or end within City boundaries are divided by 2 to evenly allocate the miles to the outside jurisdiction. Additional details on transportation emissions quantification are provided in Appendix A.

Electric vehicles are an important part of the climate action strategy. Under the CAP, the City will work to ensure that existing and potential electric vehicle owners can find adequate charging infrastructure at public and workplace locations. The City will also add plug-in vehicles to its municipal fleet and encourage plug-in adoption for car-share organizations. In addition, the City will support public outreach to educate and motivate residents to drive electric vehicles (EVs) and property owners to install chargers and/or become EV-ready.

Co-Benefits
- Improved Air Quality
- Improved Public Health
- Increased Non-Motorized Transportation
- Reduced Fossil Fuel Reliance

Legislative reductions will reduce transportation emissions in 2035 by 10 percent, mainly due to improvements in State and federal vehicle fuel efficiency standards. These legislative reductions apply to the fuel efficiency of vehicle operations, while measures that affect the frequency or distance of vehicle travel are within local or regional control and can be addressed in a local CAP.

Measures under the transportation strategy will reduce transportation emissions by an additional 14 percent, resulting in an approximately 24 percent reduction in transportation emissions in 2035 when combined with legislative reductions. The transportation measures proposed under this strategy aim to further reduce emissions by reducing vehicle trips and vehicle fuel use. Emissions reductions from these measures rely on

successful coordination with, and participation from, local and regional transportation and planning agencies, residents, and businesses, and the City. Emissions reduction calculation details can be found in Appendix B.

The transportation strategy includes 11 measures. Table 3-3 summarizes the reductions anticipated from transportation measures. Each measure is described in further detail below.

Table 3-3 Summary of Transportation Measures

Measure Number	Measure Description	GHG Reductions ($MTCO_2e$)
		2035
T-1	Increase EVs and AFVs VMT to 30% of total VMT	17,495
T-2	Increase commuting by vanpools to 20% of labor force	608
T-3	Reduce average commuter trip distance by 1 mile	464
T-4	Increase commuting by mass transit to 10% of labor force	429
T-5	Increase preferred parking for EVs and AFVs to 20% of eligible parking spots	325
T-6	Retime four traffic signals	144
T-7	Promote telecommuting to achieve 10% participation	86
T-8	Convert municipal gasoline fueled vehicle fleet to EVs to achieve 50% gasoline reduction	56
T-9	Increase commuting by walking to 5% of labor force	16
T-10	Increase commuting by bicycling by achieving approximately 17 bike lane miles	11
T-11	Promote alternative work schedule to achieve participation from 1% of labor force	9
TOTAL		19,643

Notes: Columns may not add to totals due to rounding.
AFV = alternative fuel vehicle; EV = electric vehicle; GHG = greenhouse gas; VMT = vehicle miles traveled
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2017.

Measure T-1 Increase EVs and alternative fuel vehicles (AFVs) vehicle miles traveled (VMT) to 30 percent of total VMT

This measure will reduce emissions by replacing fossil fuel-driven vehicles with EVs and other AFVs that have lower GHG emissions. The CAP goal is to increase the percentage of VMT driven by EVs and other AFVs to 30 percent of total VMT by 2035.The City will encourage a shift to EVs and AFVs through the following actions:

- Support public and private sector provisions of alternative fueling stations in the City and adjacent cities.
- Require EV charging stations and EV charger-ready wiring in commercial/multi-family and residential structures (both new construction and substantial remodels) as follows: residential EV charger-ready wiring; commercial and multi-family EV charger-ready wiring at all garages; and EV chargers in quantities proportional to the total parking spaces available.
- Collaborate with SANDAG to increase EVs in the region.
- Provide incentives for the City's residents to increase use of EVs.
- Explore grant funding for electric vehicle chargers.

- Advocate for and facilitate the implementation of an EV car sharing fleet network to serve the City.
- Explore barriers for EV charging for garage-free homes, install charging infrastructure integrated into streetlights; support use of electric bikes.

Measure T-2 Increase commuting by vanpools to 20 percent of labor force

This measure will reduce VMT from single occupancy vehicles by promoting ridesharing. The City will increase vanpooling to 20 percent of its resident and employer labor force through the following actions:

- Collaborate with SANDAG to identify the longest commute distances and associated employers to add vanpooling.
- Collaborate with SANDAG on successfully implementing its North Coast Transportation Demand Management (TDM) plan (SANDAG 2013), and connect the City's employers and residents to travel-planning resources.
- Review Key Performance Indicators (KPIs) in SANDAG's TDM implementation plan (SANDAG 2012) at least once annually.
- Explore modifying the Solana Beach Municipal Code parking standard requirements to incentivize provision of parking stalls for carpool or vanpool vehicles as a credit toward parking requirements.
- Advocate for Interstate 5 high-occupancy vehicle lanes at least to and from City on-ramps and off-ramps.

Measure T-3 Reduce average commuter trip distance by one mile

This measure would reduce average trip distance from commuter trips by the labor force by one mile. The current average commute distance in the City is 15 miles, as reported by SANDAG. The City contains adequate sites designated for mixed-use and higher density residential units to accommodate its share of the regional housing need. These sites are generally located where mixed-use and compact infill development is encouraged, such as along the planned multi-modal boulevards and adjacent to existing commercial areas. Accommodating additional housing in these locations would serve to reduce commuter trip distances. The City will reduce average commuter trip distance of its labor force by one mile through the following actions:

- Improve land use and transportation planning to provide a well-connected transportation network. Higher-density and mixed-use neighborhoods with complete street design provide infrastructure for vehicles, bicycles, and pedestrians, allowing a shift from single-occupancy vehicles.
- Implement the General Plan Land Use Element, specifically Goal LU-3.0 and the following policies:
  - Policy LU-3.1 Concentrate commercial, mixed-use, and medium to high density residential development along transit corridors and near activity centers that can be served efficiently by public transit and alternative transportation modes.
  - Policy LU-3.2 Enable residents to reduce their commutes by allowing and encouraging the creation of live/work units for artists, craftspeople, and other professions, promoting home occupations and telecommuting, and supporting other means of achieving a jobs/housing balance.

Source: City of Solana Beach

- Policy LU-3.3 Identify and prioritize infrastructure improvements needed to support increased use of alternatives to private vehicle travel, including transit, bicycle, and pedestrian modes.

Measure T-4 Increase commuting by mass transit to 10 percent of labor force

This measure will reduce VMT by single occupancy vehicles by promoting use of public transportation. The City will achieve 10 percent mass transit ridership by its labor force through the following actions:

- Advocate for funding of bus enhancements (i.e., Express [limited stops]) or Bus Rapid Transit (BRT) on the 101 Coast Highway.
- Advocate to San Diego Metropolitan Transit System (MTS), North County Transit District (NCTD), and SANDAG to improve transit service and promote east-west shuttle on Lomas Santa Fe Drive. Support measures that prioritize mass transit over automobile projects.
- Collaborate with SANDAG on successfully implementing its North Coast TDM plan, and connect the City's employers and residents to travel-planning resources.
- Improve connectivity (by public transit, bicycle infrastructure, and pedestrian walkways) to the Solana Beach train station for access to commuter rail.
- Implement the General Plan's Circulation Element for a "Complete Streets" approach in designing streets, which considers every transportation mode and user for applicable arterial streets and incorporates multi-modal design and principles in all projects.

Measure T-5 Increase preferred parking for EVs and AFVs by converting 20 percent of eligible parking spots

Providing increased parking for EVs and AFVs will encourage the transition from conventional vehicles to low emission vehicles. The City will increase preferred parking for EVs and AFVs through the following actions:

- Identify eligible on-street parking spots and spots in City-owned lots for conversion to preferred parking for EVs and AFVs.
- Explore modifying the Solana Beach Municipal Code parking standard requirements to incentivize parking stalls for EVs and charging stations as a credit toward parking requirements.
- Install dedicated stalls for EV parking and charging stations at City facilities.
- Conduct outreach and education for the City's businesses and commercial property owners to encourage the conversion of private parking spaces to EV and AFV preferred parking.

Measure T-6 Retime four traffic signals

Retiming traffic signals would have traffic flow smoothing effects leading to reduced fuel use by on-road vehicles at affected intersections. The City will retime four traffic signals through the following action:

- Conduct a traffic study to identify candidate traffic lights along arterials that could be re-timed.
- Retime identified traffic signals to reduce delays and vehicle idling.

Measure T-7 Promote telecommuting to achieve 10 percent participation

Telecommuting can contribute to VMT reduction by allowing employees to work from home and avoid a daily commute. The CAP goal is to achieve participation from 10 percent of the eligible labor force to telecommute two days per week. The City will promote telecommuting and increase telecommuting participation to 10 percent through the following actions:

Source: City of Solana Beach

- Collaborate with SANDAG on successfully implementing its North Coast TDM plan (SANDAG 2013), and connect the City's employers and residents to travel-planning resources.
- Review KPIs in SANDAG's TDM implementation plan at least once annually.
- Work with local office-based businesses to encourage telecommuting. Telecommuting should not impede on normal business practices, and therefore, may not be suitable for businesses that require physical employee presence, such as retail storefronts and warehouses.
- Conduct educational outreach to residents and businesses to disseminate information about resources, such as SANDAG's iCommute program, to reduce commuter trips.

Measure T-8 Convert municipal gasoline fueled vehicle fleet to EVs to achieve a 50 percent reduction in gasoline consumption

The City maintains a vehicle fleet for municipal operations use. Converting the municipal gasoline-fueled vehicle fleet to EVs or AFVs will reduce gasoline use and reduce GHG emissions. The current fleet gasoline consumption is approximately 12,000 gallons. The CAP goal is to reduce gasoline consumption in the municipal fleet by 50 percent. The City will reduce its current gasoline consumption by 50 percent through the following action:

- Replace the City's municipal fleet with EVs and AFVs to achieve the 50 percent reduction in gasoline consumption from current levels. For the remaining vehicles, explore low-carbon fuels for City vehicles, including biodiesel, compressed natural gas, liquid natural gas, and propane.
- Adopt a clean vehicle purchasing policy for new fleet vehicles.

Measure T-9 Increase commuting by walking to five percent of labor force

This measure would reduce emissions by encouraging more commuters to walk to work. The City will increase the labor force commuting by walking to five percent through the following actions:

- Implement the General Plan's Circulation Element for a "Complete Streets" approach in designing streets, which considers every transportation mode and user for applicable arterial streets and incorporates multi-modal design and principles in all projects.
- Implement the General Plan's Circulation Element and develop and implement a Pedestrian Master Plan that would comprehensively review and plan for pedestrian improvements and identify mobility linkages to promote walkability and safety for pedestrians.

Measure T-10 Increase commuting by bicycling by increasing bike lanes to approximately 17 miles and providing bike parking

The City currently has 10 miles of bicycle lanes within its 3.5 square mile jurisdiction, translating to approximately 3 bike lane miles per square mile. The City is currently implementing a plan to increase this number to 13 lane miles by 2019, or approximately 4 bike lane miles per square mile. The CAP goal is to achieve an additional mile per square mile by 2035, or approximately 5 bike lane miles per square mile. This converts to approximately 17 bike lane miles by 2035. The City will implement this measure through the following actions:

Source: City of Solana Beach

- Implement the General Plan's Circulation Element and continue to update and implement the City's Bicycle Transportation Plan which identifies ideal bicycle routes to optimal destinations in the City, connects the regional bicycle path network, and prioritizes effective bicycle path routes for implementation.
- Adopt and implement the Comprehensive Active Transportation Strategy that provides the foundation for improved bicycle and pedestrian facilities within the City and connections to adjacent jurisdictions and greater regional networks over the next 15 years.
- Make existing bike lanes more user-friendly, including options such as:
  - Widening bike lanes;
  - Enhancing safety elements and markings; and
  - Identifying locations to install additional bicycle racks and repair stations.
- Increase the number of publicly available bike parking spaces in the City.

Measure T-11 Promote alternative work schedule to achieve participation from one percent of the labor force

An alternative work schedule serves to reduce VMT by avoiding commuter trips during rush hour traffic. The City will increase the labor force with a four-day-a-week work schedule to one percent through the following actions:

- Identify employers in the City that could be candidates for alternative work schedules.
- Collaborate with SANDAG to encourage alternative work schedules for the City's employers.
- Conduct surveys for City residents to identify opportunities for alternative work schedules for commuters that work outside the City.
- Collaborate with SANDAG on successfully implementing its North Coast TDM plan, and connect the City's employers and residents to travel-planning resources.
- Review KPIs in SANDAG's TDM implementation plan at least once annually.
- Conduct educational outreach to residents and businesses to disseminate information about resources, such as SANDAG's iCommute program, to reduce commuter trips.

3.3.3 Renewable Energy and Buildings

Like transportation, building energy is also a significant contributor to the City's GHG emissions. Emissions from electricity and natural gas sources accounted for 31 percent of the City's total emissions in 2010. Legislative reductions from State actions will reduce electricity and natural gas emissions by 9 percent in 2035.

Co-Benefits
- Energy Efficiency/Reduced Energy Demand
- Increased Renewable Energy
- Energy Efficiency Education

An overall goal of the CAP is to have 100 percent of the electricity used in the City to come from renewable sources that do not emit GHGs (i.e., wind, solar, geothermal, hydroelectric, and biomass energy) by 2035. The building energy measures included in the CAP aim to further reduce emissions by improving energy efficiency earlier than, or beyond State requirements, streamlining access to renewable energy, and increasing the supply of renewable energy for homes and businesses within the City. The success of these measures relies on coordination with local utility providers and organizations, participation from the community, and administration of new or revised local policies and programs.

The renewable energy and buildings strategy includes eight measures that are quantified. Emissions reduction calculation details can be found in Appendix B. Table 3-4 summarizes the reductions anticipated from renewable energy and building measures. Each measure is described in further detail below.

Table 3-4 Summary of Electricity and Natural Gas Measures

Measure Number	Measure Description	GHG Reductions ($MTCO_2e$)
		2035
E-1	Implement a Community Choice Aggregation program, subject to City Council approval	10,466
E-2	Achieve 10.8 MW residential rooftop solar photovoltaic systems	5,858
E-3	Achieve 2 MW commercial rooftop solar photovoltaic systems	1,085
E-4	Solar hot water heating at 20% of existing commercial spaces	2,811
E-5	Solar hot water heating at 25% of new homes and home retrofits	539
E-6	Reduction in non-space/water heating residential natural gas use by 15%	359
E-7	Residential energy efficiency retrofits to achieve 15% reduction	59
E-8	Commercial energy efficiency retrofits to achieve 15% reduction	37
TOTAL		21,214

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent; MW = megawatts
Source: EPIC 2017.

Measure E-1 Implement a Community Choice Aggregation program, subject to City Council approval, and provide 100 percent renewable energy by 2035

The CAP goal is to achieve 100 percent renewable electricity supply from this measure by 2035. The City can expand its supply of renewable energy through Community Choice Aggregation (CCA). CCA programs enable local governments to aggregate electricity demand within their jurisdictions to procure alternative energy supplies while maintaining the existing electricity provider for transmission and distribution services. Typically for these programs, residents are automatically enrolled but can opt-out at any time. A CCA program would aid in reducing GHG emissions in the City by reducing the emissions factor for electricity. It is the goal of this measure to supply 100 percent renewable electricity through a CCA program. It should be noted that there would still be a residual supply from the utility, which is assumed to achieve the mandated 50 percent renewable mix in 2030. The total supply is therefore approximately 96 percent renewable

electricity in 2035. This would be achieved through a combination of renewable electricity supply policies, utility renewable supply, a CCA, and/or distributed photovoltaic (PV) systems, as detailed in Appendix B. The City will increase renewable energy supply through a CCA and through the following actions:

- Continue with implementation of a CCA, based on City Council approval, to achieve the 100 percent renewable energy goal, based on the technical analysis conducted previously.
- Explore opportunities to collaborate with other cities in the region for a regional CCA for San Diego County.
- Explore opportunities to source renewable energy – whether via CCA or otherwise – from our region.
- Support statewide energy decarbonization, renewable energy, and similar initiatives and consider supporting the State call for federal carbon fee and dividend legislation, pending Council consideration and approval.

Measure E-2 Achieve 10.8 MW residential rooftop solar PV systems

Residential solar PV capacity was approximately 0.4 megawatts (MW) from approximately 18 interconnected systems in 2010. In the past few years, residential solar system installation has increased rapidly in the City, with more than 70 systems interconnected in 2015 alone and a total of 1.6 MW at the end of 2015. This measure assumes that this trend will continue, with 0.5 MW capacity added every year in the residential sector. The City will reach 10.8 MW, or approximately 2,000 single-family and multi-family homes, of residential rooftop solar PV systems through the following actions:

- Work with San Diego Gas & Electric (SDG&E), and through a CCA, and local non-profit organizations to reach 100 percent of households
- annually with targeted educational and marketing materials (e.g., website or e-blast).
- Provide expedited permitting incentives for installation of rooftop solar PV systems on residential buildings.
- Conduct educational outreach to residents about incentives available for installation of PV systems.
- Explore the development of a mandatory ordinance requiring “solar ready” or the installation of solar PV systems for major remodel/renovation projects, pending Council consideration and approval.

Measure E-3 Achieve 2 MW commercial rooftop solar photovoltaic systems

The commercial solar PV capacity in the City was less than 0.1 MW, with less than five systems interconnected in 2010. Ten new systems have been interconnected at commercial spaces since 2010 and new opportunities for commercial solar PV systems are available city-wide. Under this measure, the City will reach 2 MW of commercial rooftop solar PV systems through the following actions:

- Work with SDG&E, and through a CCA, to reach 100 percent of businesses and schools annually with targeted educational and marketing materials (e.g., website or e-blast).

Source: City of Solana Beach

- Provide expedited permitting incentives for installation of rooftop solar PV systems on commercial buildings.
- Conduct educational outreach to local businesses and schools about incentives available for installation of PV systems.
- Support the development of community solar projects that benefit all residents, including lower-income communities.
- Explore the development of a mandatory ordinance requiring "solar ready" or the installation of solar PV systems for new commercial development and major remodel/renovation projects, pending Council consideration and approval.
- Establish policies, programs and ordinances that promote the siting of new onsite PV generation and energy storage, pending Council consideration and approval.

Measure E-4 Solar hot water heating at 20 percent of existing commercial spaces

On average, 6 percent of commercial building energy use is for water heating. The CAP aims to retrofit 20 percent of existing commercial spaces in the City with solar hot water heaters (SHW). It was assumed that 60 percent of existing water heaters are fueled by natural gas, while the remaining 40 percent are fueled by electricity. The City will retrofit 20 percent of its existing commercial spaces with SHWs through the following actions:

- Work with SDG&E, or through a CCA, to reach 100 percent of businesses annually with targeted educational and marketing materials (e.g., website or e-blast).
- Promote the installation of SHWs by publicizing incentives, rebates, and financing options, such as Property Assessed Clean Energy (PACE) financing, California Solar Initiatives (CSI), or CSI-Thermal Program, for existing commercial buildings by posting on the City's website or e-blast.
- Explore the development of a mandatory ordinance requiring "solar ready" or the installation of SHWs for major remodel/renovation projects, pending Council consideration and approval.

Measure E-5 Solar hot water heating at 25 percent of new homes and home retrofits

The CAP goal is retrofit 25 percent of existing homes with SHWs and install SHWs in 25 percent of new homes in the City. The City will implement this measure through the following actions:

- Work with SDG&E to reach 100 percent of households annually with targeted educational and marketing materials (e.g., website or e-blast).
- Promote the installation of SHWs by publicizing incentives, rebates, and financing options, such as PACE financing, CSI, or CSI-Thermal Program, for existing residential buildings by posting on the City's website or e-blast.
- Explore the development of an ordinance requiring installation of SHWs for new homes and major remodel/renovation projects.

Measure E-6 Reduction in non-space/water heating residential natural gas use by 15 percent

In California, approximately 22 percent of household end-use natural gas consumption is from non-space and water heating natural gas use. Other natural gas use includes cooking appliances, clothes washers and dryers, dishwashers, and other small appliances. The CAP goal is to reduce 15 percent of the non-space/water heating natural gas use by 2035. The City will reduce non-space/water heating residential natural gas use through the following actions:

- Provide incentives to reduce 15 percent of non-space/water heating natural gas use, such as dryers, ovens, and cooktops, for new and existing residential buildings by 2035.
- Provide expedited permitting incentives for replacement of natural gas space and water heaters.
- Explore the development of an ordinance requiring non-natural gas appliances in new residential development.

Measure E-7 Residential energy efficiency retrofits to achieve 15 percent reduction

The City will achieve 15 percent in energy reduction from programs for single-family and multi-family homes through the following actions:

- Work with SDG&E, or through a CCA, to reach 100 percent of households annually with targeted educational and marketing materials (e.g., website or e-blast).
- Publicize incentives, rebates, and financing options, such as PACE financing, CSI, or CSI-Thermal Program, for existing residential buildings by posting on the City's website or e-blast.

Measure E-8 Commercial energy efficiency retrofits to achieve 15 percent reduction

The City will achieve 15 percent reduction in electricity and natural gas consumption from commercial spaces through the following actions:

- Work with SDG&E, or through a CCA, to reach 100 percent of businesses annually with targeted educational and marketing materials (e.g., website or e-blast).
- Publicize incentives, rebates, and financing options, such as PACE Financing, CSI, or CSI-Thermal Program, for existing commercial buildings by posting on the City's website or e-blast.
- Increase use of solar technology on municipal-owned buildings.
- Develop a Zero Net Energy policy for municipal-owned buildings.
- Prepare and adopt an energy efficiency and reduction plan for municipal facilities.
- Explore City government carbon accountability at the departmental level.

3.3.4 Waste and Water

Co-Benefits
- Water Conservation
- Increased Resiliency

The waste and water sectors accounted for 5 percent of the City's emissions in 2010. Legislative reductions outside of the City's jurisdiction will reduce solid waste emissions by 3 percent in 2035. The measures included in the CAP aim to further reduce emissions by reducing solid waste entering landfills, capturing landfill gas emissions, reducing methane emissions from wastewater treatment, and reducing City-wide water consumption. Solid waste emissions reductions depend on participation from landfills; expansion of City waste reduction, recycling, and composting programs; and participation from City residents and businesses to reduce waste and increase recycling.

Waste and water measures will reduce waste and water GHG emissions by 3% in 2035.

Although waste and water-related GHG emissions only accounted for 5 percent of the City's emissions in 2010, water conservation is needed to address serious periodic drought issues affecting the City and the State. As discussed further in Chapter 4, drought conditions could increase in frequency and severity because of climate change over the long term.

Water- and wastewater-related measures included in this CAP will reduce both the strain on water supplies and GHG emissions from pumping and treatment activities. Emission reduction calculation details can be found in Appendix B.

This strategy includes five measures. Table 3-5 summarizes the measures included in this strategy. Each measure is described in further detail below.

Table 3-5 Summary of Waste and Water Measures

Measure Number	Measure Description	GHG Reductions ($MTCO_2e$)
		2035
W-1	Divert 90% of waste from landfills and capture 85% of landfill gas emissions	3,389
W-2	Implementation of existing water rate and billing structure	407
W-3	Expand recycled water program expansion to reduce potable water consumption by 10%	292
W-4	Capture 100% of emissions from wastewater treatment	66
W-5	Water conservation	30
TOTAL		4,184

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2017.

Measure W-1 Divert 90 percent of waste from landfills and capture 85 percent of landfill gas emissions

The CAP goal is to achieve 90 percent waste diversion by 2035. In addition, the CAP goals also include achieving a landfill gas capture rate of 85 percent by 2035. Landfill gas is a mix of predominantly methane and carbon dioxide that can be captured and utilized onsite as a fuel to operate boiler systems and/or to generate electricity. Increasing gas capture reduces direct emissions and reduces energy consumption and associated emissions. The City will divert 90 percent of solid waste from entering landfills with an 85 percent gas capture rate at landfills through the following actions:

- Adopt a policy that requires all City-sponsored events (and City-funded non-profit events) to be zero waste (e.g., use recyclable and compostable materials and provide corresponding waste receptacles), and promote zero-waste events to community organizations and businesses.
- Adopt a policy that requires a minimum of 75 percent of construction and demolition waste be recycled or re-used.
- Develop an Organics Diversion Program to eliminate organic waste from landfills.
- Start and implement a pilot education program on organics recycling.
- Develop a food waste prevention plan for restaurants in the City and collaborate with other municipalities to develop a regional plan.
- Provide public education to promote textile recycling (e.g., mattresses, carpets, clothing, and other textiles).
- Advocate to the agencies that own and operate landfills serving the City to encourage increased methane capture at the landfills.
- Explore creation of regional compost facility with other municipalities.

- Expand opportunities for food production and neighborhood-scale distribution including community gardens, especially for low-income communities.
- Develop and implement a City Green Purchasing Plan and set targets to reduce carbon emissions associated with purchased goods and services.
- Explore and support development of local and regional biogas resources, including anaerobic digestion of food scraps.
- Develop and implement a Zero Waste Plan, pending Council consideration and approval.

Measure W-2 Implementation of existing water rate and billing structure

In October 2015, the board of directors of Santa Fe Irrigation District approved a rate proposal to raise the rates by an average of 9 percent annually over the following three years beginning in February 2016, thereby achieving a compounded increase of 30 percent in the three years from 2016 to 2018. Reduction in water use will reduce the energy associated with upstream water supply, water treatment and distribution. This measure does not have specific City actions but would aid in reducing GHG emissions from water consumption beyond the 2010 baseline.

Measure W-3 Expand recycled water program expansion to reduce potable water use by 10 percent

This measure aims to achieve a 10 percent reduction in potable water use by 2035, by specifically targeting commercial and multi-family common areas landscape irrigation water use. Replacing potable water with recycled water reduces the upstream, conveyance and treatment energy use associated with the potable water supply. The City will implement this measure through the following actions:

- Expand the current recycled water program and purple pipe infrastructure.

Measure W-4 Capture 100 percent of emissions from wastewater treatment

The goal of the CAP is to achieve a 100 percent methane capture rate from wastewater treatment by 2035 by collaborating with the wastewater treatment operators. The City will achieve a 100 percent methane capture from wastewater treatment through the following action:

- Advocate to the San Elijo Wastewater Treatment Plant for 100 percent methane capture.

Source: City of Solana Beach

Measure W-5 Water conservation

The City will reduce water use through the following actions:

- Implement PACE Programs in the City and continue to assess other efficiency financing tools for possible use in the community.
- Educate property owners about eligibility for PACE financing.
- Actively promote water efficiency rebate programs offered by San Diego County Water Authority and Metropolitan Water District.
- Maintain a water waste reporting public education and enforcement program to repair leaks and decrease over-irrigation.
- Promote programs/resources to help customers convert to more water-efficient landscaping.
- Encourage greywater use for landscaping.

- Provide incentives for installation of rainwater catchment systems on roofs to use rainwater generated.
- Work with the Santa Fe Irrigation District to track per capita water consumption in the City separately.
- Support water rate structures that provide incentives to conserve and reuse water, including greywater use.
- Explore amendments to City's outdoor landscaping ordinance that would require use of weather-based irrigation controls.

3.3.5 Carbon Sequestration (Urban Tree Planting)

Co-Benefits
- Improved Air Quality
- Improved Public Health
- Energy Efficiency/Reduced Energy Demand
- Increased Resiliency

Trees and vegetation can provide shade and cooling through transpiration and evaporation processes, which reduce the temperature of the environment around them. Well-shaded streets and parking areas can reduce the heat-island effect of higher air and structure temperatures in an urban setting. Trees and vegetation also reduce GHG emissions through sequestration by decreasing the concentration of carbon dioxide in the atmosphere. The City's goal is to achieve urban tree canopy coverage in 30 percent of developed areas by 2035, or 2,107 acres of land in the City. The most recent urban tree canopy assessment in San Diego region, based on high-resolution Light Detection and Ranging (LiDAR), shows that Solana Beach has 22 percent existing urban tree canopy. Emissions reduction calculation details can be found in Appendix B.

Measure U-1 Carbon Sequestration (Urban Tree Planting Program)

The City will achieve 30 percent of developed areas covered by urban tree canopy through the following action:

- Implement the Urban Tree Planting Program to achieve the City's goal to cover 2,107 acres of developed areas with urban tree canopy by 2035. The program would require new development to plant trees to achieve an equivalent canopy coverage. Furthermore, the City would plant trees at City-owned properties and public areas to achieve the same canopy coverage. Public areas would cover open space, streets, and parking lots.
- Educate and encourage residents and businesses to maintain and care for existing trees and plant new trees.
- Continue research and monitor developments of Blue Carbon for sequestration.

Source: City of Solana Beach

3.3.6 Summary

As described in Chapter 2, the City will meet and exceed the 2020 GHG emissions reduction target (15 percent below 2010 levels) by just over 10,000 $MTCO_2e$, but would fall short of the 2035 target (50 percent below 2010 levels) by 73,099 $MTCO_2e$. Proposed reduction strategies and measures will further reduce 2035 GHG emissions by 46,026 $MTCO_2e$. After legislative reductions and proposed reduction strategies and measures in this CAP, there is a gap of approximately 51 $MTCO_2e$ to reach the 2035 target. The BAU emissions, 2020 and 2035 GHG emissions reduction targets, GHG emission reductions from the proposed reduction measures, and the remaining emissions after reductions are depicted in Figure 3-1.

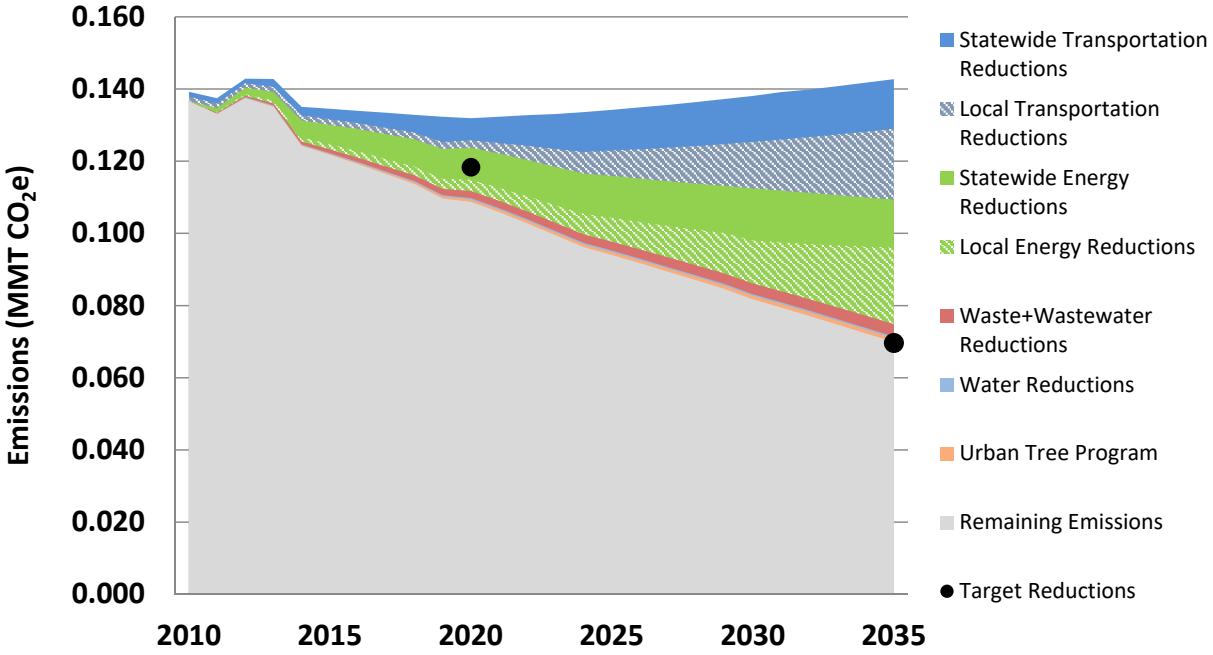


Figure 3-1: City of Solana Beach Greenhouse Gas Emissions Reductions

Chapter 4
Climate Adaptation

4.1 Introduction

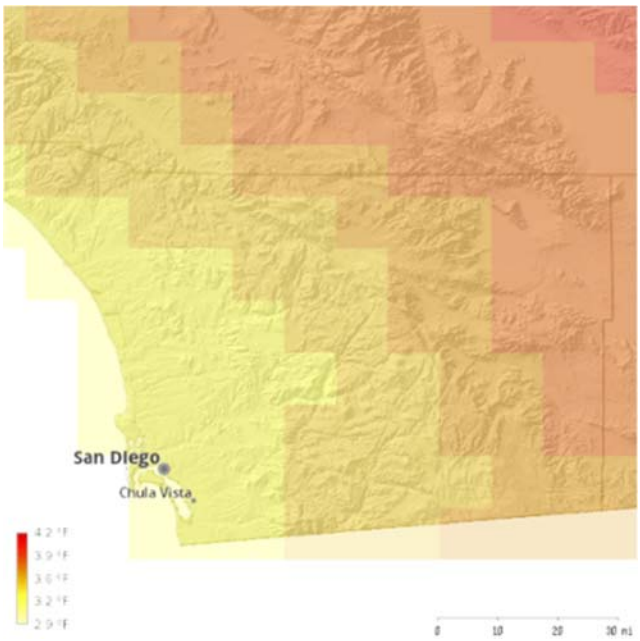
Climate change is a global phenomenon that over the long term has the potential for a wide variety of impacts on human health and safety, economic continuity, water supply, ecosystem function, and the provision of basic services (California Natural Resources Agency [CNRA] 2012:3). Locally, climate change is already affecting and will continue to affect the physical environment throughout California, the San Diego region, and the City of Solana Beach (City). Because impacts of climate change vary by location and other social and economic characteristics, it is important to identify the projected severity these impacts could have in the City. Climate adaptation strategies and measures for the City are included in Section 4.3 of this chapter.

4.2 Summary of Climate Change Effects

This section identifies localized climate change exposure and related effects and the consideration of how likely and how quickly impacts will occur.

4.2.1 Climate Change Effects

The first step is to identify what climate change effects the City will experience in the future. To begin assessing potential climate change impacts over time, Cal-Adapt, a climate change scenario planning tool was used for the San Diego region because specific projections for the City alone are not available. Cal-Adapt downscales global climate simulation model data to local and regional resolution under both high and low global GHG emissions scenarios. The high GHG emissions scenario predicts GHG emissions will continue to rise over the 21st century. The low GHG emissions scenario predicts GHG emissions will level off in the middle of the 21st century and decrease to lower than 1990 levels by the end of the century. Results from both GHG emissions scenarios effecting wildfire risks, change in precipitation and hydrology, non-coastal flooding, and increased erosion and ground instability are considered in this summary and distinguished where possible.



Source: CalAdapt 2016.

The direct, or primary, changes analyzed for the City include average temperature, annual precipitation, and sea-level rise. Secondary impacts, which can occur because of individual or a combination of these changes, are also assessed and include extreme heat and its frequency, wildfire risk, and changes in precipitation and hydrology (CNRA 2012:16-17).

Increased Temperatures

Annual temperatures in the San Diego region are projected to climb steadily. San Diego's historical average temperature, based on data from 1960-1990, is 64.0 degrees Fahrenheit (˚F). Under the low-emissions scenario, annual average temperature is projected to increase to 67.3 ˚F by 2090, an increase of 3.3 ˚F. The annual average temperature under the high-emissions scenario is projected to increase 5.8 ˚F to 69.8 ˚F by the end of the century.

The San Diego region's average annual low temperature, based on historical data from 1960-1990, is 53.1˚F. Under the low-emissions scenario, annual low temperature is projected to increase to 57.8 ˚F by 2090, an increase of approximately 4.7 ˚F. The annual average low temperature under the high-emissions scenario is projected to increase to 60.4 ˚F in 2090, an increase of approximately 7.3 ˚F. Historically, annual high temperatures average 73.4 ˚F. Annual average high temperatures are projected to increase under the low-emissions scenario by approximately 3.5 ˚F to 76.9 ˚F. Under the high-emissions scenario, annual average high temperature is projected to increase to 80.2 ˚F, an increase of approximately 6.8 ˚F.

Annual average temperatures are projected to increase between 3.3 ºF and 5.8 ºF by the end of the century.

Increased Frequency of Extreme Heat Events and Heat Waves

In the San Diego region, "extreme heat" is considered a high temperature of at least 89 ˚F (Cal-Adapt 2016). Historically, the San Diego region has experienced an average of 4 extreme heat days a year. Because of climate change, the number of extreme heat days is projected to increase substantially by 2099. The projected annual average number of extreme heat days is expected to increase approximately 19-55 days per year in 2050, and 19-99 days per year towards the end of the 21st century.

Heat waves have been historically infrequent in the San Diego region. However, with climate change, a significant rise in the frequency of heat waves is projected to occur.

Heat waves, which can be defined as 5 or more consecutive extreme heat days, have been historically infrequent in the San Diego region, with no more than 3 heat waves occurring in a year. However, with climate change, a significant rise in the frequency of heat waves is projected under both emissions scenarios. Under the low emissions scenario, projections show an increase of heat wave events with around 4 per year at the middle of the century and up to 8 per year in 2094. The high emissions scenario also shows an increase in annual heat wave events, with up to 6 heat wave events occurring annually by midcentury and as high as 19 heat wave events in 2098. Along with an increased frequency of heat events, heat waves are also projected to occur both earlier and later in the season, which historically started in late June and ended in mid-October.

Sea-Level Rise

Another outcome of global climate change is sea-level rise. The City encompasses approximately 3.5 square miles of land with 1.7 miles of coastline. The City is located between the San Elijo Lagoon to the north and the Del Mar Estuary/San Dieguito River to the south. Elevations in the City range from sea level to the west, to several hundred feet above sea level to the east.

Global sea-level rise will vary in severity across the globe due to the function of a variety of factors. For example, the melting of West Antarctic Ice Sheet may cause a change in the Earth's gravitational field and rotation which could result in higher sea-level rise along the coast of California as compared to global mean sea level. The science surrounding future projections of sea-level rise has advanced in recent years to account for previously underappreciated glaciological processes. As such, sea levels may rise by 6 feet or more from 2000 sea levels by the end of the century if emissions remain unabated (California Ocean Protection Council Science Advisory Team [OPC-SAT] 2017). Further, given the long-term nature of sea-level rise, the nascent science associated with sea-level rise projections, and the

Source: City of Solana Beach

uncertainty of future emissions levels, estimates of sea-level rise by 2050 and 2100 will continue to develop as the century unfolds (OPC-SAT 2017).

Based on the data and emissions projections scenarios used in OPC-SAT's April 2017 Rising Seas in California report, sea-level rise at La Jolla has a 1 percent and 0.4 percent chance of experiencing a 6-foot rise in sea level from 2000 levels by 2100 under a high-emissions scenario (i.e., IPCC's representative concentration pathway [RCP] 8.5) and low-emissions scenario (i.e., IPCC's RCP 2.6), respectively. Using the same modeling parameters, sea-level rise on the coast of La Jolla has a 50 percent chance of increasing by an average of 6.7 millimeters per year (mm/year) and 5.1 mm/year between 2030 and 2050 under RCP 8.5 and RCP 2.6, respectively (OPC-SAT 2017).

A total of 9,300 people are vulnerable to a 100-year flood along the San Diego coast (CEC 2009a). This magnitude of sea-level rise would impact Solana Beach by potentially increasing the frequency of days when the beaches are not accessible. This would have adverse impacts on tourism and recreational opportunities in the City.

The City has recognized the challenges that come with managing the actively eroding shoreline. Multiple factors, such as wave action, winter storms, sea-level rise, and the lack of sand replenishment contribute to an unstable geologic environment. Seacliff erosion poses a threat to the public recreational use of the beach and to the homes located at the top of the bluffs. Shoreline protective devices along the coast include seawalls, revetments, shotcrete walls/cave infills, notch and dripline infills, and mid- and upper-bluff retention systems. More than 50 percent of the City's coastline is protected by some type of bluff retention device (City Solana Beach 2013).

Changes to Water Availability

While projections generally show little change in total annual precipitation in California and trends are not consistent, even modest changes could have a significant effect on California ecosystems that are conditioned to historical precipitation levels (Cal-Adapt 2016).

The City has a Mediterranean climate with wet winters and dry summers. Historically, the El Niño/Southern Oscillation has been an important influence on weather conditions in Southern California. The City experiences higher than normal precipitation during El Niño winters and lower than normal precipitation during La Niña winters (CEC 2009b).

Source: City of Solana Beach

Climate change is expected to reduce water supplies in Southern California, as well as in the available imported water from the Colorado River, the State Water Project, and local surface and ground water due to a warmer climate, a decrease in overall precipitation, a decline in river flow due to reduced snowpack, and more frequent and severe periods of drought (Island Press 2013). These climate characteristics will present challenges for Southern California in terms of water supply. The State Water Project water supply is reliant on spring and early-summer snowmelt in the Sierra Nevada and the flow of the Colorado River is dependent on the melting of the Rocky Mountain snowpack. Future water supplies to Southern California are also expected to be affected by the CALFED program, which is trying to balance water supplies with environmental goals for the Sacramento-San Joaquin River Delta, as well as the amount and availability of freshwater associated with the Sierra snowpack. The Delta's deteriorating levee system may be subject to more frequent and severe winter rain storms as a result

of climate change. A failure of the levee system and sea water intrusion into the Delta due to rising sea level could result in significant reductions in water supply (CEC 2009b).

Thus, the City could face increasing challenges of providing adequate water supplies due to increased uncertainty in the amount and timing of water availability to meet future demand. If demand exceeds supply, water users could face shortages in normal or dry years.

Increased Wildfire Risk

Drought conditions are expected to increase the likelihood of large wildfires. Wildfires in the San Diego region occur throughout the year, primarily during late summer and early fall. In the past 10 years, the extent of wildfires has exceeded that during any past decade. In 2003 and 2007, wildfires burned nearly 740,000 acres. The cost of the 2007 wildfires in San Diego was estimated at nearly $2 billion for losses in residential and commercial properties. Increased incidence of wildfires also contributes to direct injuries and mortality and indirect health effects of air pollution (CEC 2009b).

4.3 Adaptation Strategies and Measures

This section defines the strategies and measures that the City will pursue to further its climate adaptation efforts. These strategies build upon current efforts to be more sustainable, adaptive, and progressive. The City's General Plan contains a number of policies aimed at maintaining balanced land use throughout the City's recreational and residential areas; promoting the protection, maintenance, and use of natural resources; preserving and rehabilitating neighborhoods and commercial areas; and achieving and sustaining a high quality of life for citizens and visitors. The strategies and measures within this section define the specific steps necessary to prepare for the future effects of a changing climate. Other City plans, programs, efforts, and policies support this vision and contribute to addressing climate change issues.

Adaptation measures are grouped into six strategies. These strategies address the climate change impacts identified above (i.e., temperature, wildfire, water, and sea-level rise). Within each strategy are a series of measures that define the programs, policies and regulations the City will implement to remain responsive to the challenges created by climate change. Consideration for how likely and how soon impacts are expected to occur are included, with specific attention given to those exposures that pose the most serious and near-term threats to the City. More detailed discussion on implementation and monitoring of the CAP can be found in Chapter 5. Strategies also have the potential to provide other important benefits including co-benefits to the community.

Below are the six strategies included in this section:

- Protect Public Health & Safety;
- Prepare for Increased Risk of Wildfire;
- Prepare for Variable Water Supplies;
- Prepare for Coastal Flooding;
- Prepare for Increased Electrical Demand; and
- Protect Coastal Habitat.

4.3.1 Protect Public Health & Safety

Temperature-related impacts because of climate change are likely to affect the City in several ways. Increased average temperatures, along with more frequent extreme heat events, are likely to exacerbate already high temperatures, in what are known in developed areas as urban heat islands. Developed areas,

which tend to have a prominence of asphalt and less vegetation, create, intensify, and retain heat. Anthropogenic warming will likely disproportionately affect coastal communities which have been historically moderate in terms of temperature range. According to a 2012 study, coastal heat waves will become more intense relative to the milder warming regulated by the ocean's proximity, especially during nighttime hours. These warming trends will pose challenges for Solana Beach where physiological acclimatization and air conditioning penetration are lower than the state average (Gershunov and Guirguis 2012).

Co-Benefits
- Improved Air Quality
- Improved Public Health
- Energy Efficiency/Reduced Energy Demand
- Increased Resiliency

Prolonged or intense exposure to high temperatures can lead to heat-related illnesses, such as heat exhaustion, heat cramps, and heat strokes. Changes in temperature also exacerbate the air quality by increasing ozone levels and particulate matter concentrations, which can cause respiratory symptoms such as asthma, shortness of breath, and respiratory harm. Sensitive populations, such as the young and elderly, are the most affected by these changes. Outdoor workers, such as construction and maintenance workers, are also more susceptible due to extended periods of exposure to extreme temperatures. Workers should be aware of heat-related illnesses and be provided training for education and prevention. The 2006 California heat wave resulted in 147 reported deaths, over 1200 hospitalizations, and over 16,000 emergency room visits (Knowlton et al. 2009).

Air pollution-related impacts, mainly particulate matter and ozone, are of concern to public health. Long-term exposure to particulate matter are associated with increased risk of mortality from cardiopulmonary causes. Fine particulate matter with a diameter smaller than 2.5 microns ($PM_{2.5}$) have been reported to cause chronic rispiratory problems, and possibly decreasing lung function. High ozone levels also cause adverse health effects, including exacerbating asthma and other respiratory diseases, cardiac effects, and mortality. Furthermore, meteorological changes have direct and indirect effects on infectious disease. Weather-related factors can effect incidence and spread of infectious diseases (The San Diego Foundation 2008).

Wildfires can cause mortality and morbidity through fire-related injuries. Wildfire smoke can worsen lung disease and other respiratory problems. Measures to protect public health and safety are listed below:

- Advocate nearby hospitals and emergency service providers to ensure sufficient resources are available to respond to extreme heat events;
- Educate residents on heat-related illness prevention;
- Increase public outreach and educational programs to inform the public of health & safety resources;
- Assist in facilitating access to cooling centers and pools for the public;
- Explore opportunities to reduce the urban heat island effect through cool roadway technology (e.g. light reflecting pavement), planting shade trees in parking lots, and creating additional green spaces;
- Promote design of buildings, public areas, and infrastructure to reduce reliance on mechanical cooling and energy use (e.g., cool roofs);
- Explore use of community alert/notification system for public updates regarding heat or air quality advisories; and
- Improve parking lot shading and landscaping in new construction and promote planting of additional trees and landscaping in existing parking lots.

4.3.2 Prepare for Increased Risk of Wildfire

Increased temperatures and reduced precipitation result in more frequent and widespread wildfires in the region that is already dealing with a water shortage. It is imperative that the City prepare for increased wildfire risk as a result of climate change. Wildfire smoke can irritate the eyes and respiratory system, and worsen chronic heart and lung diseases. Also, wildfires can cause potential loss of lives, damage property, and disrupt business activity. Measures to prepare the City for increased risk of wildfire are listed below:

Co-Benefits
- Improved Air Quality
- Improved Public Health
- Increased Resiliency

- Map and identify locations that are at fire risk;
- Maintain adequate fire emergency services and resources;
- Leverage the City's Community Emergency Response Team program to integrate emergency preparedness in case of wildfires;
- Encourage the use of fire-resistant building design, materials, and landscaping;
- Manage combustible vegetation and maintain defensible space; and
- Encourage removal of eucalyptus and other non-native vegetation from the wildland-urban interface.

4.3.3 Prepare for Variable Water Supplies

Climate change effects will result in variable water supplies in the City. Multi-year droughts threaten water supplies and limit imported water supply caused by reduced rainfall, decreased snowfall, and increased temperatures. Extreme weather events, not consistent with historical patterns, disrupt existing processes and storage (e.g., time and amounts) to both store and release water (e.g., snowpack, lakes, and reservoirs). To prepare for these conditions, the City will promote conservation and advocate for recycled water use. Measures to prepare for variable water supplies are listed below:

Co-Benefits
- Water Conservation
- Increased Resiliency

- Educate the public about water conservation;
- Promote conversion of turf grass to drought tolerant landscaping;
- Encourage residents to install greywater systems;
- Advocate for the development of local water supplies that would not be affected by climate change, such as advanced water purification;
- Pursue grant funding opportunities for water resource planning projects; and
- Implement a storm water catchment and water reserve system.

4.3.4 Prepare for Coastal Flooding

The combination of sea-level rise, higher tides and greater winter storms are likely to result in more frequent coastal flooding. Rising sea level will likely accelerate shoreline recession due to erosion. Measures to prepare for coastal flooding are listed below:

Co-Benefits
- Increased Resiliency

- As data and coastal science progress, conduct sea-level rise studies in addition to the study prepared as a part of the U.S. Army Corps of Engineers (USACE) Solano Beach & City of Encinitas Coastal Storm Damage Reduction Project to better understand the risks and cost/benefits of development within flooding hazard zones and potential long-term mitigation recommendations;
- Protect existing, and construct new buffers to protect the coastline from flooding;
- Implement and expand upon the short- and long-term sediment management programs identified in the Solano Beach & City of Encinitas Coastal Storm Damage Reduction Project to preserve shorelines through beach replenishment and nourishment to address impacts of sea-level rise on shorelines;
- Incorporate sea-level rise effects into capital improvement plans;
- Install “green infrastructure,” using vegetation and soils to restore natural processes required to manage stormwater, around buildings and other parcel areas;
- Expand upon living shoreline-related projects similar to the Southern California Reef Technology Project to create shoreline habitat, enhance recreation, and improve sand retention; and
- Encourage the use of native landscaping with deep roots that can provide a sponge-effect by absorbing urban runoff.
- Join with other coastal cities in the region to share information and collaborate on adaptation measures.

4.3.5 Prepare for Increased Electrical Demand

Extreme and prolonged high temperatures threaten local energy supply due to high demand for electricity use, which burdens the ability of the utility provider to meet increased demand. Surge in energy use in the City and the San Diego region may cause brownouts or blackouts. Measures to prepare for increased electrical demand are listed below:

Co-Benefits
- Energy Efficiency/Reduced Energy Demand
- Increased Renewable Energy
- Energy Efficiency Education
- Increased Resiliency

- Educate the public to become more energy efficient, reduce demand, and optimize time-of-use;
- Encourage improved building envelopes by adding insulation and placing trees to provide shade;
- Explore opportunities to reduce urban heat island effect through cool roadway technology (e.g. light reflecting pavement), planting shade trees in parking lots, and creating additional green spaces. Promote design of buildings, public areas, and infrastructure to reduce reliance on mechanical cooling and energy use (e.g., cool roofs);

- Encourage and incentivize solar-based or other renewable energy sources to supplement the grid and reduce peak demand; and
- Encourage renewable energy battery storage to mitigate for electricity supply and demand variability.

4.3.6 Protect Coastal Habitat

Increased temperatures, sea-level rise, and changes to precipitation patterns potentially impact San Diego's habitat and ecosystem. Increased storm water runoff can be detrimental by causing shoreline erosion impacting the surrounding habitat. Furthermore, increased nutrient and toxic runoff can cause algal blooms and closure of coastal recreation. Coastal habitats defend against storm surges, provide agriculture opportunities, and wetlands serve as a filter for pollutants. It is important to conserve and protect local wildlife and the environment. San Diego County is rich in biodiversity, including a variety of plants, animals, and other living things, and the County supports more biodiversity than any other county in North America. Protecting and maintaining biodiversity is important for balancing and allowing the ecosystem to thrive (SDSU 2004). Measures to protect coastal habitat are listed below:

- Encourage the use of native landscaping with deep roots that can provide a sponge-effect by absorbing urban runoff;
- Install "green infrastructure," that uses vegetation and soils to restore natural processes required to manage stormwater, around buildings and other parcel areas;

Co-Benefits
- Water Conservation
- Increased Resiliency

- Organize local beach cleanup events;
- Acquire and protect open space areas;
- Educate the public on benefits of using native and drought tolerant landscaping;
- Protect, preserve, and restore native habitats; and
- Encourage removal of eucalyptus and other non-native vegetation from the wildland-urban interface.

Chapter 5
Implementation and Monitoring

5.1 Introduction

This chapter outlines how the City of Solana Beach (City) will implement and monitor the Climate Action Plan (CAP) strategies and measures over time to reduce greenhouse gases (GHGs) and adapt to climate change. To achieve the GHG emissions reductions and adaptation strategies described in Chapters 3 and 4, measures should also be continuously assessed and monitored to ensure that: (1) the measures are effective; (2) the CAP is on track to achieve the GHG reduction targets; and (3) desired community outcomes are attained.

5.2 Implementation Strategy

Implementation of the recommended reduction measures will require ongoing management, oversight, and staffing. Ensuring that the measures translate to on-the-ground results and reductions in GHG emissions is critical to the success of the CAP. Success of the City's CAP and GHG emissions reduction measures will depend on the participation of the City's residents, businesses, and local government entities.

This chapter describes how City staff will implement CAP measures, and how the CAP will be updated over time to ensure continued effectiveness and relevance of the document.

The City will implement strategies and measures of the CAP through several types of programs and activities that can be grouped into the following categories:

- **New Ordinances.** Several of the measures in the CAP would be implemented through new regulations adopted by the City, such as the "solar ready" ordinance or installation of solar panels on new or significantly remodeled development projects. New ordinances will ensure that the City requirements are in place to achieve the objectives of the CAP.
- **Code Updates.** Like adopting new ordinances, certain measures in the CAP would be implemented through amended regulations as part of City's Municipal Code updates. The City, for example, may modify the Solana Beach Municipal Code parking standard requirements to incentivize parking stalls for carpool or vanpool vehicles as a credit toward parking requirements.
- **Financing and Incentives.** Identifying mechanisms for funding and allocating resources will help ensure that the CAP is successfully implemented.
- **Partnerships.** Inter-agency coordination and partnerships with other organizations is critical to ensuring implementation of certain measures (e.g., collaborate with the San Diego Association of Governments [SANDAG] on successfully implementing its North Coast Transportation Demand Management plan) and with other governments, universities, and non-profits in the region.
- **Education and Outreach**. Education efforts about the objectives of the CAP will help create support for the CAP and involve the community in its implementation.

Source: City of Solana Beach

The City will develop more detailed implementation schedules for each measure, based on staff requirements and funding opportunities available for implementing the measures outlined in the CAP. Key staff in each department will facilitate and oversee action implementation. Priority will be given to measures based on cost-effectiveness, GHG reduction potential, available funding, and the ease and length of time for implementation. These details will be developed further through an Implementation Plan for the CAP.

5.2.1 Measure Implementation

A separate Implementation Plan will be prepared after CAP adoption to identify relevant parties, ordinances needed, key actions, funding sources, timeline, and costs for implementation of each GHG reduction measure. To provide preliminary implementation information, the recommended reduction measures were evaluated qualitatively to assess the level of effort required for implementation. Measures can be categorized based on the convention of low, medium, or high, with low-level measures requiring the least level of effort by the City and being the most likely to be pursued initially. Prioritization of the recommended measures was based on the following factors:

- GHG reduction efficiency;
- Cost-effectiveness;
- Level of City control/effort;
- Ease of implementation;
- Time required to implement; and
- Community input.

Criteria are shown in Table 5-1 below.

Table 5-1 Measures Implementation Criteria

Implementation Effort Level	Sample Criteria
Low	• Requires limited staff resources. • Existing programs in place to support implementation. • External and internal coordination is limited. • Revisions to policy or code are limited.
Medium	• Requires staff resources beyond typical daily level. • External and internal coordination is required. • Policy or code revisions necessary.
High	• Requires extensive staff resources. • Development of new policies, programs, or codes, or revision to the General Plan. • Robust outreach program required to residents and businesses. • Requires regional cooperation and securing long-term funding.

The City will incur costs to implement some of the measures outlined in the CAP. These include initial start-up, ongoing administration, and enforcement costs. While some measures will only require funding from public entities, others would result in increased costs for businesses, new construction, and residents. However, most measures provide substantial cost-savings in the long term. The City will be diligent in seeking cost-effective implementation, strategic funding opportunities and using partnerships to share the cost. All measures with potentially significant costs will be brought to City Council for consideration and approval.

Success of the CAP will require capital improvements, investments, and increased operations and maintenance costs. The summary of funding and financing options are summarized in Table 5-2 below. Funding options are included from a variety of sources including the City, regional agencies such as SANDAG, or San Diego Gas & Electric (SDG&E). The City should monitor private and public funding sources for new grant and rebate opportunities. Leveraging funding opportunities would facilitate successful implementation of the GHG reduction measures.

Table 5-2 Potential Funding Sources to Support GHG Reduction Measures

Funding Source	Description
City	
California Department of Resources Recycling and Recovery (CalRecycle)	• CalRecycle grant programs allow jurisdictions to assist public and private entities in management of waste streams. • Incorporated cities and counties in California are eligible for funds. Program funds are intended to: • Reduce, reuse, and recycle all waste. • Encourage development of recycled-content products and markets. • Protect public health and safety and foster environmental sustainability.
California Air Resources Board (ARB)	• ARB offers several grants, incentives, and credit programs to reduce on-road and off-road transportation emissions. Residents, businesses, and fleet operators can receive funds or incentives depending on the program. The following programs can be utilized to fund local measures: • Air Quality Improvement Program (Assembly Bill 118) • Loan Incentives Program • California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project

Transportation-Related Federal and State Funding	• For funding measures related to transit, bicycle, or pedestrian improvements, the following funding sources from SANDAG may be utilized:
	  • Smart Growth Incentive Program
	  • Active Transportation Grant Program
	  • Job Access and Reverse Commute and New Freedom Programs

New Development Impact Fees	• These types of fees may have some potential to provide funding for proposed programs and projects, but such fees are best implemented when the real estate market and overall regional economic conditions are strong.
General Obligation Bond	• A general obligation bond is a form of long-term borrowing and could be utilized to fund municipal improvements.
Other Funding Mechanisms for Implementation	• Grants may be available from the Strategic Growth Council (SGC) or the State Department of Conservation (DOC) to fund sustainable community planning, natural resource conservation, and development, and adoption.
Community	
San Diego Gas & Electric (SDG&E)	• SDG&E is one of the utilities participating in the Go Solar initiative. • A variety of rebates are available for existing and new homes. • Photovoltaics, thermal technologies, and solar hot water projects are eligible. • Single-family homes, commercial development, and affordable housing are eligible.
Property-Assessed Clean Energy (PACE)	• The PACE finance program is intended to finance energy and water improvements within a home or business through a land-secured loan, and funds are repaid through property assessments.

Table 5-2 Potential Funding Sources to Support GHG Reduction Measures

Funding Source	Description
	• Municipalities are authorized to designate areas where property owners can enter into contractual assessments to receive long-term, low-interest loans for energy and water efficiency improvements, and renewable energy installation on their property. • Financing is repaid through property tax bills. • SANDAG has implemented the Home Energy Renovation Opportunity (HERO; a PACE program) in the County to assist residents in financing residential energy efficiency and solar retrofits.
Energy Upgrade California	• Program is intended for home energy upgrades. • Funded by the American Recovery and Reinvestment Act, California utility ratepayers, and private contributions. • Utilities administer the program, offering homeowners the choice of one of two upgrade packages—basic or advanced. • Homeowners are connected to home energy professionals. • Rebates, incentives, and financing are available. • Homeowners can receive up to $4,000 back on an upgrade through the local utility.
Federal Tax Credits for Energy Efficiency	• Tax credits for energy efficiency can be promoted to residents.
Energy Efficient Mortgages (EEM)	• An EEM is a mortgage that credits a home's energy efficiency in the mortgage itself. • Residents can finance energy saving measures as part of a single mortgage. • To verify a home's energy efficiency, an EEM typically requires a home energy rating of the house by a home energy rater before financing is approved. • EEMs typically are used to purchase a new home that is already energy efficient, such as an ENERGY STAR® qualified home.
Private Funding	• Private equity can be used to finance energy improvements, with returns realized as future cost savings. • Rent increases can fund retrofits in commercial buildings. • Net energy cost savings can fund retrofits in households. • Power Purchase Agreements (PPA) involve a private company that purchases, installs, and maintains a renewable energy technology through a contract that typically lasts 15 years. After 15 years, the company would uninstall the technology or sign a new contract. • On-Bill Financing (OBF) can be promoted to businesses for energy-efficiency retrofits. Funding from OBF is a no-interest loan that is paid back through the monthly utility bill. Lighting, refrigeration, heating, ventilation, and air conditioning, and light-emitting diode streetlights are all eligible projects.
Community Choice Aggregation (CCA) Revenue	• Revenue generated by a local CCA program may be used to fund or incentivize GHG reduction measures.

5.3 Monitoring and Updates

The CAP lays out a broad-based strategy to reduce GHG emissions and improve the sustainability and resilience of the community. However, the CAP will need to be updated and maintained if it is to remain relevant and effective. Thus, City staff will need to evaluate and monitor plan performance over time and make recommendations to alter or amend the plan if it is not achieving the proposed reduction targets. This will include conducting periodic GHG emissions inventory updates and analyzing measure performance.

Upon adoption, the CAP's measures and actions will begin to be implemented by the City. It is anticipated that the City will spend two years after the CAP's adoption for initial start-up and to initiate data tracking. City Staff will prepare an initial presentation to the City Council in 2018, and staff will present to the City Council every year beginning in 2019 to summarize the inventory and achievements to date. To track progress, City staff will coordinate updates to the inventory every two years beginning with the 2016 inventory year, consistent with SANDAG's Regional Framework schedule. This will help ensure progress is being made towards achieving emissions reduction targets.

The City will:

- Prepare an initial presentation to the City Council in 2018.
- Prepare a presentation to the Climate Action Commission and City Council every year starting in 2019;
- Coordinate inventory updates every 2 years, starting with a 2016 inventory;
- Evaluate and summarize measures in a report to City Council every 2 years starting in 2019; and
- Prepare a CAP update every 5 years starting in 2022.

In addition to updating the City's emissions inventory, City staff will also evaluate the GHG emissions reduction measures' capacity, cost, effectiveness, and benefits of each individual measure. Evaluating CAP measure performance entails monitoring the level of community participation, costs, and barriers to implementation, as well as actual reductions in fuel consumption, vehicle miles traveled, energy usage, water usage, landfilled waste, or other activities that result in GHG emissions reductions. By evaluating whether the implementation of a measure is on track to achieve its reduction potential, the City can identify successful measures and reevaluate or replace under-performing ones.

CAP Monitoring Schedule

2017	**CAP Adopted** City Council adopts plan and staff begins to implement CAP measures.
2017-2019	**Initial Set-up** Staff performs initial start-up tasks and implementation of data tracking.
2018	**Inventory Update** City staff conducts update to inventory every two years starting with the 2016 inventory year.
2018	**Initial Presentation to City Council** City Staff prepares initial presentation to City Council.
2019	**Presentation to City Council** City Staff prepares presentation to the Climate Action Commission and City Council annually starting in 2020. The presentation summarizes the inventory and achievements to date and provides a status of implementation.
2019/2021 2022	**Measure Status Review / CAP Report / CAP Update** City staff, in coordination with the City Council, conducts updates to inventory, reviews measure performance, provides an initial review of the status of implementation, summarizes achievements to date, and makes recommended changes to the CAP if measures prove infeasible, and prepares report to City Council. The report will identify ways to adapt the plan to maintain the desired reduction path. City staff prepares a CAP update based on the recommendations and findings in the report. The report is conducted every two years starting in 2019 while the CAP update is conducted every five years.

Figure 5-1. CAP Monitoring Schedule

City staff, in coordination with the City Council, will evaluate measures every two years beginning in 2019 and will summarize progress toward meeting the GHG reduction target at that time in a report to the City Council that describes:

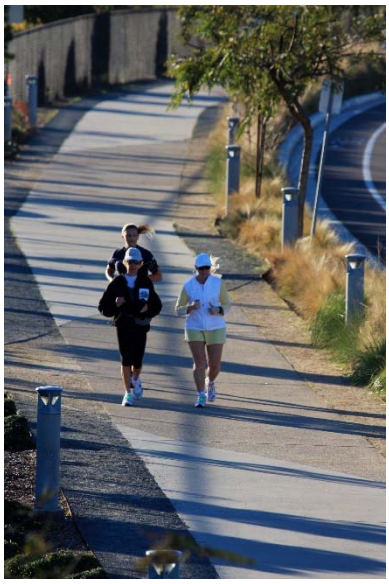
- estimated annual GHG reductions;
- participation rates (where applicable);
- implementation costs and funding needs;
- community benefits realized;
- remaining barriers to implementation; and
- recommendations for changes to the CAP.

Additionally, the City will prepare a CAP update every five years beginning in 2022, following the second CAP report after adoption. The CAP will be updated based on the recommended changes and findings in the CAP report.

5.4 Ongoing Community Engagement and Participation

As the City continues to implement and monitor progress on the CAP, continued engagement with, and participation by the community is critical. This includes individual residents and businesses, community organizations, developers, property owners, other local and regional government agencies, and others. While this CAP focuses on measures in which the City has a role, many of the measures require partnership and collaboration.

The City is also committed to public education about the important role individuals play in combating climate change. Effective and long term climate action and resiliency in the City can only be achieved through efforts that continue to change the way individuals interact with the environment. Many of the measures in Chapters 3 and 4 are focused on increasing community awareness and participation in existing programs, or connecting the community with new information, tools, funding or resources to take action. Thus, this CAP serves as a resource that supports community-based action.



Source: City of Solana Beach

Chapter 6
References

Executive Summary

None present.

Chapter 1, Introduction

Intergovernmental Panel on Climate Change. 2007. Frequently Asked Questions: What is the Greenhouse Effect. Available: http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-faqs.pdf. Accessed April 12, 2017.

_____. 2014 (November). *Climate Change 2014 Synthesis Report: Approved Summary for Policymakers.* Available: http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf. Accessed April 12, 2017.

IPCC. *See* Intergovernmental Panel on Climate Change.

Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

Chapter 2, Greenhouse Gas Emissions Inventory, Forecasts, and Reduction Targets

ARB. *See* California Air Resources Board.

California Air Resources Board. 2017 (January). *The 2017 Climate Change Scoping Plan Update*. Available: https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf. Accessed April 12, 2017.

EPA. *See* U.S. Environmental Protection Agency.

Intergovernmental Panel on Climate Change. 2007 (February). *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the IPCC. Geneva, Switzerland

IPCC. *See* Intergovernmental Panel on Climate Change.

U.S. Environmental Protection Agency. 2016 (May). Greenhouse Gas Equivalencies Calculator. Available: https://www.epa.gov/ energy/greenhouse-gas-equivalencies-calculator. Accessed April 12, 2017. Last Updated: May 2016.

Chapter 3, Greenhouse Gas Reduction Strategies and Measures

SANDAG. *See* San Diego Association of Governments.

San Diego Association of Governments. 2012 (May). *Integrating Transportation Demand Management into the Planning and Development Process: A Reference for Cities.* Available: http://www.icommutesd.com/documents/TDMStudy_May2012_webversion_000.pdf. Accessed April 19, 2017.

_____. 2013 (September). *North Coast Corridor Transportation Demand Management Implementation Plan.* Available: http://www.sandag.org/uploads/projectid/projectid_19_16644.pdf. Accessed April 19, 2017.

Chapter 4, Climate Adaptation

Cal-Adapt. 2016. Cal-Adapt Local Climate Snapshots for City of Solana Beach. Prepared under contract by Scripps institute of Oceanography. Available: http://cal-adapt.org/tools/factsheet/. Accessed March 28, 2017.

California Energy Commission. 2009a (August). *Impacts of Sea-Level Rise on the California Coast.* Available: http://www.energy.ca.gov/2009publications/CEC-500-2009-024/CEC-500-2009-024-F.PDF. Accessed: March 28, 2017.

_____. 2009b (August). *Climate Change-Related Impacts in the San Diego Region by 2050.* Available: http://www.energy.ca.gov/2009publications/CEC-500-2009-027/CEC-500-2009-027-F.PDF. Accessed: March 28, 2017.

_____. 2012 (July). The Impacts of Sea-Level Rise on the San Francisco Bay. Available: http://www.energy.ca.gov/ 2012publications/CEC-500-2012-014/CEC-500-2012-014.pdf. Accessed April 18, 2017.

California Natural Resources Agency. 2012 (July). *California Adaptation Planning Guide: Planning for Adaptive Communities.* Available: http://resources.ca.gov/ docs/climate/01APG_Planning_for_Adaptive_Communities.pdf. Accessed March 28, 2017.

_____. 2014 (July). *Safeguarding California: Reducing Climate Risk. An update to the 2009 California Climate Adaptation Strategy.* Available: http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf. Accessed March 28, 2017.

CEC. *See* California Energy Commission.

Census. *See* U.S. Census Bureau.

City. *See* City of Solana Beach.

City of Solana Beach. 2013 (February). *City of Solana Beach Local Coastal Plan.* Amended February 27, 2013.

CNRA. *See* California Natural Resources Agency.

County of San Diego. 2010 (August). *Multi-Jurisdictional Hazard Mitigation Plan.* Available: http://www.sandiegocounty.gov/content/dam/sdc/oes/docs/2010-HazMit-Final-August-2010.pdf. Accessed April 4, 2017.

IPCC. *See* Intergovernmental Panel on Climate Change.

Intergovernmental Panel on Climate Change. 2001. Climate Change 2001 Synthesis Report: Summary for Policymakers. Available: https://www.ipcc.ch/ipccreports/tar/vol4/english/ index.htm /. Accessed March 29, 2017.

The San Diego Foundation. 2008. *Chapter 7: Public Health in The San Diego Foundation Regional Focus 2050 Study: Working Papers for the 2008 Climate Change Impacts Assessment, Second Biennial*

Science Report to the California Climate Action Team. San Diego, California. Available: http://www.delmar.ca.us/DocumentCenter/View/1891. Accessed May 15, 2017.

San Diego State University Foundation. 2004. *Overview of San Diego's Biodiversity.* Available: https://interwork.sdsu.edu/fire/resources/overview_bioderversity.htm. Accessed May 15, 2017.

SDSU. *See* San Diego State University Foundation.

Chapter 5, Implementation and Monitoring

None present.

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Appendix A

GHG Inventory & Forecast Report

City of Solana Beach Greenhouse Gas Emissions Inventory and Forecast

April 2016

Prepared for the City of Solana Beach

Prepared by the Energy Policy Initiatives Center

ENERGY POLICY INITIATIVES CENTER
UNIVERSITY OF SAN DIEGO SCHOOL OF LAW

About EPIC

The Energy Policy Initiatives Center (EPIC) is a nonprofit academic and research center of the USD School of Law that studies energy policy issues affecting the San Diego region and California. EPIC integrates research and analysis, law school study, and public education, and serves as a source of legal and policy expertise and information in the development of sustainable solutions that meet our future energy needs.

For more information, please visit the EPIC website at www.sandiego.edu/epic.

TABLE OF CONTENT

TABLES AND FIGURES

1 INTRODUCTION

This report provides a summary of community-scale greenhouse gas (GHG) emissions from 2010 to 2013 and business-as-usual (BAU) GHG emissions projection for 2020 and 2035 for the City of Solana Beach. This document also describes the methodology used to calculate the 2010 to 2013 GHG emissions by category and BAU GHG emissions from the City of Solana Beach.

Section 2 provides background sources and common assumptions used to estimate GHG emissions. Section 3 provides the results of GHG emissions from the City of Solana Beach from 2010 to 2013. More details on method used in each category, input data, and emission factors are provided in Section 4. The methods used for BAU emission projections are provided in Section 5. Section 6 provided a discussion of the major methodological differences with the previous 2005 inventory.

2 BACKGROUND

2.1 Greenhouse Gases

The primary greenhouse gases (GHGs) included in this inventory are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Each GHG has a different capability of trapping heat in the atmosphere, known as its global warming potential (GWP), which is normalized relative to CO_2 and expressed in carbon dioxide equivalents (CO_2e). In general, the 100-year GWPs reported by the Intergovernmental Panel on Climate Change (IPCC) are used to estimate greenhouse gas emissions. The GWPs used in this inventory are from IPCC Forth Assessment Report (AR4)[1], given in Table 1.

Table 1 Global Warming Potentials Used in the Solana Beach Inventory

Greenhouse Gas	Global Warming Potential (GWP)
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298

IPCC, 2007

2.2 Categories of Emissions

The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions published by ICLEI USA (referred to as the ICLEI Community Protocol) recommends including emissions from six categories for a typical community-scale GHG inventory.[2] These categories are: electricity, natural gas, transportation, solid waste, water, and wastewater. GHG emissions are calculated by multiplying activity data (e.g., kilowatt-hours of electricity, tons of solid waste) by an emissions factor. For these categories, methods used in this inventory were based on the ICLEI Community Protocol standard methods, with modifications based on regional- or city-specific data when available.

[1] IPCC Forth Assessment Report: Climate Change 2007. Direct Global Warming Potentials. https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

[2] ICLEI – Local Governments for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). http://icleiusa.org/tools/ghg-protocols/

3 SUMMARY OF GHG EMISSIONS

In 2010, the total GHG emissions from the City of Solana Beach were 139,216 metric tons CO_2e (MT CO_2e), distributed into six categories as shown in Figure 1.

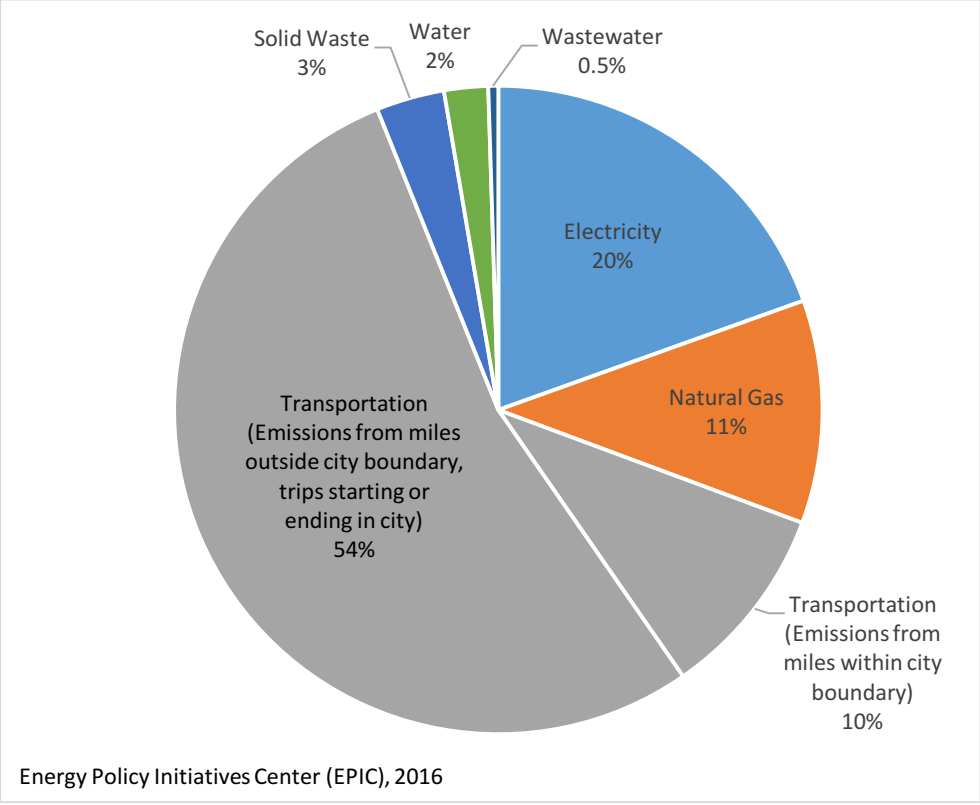


Figure 1 Breakdown of GHG Emissions in City of Solana Beach by Category (2010)

Transportation contributed the most to overall GHG emissions: 10% from trips within the Solana Beach boundary and 54% from trips outside the Solana Beach boundary but starting or ending in the city. Wastewater contributed the least to overall GHG emissions (<1%).

The total GHG emissions from the City of Solana Beach in 2013 were 142,750 metric tons CO_2e (MT CO_2e), 3% higher than the total GHG emissions in 2010, with similar distribution of the categories. The emissions in each category from 2010 to 2013 are presented in Table 2.

Table 2 Breakdown of GHG Emissions by Category from City of Solana Beach (2010 to 2013)

Category	2010	2011	2012	2013
Electricity	27,182	25,267	30,762	29,205
Natural Gas	15,504	15,631	15,315	15,614
Transportation (Emissions from miles within city boundary)	13,489	13,484	13,433	13,513
Transportation (Emissions from miles outside city boundary, trips starting or ending in city)	74,560	74,772	74,718	75,395
Solid Waste	4,736	4,622	4,419	4,862
Water	3,052	2,963	3,601	3,553
Wastewater	693	673	621	607
Total (MT CO_2e)	**139,216**	**137,412**	**142,868**	**142,750**

EPIC, 2016

Between 2010 and 2013, the lowest total GHG emissions were generated in 2010 and the highest were generated in 2012.

4 SUMMARY OF METHODS BY CATEGORY

4.1 Electricity

GHG emissions from electricity consumption by the City of Solana Beach were estimated using method BE.2 Emissions from Electricity Use, from the ICLEI Community Protocol.[3] Electricity consumption in the City of Solana Beach was provided by the local utility, San Diego Gas & Electric (SDG&E), for two customer classes: residential and commercial.[4] Two modifications were made to the consumption (Table 3) for this inventory. First, the annual electricity consumption obtained from SDG&E was grossed up using a loss factor[5] of 1.066 to account for transmission and distribution losses.[6] Second, in order to avoid double counting, the portion of electricity consumption associated with the local distribution of water was subtracted from the electricity category and attributed to the water category.

The modified electricity consumption was multiplied by the electricity emission factor for the City of Solana Beach in the given year (Table 3) and expressed in pounds of CO_2e per megawatt-hour (lbs

[3] ICLEI – Local Governments for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix C: Built Environment Emission Activities and Sources. http://icleiusa.org/tools/ghg-protocols/

[4] Communication with SDG&E. Data provided to EPIC on 10/28/2015.

[5] Transmission and Distribution Loss Factor is used to scale end-use demand or retail sales to produce net energy for load. Wong (2011). *A review of transmission losses in planning studies.* CEC Staff Paper. http://www.energy.ca.gov/2011publications/CEC-200-2011-009/CEC-200-2011-009.pdf

[6] California Energy Commission (CEC). *California Energy Demand 2015-2025 Final Forecast Mid-Case Final Baseline Demand Forecast Forms*. SDG&E Mid. Download Date: 06/23/2015. The transmission and distribution loss factor, 1.066, is calculated based on SDG&E Form 1.2 Mid. http://www.energy.ca.gov/2014_energypolicy/documents/demand_forecast_cmf/Mid_Case/

CO_2e/MWh). For a given year, the electricity emission factor in the City of Solana Beach is developed based on the city-specific power mix of SDG&E bundled power[7] and the power provided by other electricity providers – known as Direct Access (DA),[8] and their respective emission factors (lbs CO_2e/MWh). The SDG&E bundled emission factor was calculated using Federal Energy Regulatory Commission (FERC) Form 1[9] and California Energy Commission (CEC) Power Source Disclosure Program[10] on SDG&E owned and purchased power, and U.S. EPA Emissions and Generating Resource Integrated Database (eGRID)[11] on specific power plant emissions. The Direct Access emission factor used here was adopted in CPUC Decision D.14-12-037[12].

The differences in the electricity emission factors in Table 3 reflect the change in power mix in Solana Beach as well as in the entire SDG&E service territory over the years. The emissions factor increased in 2012 compared with previous years. This was due to the shut-down in 2012 of the zero-emissions electricity supply from the San Onofre Nuclear Generation Station (SONGS). The SONGS electricity supply was replaced by other natural gas-fired power plant sources[13] that increased the emission factor.

The total electricity consumption, electricity emission factor, and corresponding GHG emissions in the City of Solana Beach are given in Table 3.

Table 3 Electricity Consumption, Emission Factor and GHG Emissions in Solana Beach (2010 - 2013)

Year	Electricity Consumption (MWh)	Emission Factor (lbs CO_2e)/MWh)	GHG Emissions (MT CO_2e)
2010	89,211	672	27,182
2011	88,991	626	25,267
2012	89,957	754	30,762
2013	87,729	734	29,205

EPIC, 2016

[7] SDG&E bundled power includes the electricity from SDG&E owned power plants and the electricity from its net procurements.

[8] Direct Access Program includes the electricity customers purchased from electric service providers (ESPs) but SDG&E provides transmission and distribution services. http://www.sdge.com/customer-choice/electricity/direct-access-faq

[9] Federal Energy Regulatory Commission (FERC). Form 1- Electricity Utility Annual Report. http://www.ferc.gov/docs-filing/forms/form-1/viewer-instruct.asp. Download Date: 07/20/2015

[10] California Energy Commission (CEC) Power Source Disclosure Program under Senate Bill 1305. http://www.energy.ca.gov/sb1305/ Obtained SDG&E annual report, 2010-2014, from CEC staff on 08/07/2015.

[11] U.S. EPA. eGRID 2012. (2015) http://www2.epa.gov/energy/egrid Download Date: 10/09/2015

[12] Decision 14-12-037, December 18, 2014 in Rulemaking 11-03-012 (Filed March 24, 2011). http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M144/K130/144130487.pdf. The Decision adopts an emission factor of 0.379 MT CO_2e/MW) for direct access electricity purchased from all investor-owned utilities, publicly owned utilities and energy service providers other than PG&E. EPIC converted the emission factor 0.379 MT CO_2e/MWh to 836 lbs CO_2e/MWh as the DA emission factor.

[13] SONGS is partially owned by SDG&E and historically accounted for approximately 15-20% of its power generation. SONGS was permanently closed in 2013 and the energy generation is replaced by other sources, including non-renewable sources, which may increase the emissions factor for SDG&E-generated electricity. https://www.sdge.com/sites/default/files/documents/1390903853/2011%20Power%20Content%20Label.pdf

Electricity consumption in Solana Beach was lowest in 2013 of the years 2010 to 2013, however, the GHG emissions varied due to the changes in the emission factor as show in Figure 2.

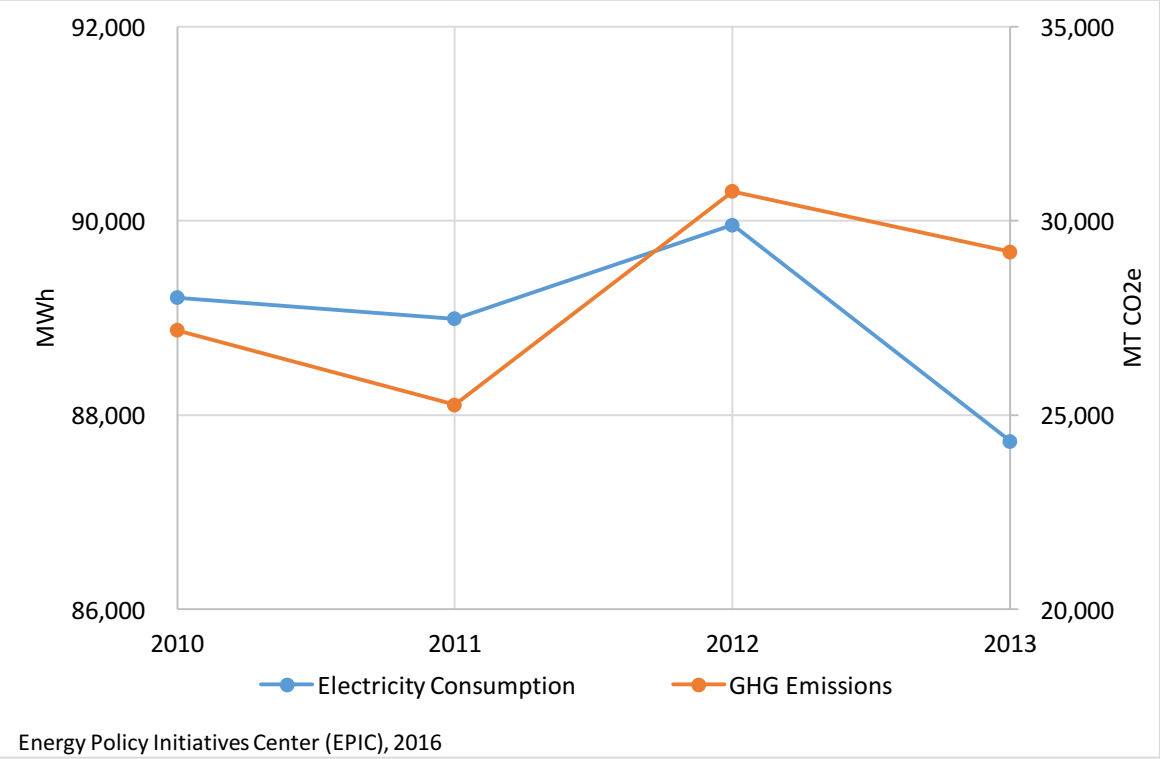


Figure 2 Trends in Electricity Consumption and GHG Emissions in Solana Beach (2010-2013)

These emissions can be broken down further into residential and commercial customer classes. In 2013, 51% of emissions could be attributed to commercial electricity consumption, while 49% came from residential electricity consumption. Figure 3 represents this breakdown in 2013, and the breakdown between commercial and residential customer class in 2010 was also 51% and 49%.

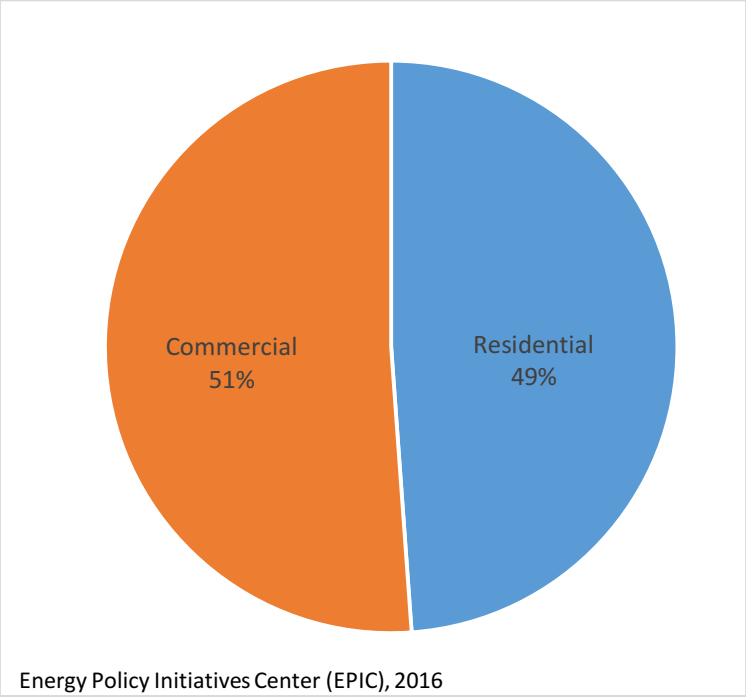


Figure 3 Breakdown of Emissions from the Electricity Category in Solana Beach (2013)

4.2 Natural Gas

GHG emissions from combustion of natural gas for end-use applications in City of Solana Beach were estimated based on method BE.1 Emissions from Stationary Fuel Combustion of the ICLEI Community Protocol.[14] Natural gas consumption in the City of Solana Beach was provided by SDG&E for two customer classes: residential and commercial.[15]

Natural gas consumption was multiplied by the natural gas GHG emission factor, 0.00544 metric ton CO_2e per million therm (MMT CO_2e/MMTherm). For a given year, the natural gas emission factor is calculated based on the heat content of natural gas, fuel CO_2, CH_4, and N_2O emissions from the latest California's Greenhouse Gas Inventory developed by California Air Resources Board (ARB),[16] and GWP of CH_4 and N_2O from Table 1.

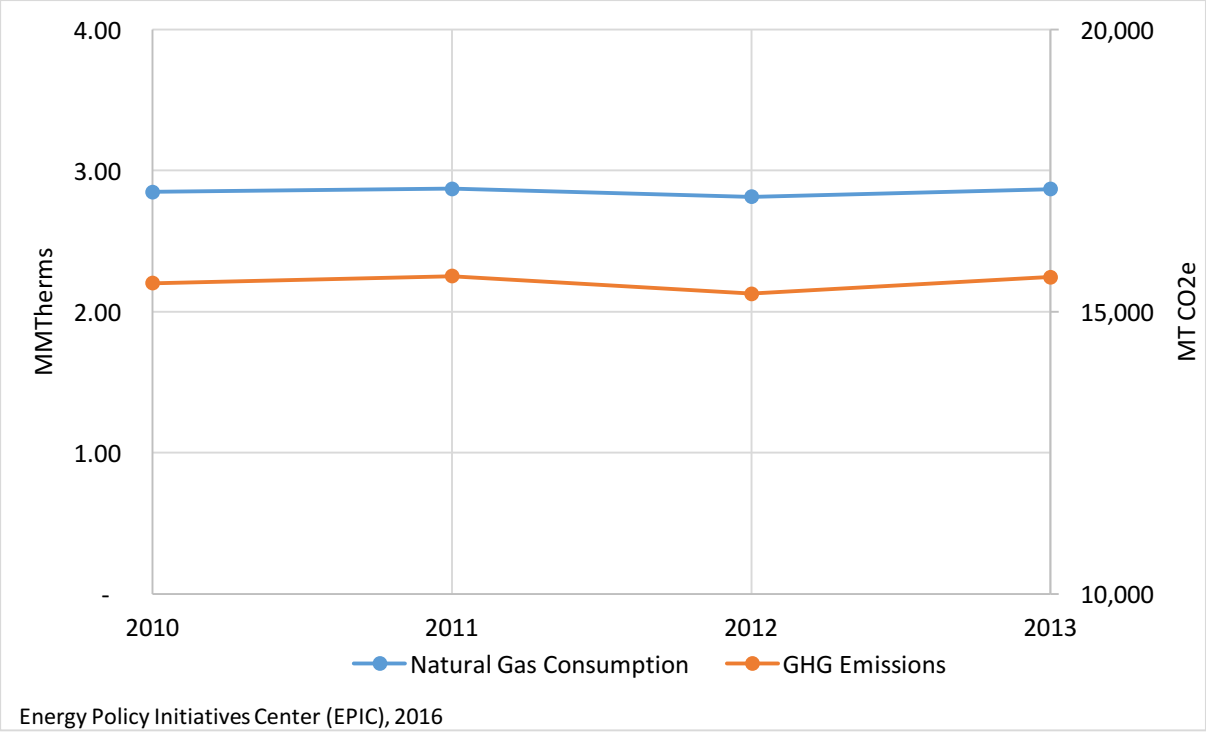
The total natural gas consumption and GHG emissions in the City of Solana Beach are given in Table 4 and the trends are shown in Figure 4.

[14] ICLEI 2012. See Note 3.
[15] Communication with SDG&E. Data provided to EPIC on 10/28/2015.
[16] ARB. 2014. Documentation of California's Greenhouse Gas Inventory. Fuel Combustion – Natural Gas. http://www.arb.ca.gov/cc/inventory/doc/docs1/1a1ai_instategenerationutilityowned_fuelcombustion_naturalgas_ch4_2013.htm

Table 4 Natural Gas Consumption, Emission Factor and GHG Emissions in Solana Beach (2010 - 2013)

Year	Natural Gas Consumption (MM Therms)	GHG Emissions (MT CO_2e)
2010	2.85	15,504
2011	2.87	15,631
2012	2.81	15,315
2013	2.87	15,614

SDG&E, EPIC 2016



Energy Policy Initiatives Center (EPIC), 2016

Figure 4 Trends in Natural Gas Consumption and GHG Emissions in Solana Beach (2010-2013)

Emissions from natural gas can be broken down further into residential and commercial customer classes. In 2013, 26% of emissions came from commercial natural gas consumption, and the remaining 74% can be attributed to residential natural gas consumption. Figure 5 represents this breakdown in 2013. In 2010, the distribution was 25% of emissions from commercial customers, and 72% from residential customers.

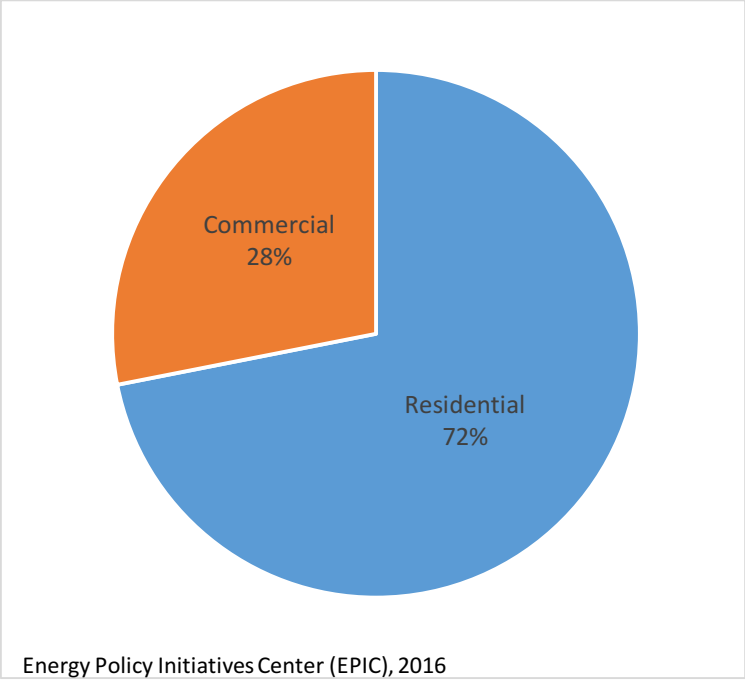


Figure 5 Breakdown of GHG Emissions from Natural Gas Category in City of Solana Beach (2013)

4.3 Transportation

GHG emissions from on-road transportation in the City of Solana Beach were estimated based on vehicle miles traveled (VMT) and the emission rates associated with the total vehicle fleet in San Diego region in a given year. VMT in the City of Solana Beach was provided by San Diego Association of Government (SANDAG), based on the Origin-Destination (O-D) method. The O-D VMT method proposed by the ICLEI Community Protocol estimates miles traveled based on where a trip originates and where it ends to allocate on-road emissions to cities and regions with policy jurisdiction over miles traveled (Figure 6).[17]

[17] ICLEI – Local Governments for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix D: Transportation and Other Mobile Emission Activities and Sources.

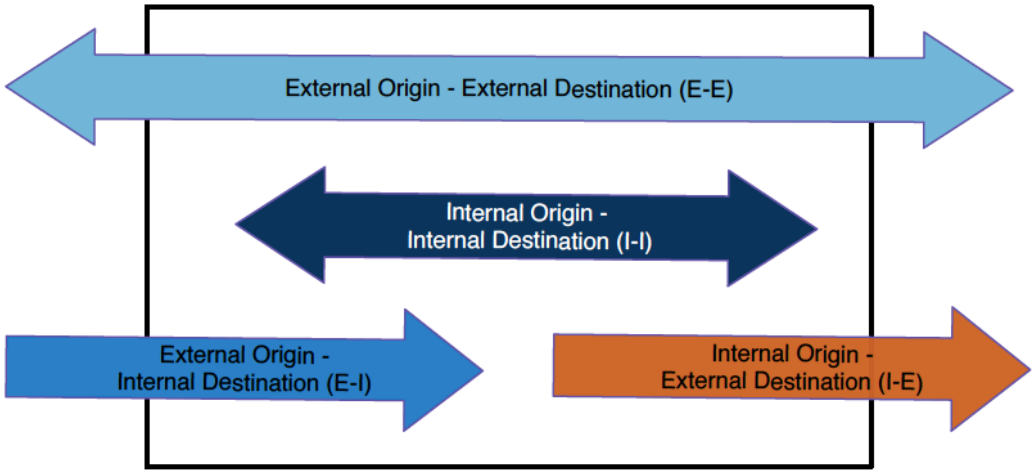


Figure 6 Components of Origin-Destination (O-D) method for Calculation of Vehicle Miles Traveled

O-D VMT include trips that originate and end within the boundary, in this case within the City of Solana Beach geographical boundary (referred to as Internal-Internal), and trips that either begin within the boundary and end outside the boundary (referred to as Internal-External) or vice versa (referred to as External-Internal). VMT from Internal-External/External-Internal trips include both the miles in Solana Beach geographical boundary and outside Solana Beach geographic boundary but within the San Diego region.

VMT from trips that begin and end outside the boundary that were only passing through the City of Solana Beach (referred to as External-External) were excluded. Therefore, emissions from External-External VMT were not allocated to the City of Solana Beach. O-D VMT data for each trip type from 2010 to 2013 are given in Table 5.[18]

Table 5 Original-Destination (O-D) VMT for Trips in Solana Beach (2010-2013)

Trip Type (miles/weekday)	2010	2011	2012	2013
Internal-Internal	27,582	27,803	28,024	28,245
Internal-External/External-Internal (within city boundary)	98,273	99,344	100,415	101,486
Internal-External/External-Internal (outside city boundary)	848,120	859,214	870,309	881,403

SANDAG, 2015

To calculate total VMT, all Internal-Internal VMT were included. External-Internal/Internal-External VMT were divided by two to split the miles evenly between the city and outside jurisdictions. The total VMT were multiplied by 0.96 to adjust from average weekday VMT to average daily VMT including

[18] Communication with SANDAG. Data received on 09/23/2015. VMT data in 2020 and 2013 were provided by SANDAG directly. 2011 and 2012 VMT Data were interpolated linearly.

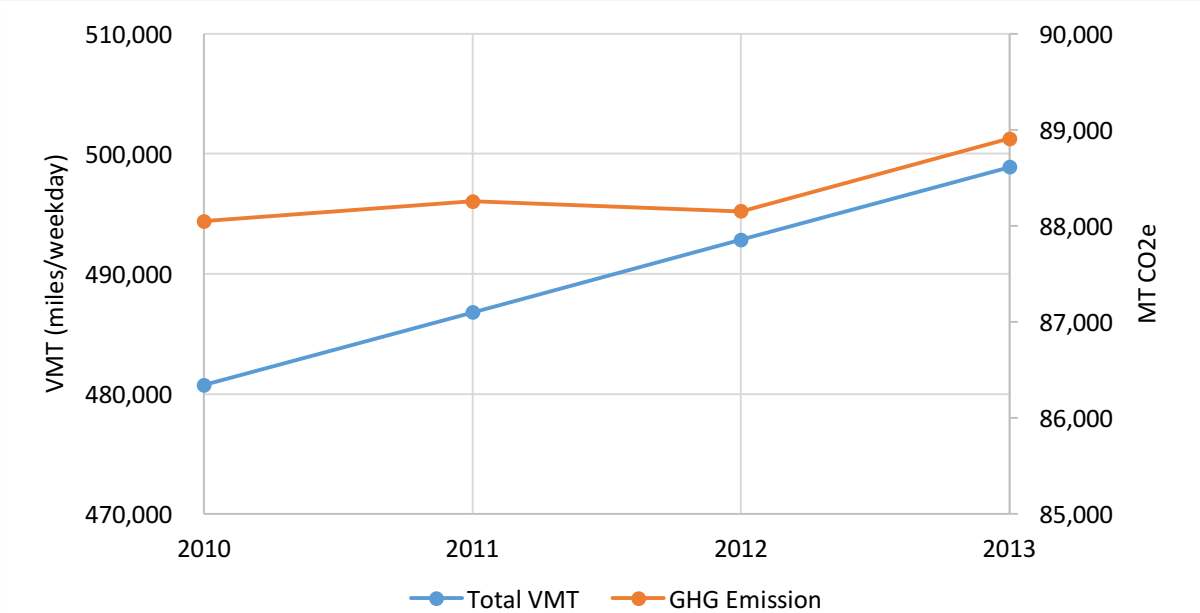
weekends.[19] The percent of VMT that is purely inside Solana Beach's geographical boundary is 15% of total VMT used the inventory.

The emission rate in grams (g) CO_2e/mile was derived from the statewide mobile source emissions model EMFAC2011, developed by California Air Resources Board (ARB).[20] EMFAC2011 was used to generate emission rates for SANDAG on a metropolitan planning organization (MPO) basis, for calendar year 2010-2013 with all vehicle classes (EMFAC2011 Categories), model years, speed and fuel types.[21] The fleetwide g CO_2/mile emission rate was calculated based on the distribution of VMT for each vehicle class and its emission rates, then adjusted to account for total greenhouse gas emissions including CO_2, CH_4 and N_2O. Table 6 summarizes the fleetwide vehicle emission rate, total VMT and GHG emissions, and the trends are shown in Figure 7.

Table 6 Total VMT, Emission Rate and GHG Emissions in Solana Beach (2010-2013)

Year	Emissions Rate (g CO_2e/mile)	Total VMT (miles/day)	GHG Emissions (MT CO_2e)
2010	501.8	480,747	88,049
2011	496.7	486,799	88,257
2012	490.0	492,850	88,151
2013	488.2	498,902	88,909

EPIC, 2016



Energy Policy Initiatives Center (EPIC), 2016

[19] The "5 to 7 day conversion" factor for VMT for freeways and highways, was provided by Caltrans, Kim Sturmer (2009).
[20] California Air Resources Board. Mobile Source Emissions Inventory. EMFAC2011. http://www.arb.ca.gov/msei/msei.htm
[21] EMFAC2011 Web Database. Emission Rates for SANDAG, Calendar Year 2012 and 2013.

Figure 7 Trends in Total VMT and GHG Emissions in Solana Beach (2010-2013)

4.4 Solid Waste

GHG Emissions from the decomposition of organic material in waste disposed at landfills are estimated based on method SW.4 from ICLEI Community Protocol.[22] For emissions from community-generated mixed waste, solid waste disposed by in the City of Solana Beach was multiplied by the mixed waste emission factor[23] to estimate the total emissions. The impact of recycling and composting diversion programs on emissions reduction were not captured in this inventory because the waste disposed data already exclude waste diverted from these programs. The recycling and diversion programs contribute to lowering the amount of community-generated waste sent to the landfills.[24]

Solid waste disposed into landfills from 2010 to 2013 was obtained from California Department of Resources Recycling and Recovery (CalRecycle) Disposal Reporting System (DRS).[25] The total waste disposal was multiplied by mixed solid waste emission factor, 0.06 MT CH_4/wet short ton[26] then converted to MT CO_2e. The landfill gas capture rate was assumed to be 75% based on ICLEI Community Protocol.[27] The total solid waste disposed and post-capture emissions in 2013 are given in Table 7 and the trends are shown in Figure 8.

Table 7 Solid Waste Disposed by Solana Beach and GHG Emissions (2010 - 2013)

Year	Community Solid Waste Disposal (metric tons/year)	Per Capita Solid Waste Disposal (kg/person/day)	GHG Emissions (MT CO_2e)
2010	12,731	2.7	4,736
2011	12,425	2.6	4,622
2012	11,878	2.5	4,419
2013	13,068	2.7	4,862

CalRecycle, EPIC 2016

[22] ICLEI – Local Governments for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix E: Solid Waste Emission Activities and Sources. http://icleiusa.org/tools/ghg-protocols/

[23] ICLEI Community protocol. Appendix E: Solid Waste Emission Activities and Sources. Table SW.5 CH_4 Yield for Solid Waste Components.

[24] ICLEI, 2012. See 22.

[25] CalRecycle. Disposal Reporting System (DRS): Jurisdiction Disposal and Alternative Daily Cover (ADC) Tons by Facility. http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/Destination/JurDspFa.aspx Download Date: 08/03/2015

[26] ICLEI, 2012. Table SW.5. See Note 23.

[27] ICLEI, 2012. See Note 22.

Energy Policy Initiatives Center (EPIC), 2016

Figure 8 Trends in Solid Waste Generation and GHG Emissions in Solana Beach, 2010-2013

4.5 Water

Emissions from water supplied to the City of Solana Beach were estimated based on method WW.14 from the ICLEI Community Protocol.[28] The method accounts for each element of the water system (upstream supply and conveyance, local water distribution, and treatment) individually, using the energy intensity per unit of water for each segment of the water system given in Table 8.

Table 8 Energy Intensity for Each Segment of Water System

Segment of Water System	Energy Intensity (kWh/Million Gallons)
Upstream Supply and Conveyance[29]	9,727
Conventional Water Treatment[30]	684
Local Water Distribution[31]	292

CEC 2006, EPIC 2016

[28] ICLEI – Local Governments for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0. (2012). Appendix F. Wastewater and Water Emission Activities and Sources.

[29] California Energy Commission (CEC), *Navigant, Refining Estimates of Water-Related Energy Use in California* (December 2006).

[30] Conventional water treatment processes include coagulation/flocculation, sedimentation, filtration and disinfection. Energy intensity of standard treatment are calculated based on data from City of San Diego's three Water Treatment Plants, provided to EPIC in 2014. (Value for 2010)

[31] City of San Diego. See Note 30.

95% of the water used in Solana Beach is provided by Santa Fe Irrigation District (SFID) and the rest is provided by Olivenhain Municipal Water District (OMWD). SFID provided the amount of potable and recycled water (million gallons) its facilities treated and distributed for Solana Beach from 2006 to 2012. The water treated and distributed from SFID for Solana Beach is then used to estimate the total water consumption in Solana Beach for 2010 to 2012. The water consumption in the latest inventory year, 2013, was extrapolated from the historical data. Based on the 2010 Urban Water Management Plan from SFID[32] and OMWD[33] no groundwater is supplied to Solana Beach, only surface water and recycled water.

For upstream supply and conveyance emissions, potable water consumption was multiplied by the upstream energy intensity to obtain the total electricity consumption from upstream supply. The electricity consumption was then multiplied by the SDG&E service territory electricity emission factor, which is the best available emission factor for upstream electricity supply to calculate GHG emissions. The SDG&E service territory electricity emission factors from 2010 to 2013 are given in Table 9, which were calculated based on the methods described in Section 4.1 – Electricity. The service territory emission factors are slightly different from the emission factors for Solana Beach (Table 3).

Table 9 SDG&E Service Territory Electricity Emission Factors (2010-2013)

Year	SDG&E Service Territory Electricity Emissions factor (lb CO_2e/MWh)
2010	691
2011	651
2012	763
2013	747

EPIC, 2016

For local water distribution and treatment, both potable and recycled water consumption were multiplied by their corresponding energy intensities. The total electricity use associated with water consumption in a given year was then multiplied by the electricity emissions factor for SDG&E service territory of that year, to get the total GHG emissions associated with water consumption. The electricity and GHG emissions associated with local water distribution are already captured in Section 4.1 - Electricity, so the emissions are deducted from electricity category.

The total water consumption (potable + recycled water) and the corresponding GHG emissions are given in Table 10 and the trends are shown in Figure 9.

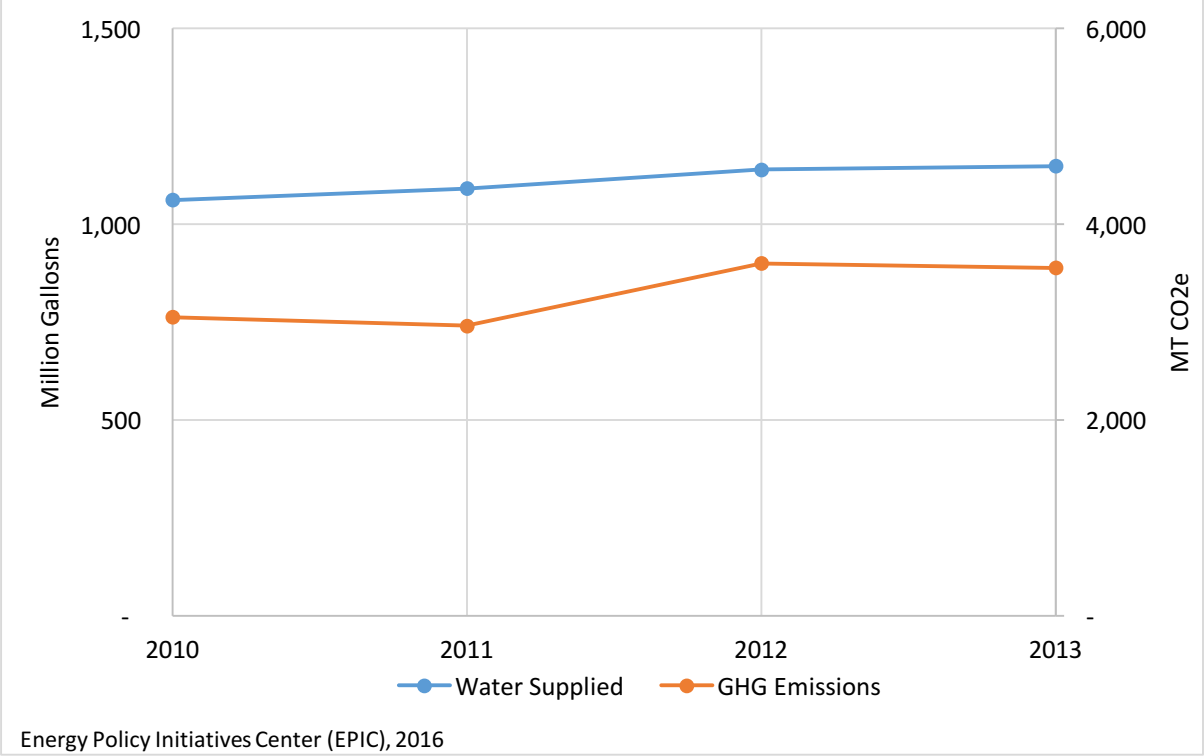
[32] Santa Fe Irrigation District, *2010 Urban Water Management Plan* (June 2011), http://www.water.ca.gov/urbanwatermanagement/2010uwmps/Santa%20Fe%20Irrigation%20District/SFID%20Final%202010%20UWMP_Final_App.pdf

[33] Olivenhain Municipal Water District, *2010 Urban Water Management Plan* (June 2011), http://www.olivenhain.com/files/docs/projects/UWMP/2010%20OMWD%20UWMP.pdf

Table 10 Water Supplied to Solana Beach and GHG Emissions (2010 - 2013)

Year	Community Water Supplied (million gallons/year)	Per Capita Water Supplied (gallons/person/day)	GHG Emissions (MT CO_2e)
2010	1,061	226	3,052
2011	1,091	231	2,963
2012	1,139	241	3,601
2013	1,148	241	3,553

EPIC, 2016



Energy Policy Initiatives Center (EPIC), 2016

Figure 9 Trends in Water Consumption and GHG Emissions in Solana Beach, 2010-2013

In 2013, 90% of the GHG emissions from water consumption were a result of upstream supply and conveyance at 3,215 MT CO_2e. The related breakdown of emissions for the water sector is given in Figure 10. The breakdown was similar in 2010, with 91% of GHG emissions from upstream supply and conveyance.

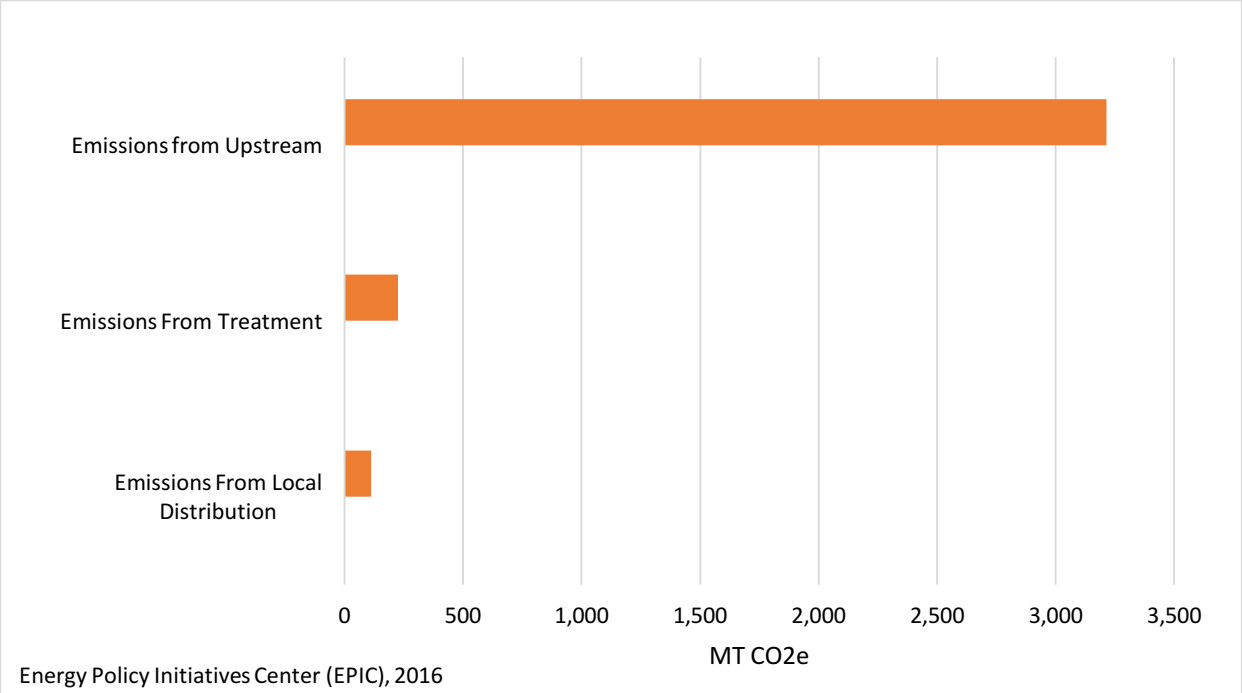


Figure 10 Breakdown of Emissions from Water Category in City of Solana Beach (2013)

4.6 Wastewater

GHG emissions from wastewater generation by the City of Solana Beach were estimated based on the total amount of wastewater generated in a given year, multiplied by the emission factor of wastewater treatment processes. All wastewater generated by the City of Solana Beach is sent to San Elijo Water Reclamation Facility (San Elijo WRF) for treatment. The total wastewater (million gallons) from 2010 to 2014 San Elijo WRF treated for Solana Beach were provided.[34]

Due to the lack of data from the wastewater treatment processes in San Elijo, the emissions from wastewater treatment were estimated using an emissions factor derived from data based on Encina Wastewater Authority, a wastewater treatment plant in the San Diego region using similar treatment processes as San Elijo, as advised by San Elijo staff. In 2013, the Encina Wastewater Authority treated 22.787 million gallons wastewater with GHG emissions of 11,359 metric tons. This results in an emission factor of 1.37 metric tons CO2e/million gallon and consists of emissions from a) biogenic direct, stationary combustion anaerobic digester gas b) process emissions from wastewater treatment with nitrification and denitrification and c) direct anaerobic digester gas. As similar data were not available for the other years, this emissions factor was used as an estimate in other inventory years.

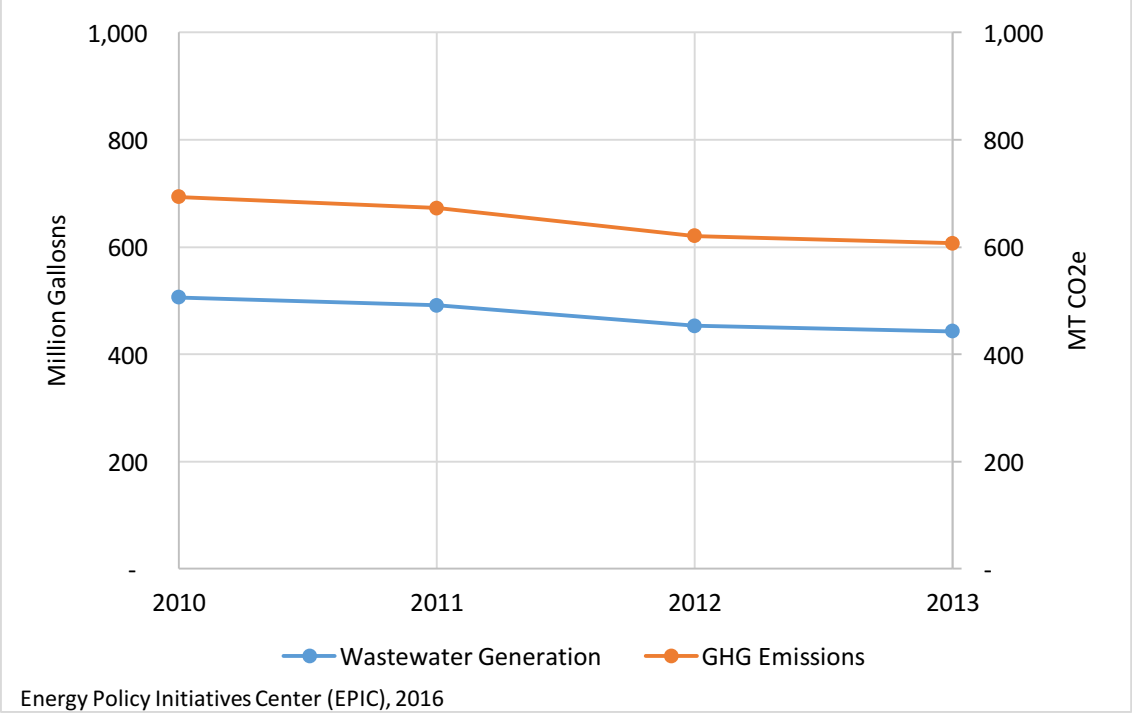
The total wastewater generation, emission factor and GHG emissions are presented in Table 11 and the trends are shown in Figure 11.

[34] Communication with San Elijo Water Reclamation Facility, Data provide to EPIC on 07/29/2015.

Table 11 Wastewater Generation in Solana Beach and GHG Emissions (2010 - 2013)

Year	Community Wastewater Generation (million gallons/year)	Per Capita Wastewater Generation (gallon/person/day)	GHG Emissions (MT CO_2e)
2010	506	108	693
2011	491	104	673
2012	453	96	621
2013	443	93	607

EPIC, 2016



Energy Policy Initiatives Center (EPIC), 2016

Figure 11 Trends in Wastewater Generation and GHG Emissions in Solana Beach (2010-2013)

5 EMISSION FORECAST TO 2020 AND 2035

GHG emissions inventories provide a retrospective view of emissions within a city; however, to plan for future reduction opportunities, emissions are projected using information about a city's anticipated growth and development but without additional changes to policy after the baseline year. Such projections are often known as business-as-usual (BAU) projections. The total GHG projections are the sum of the emissions projected by category for year 2020, 2030 2035.

5.1 Summary of Emission Forecasts

The total GHG emissions in 2020 were projected at 131,868 MT CO_2e, and the GHG emissions in 2035 were projected at 142,707 MT CO_2e. This is due to the changes in growth and development in each category. Figure 12 below shows a comparison of the emissions breakdown by category for inventory years (2010 and 2013) and forecast years (2020, 2030 and 2035).

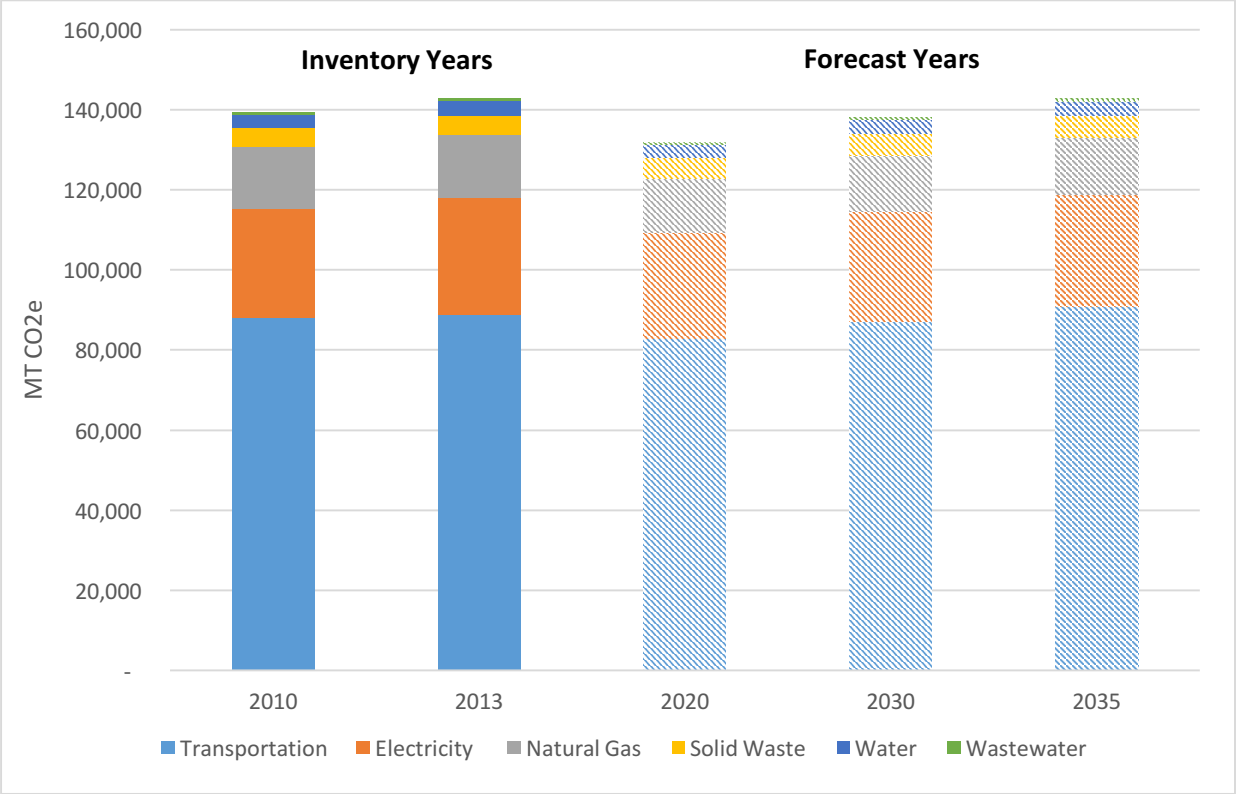


Figure 12 Comparison of Emissions Breakdown by Category in Solana Beach

5.2 Summary of Projection Methods by Category

In general, population and job growth from SANDAG Series 13 Regional Growth Forecast were used for the projection. The population estimates and forecast, and job forecast for City of Solana Beach is given in Table 12.

Table 12 Population Estimates, Population and Job Forecast for Solana Beach

Year	Population[35]	Jobs[36]
2013	13,031	7,642
2020	13,376	8,156
2030	13,971	8,387
2035	14,207	8,533

SANDAG 2013 and 2016, EPIC 2016

[35] Population in 2013 is from SANDAG population estimates (Updated in February 24, 2016). The SANDAG Population Estimates are released annually and modified based on *E-5 Population and Housing Estimates for Cities, Counties and the State*, California Department of Finance. Population in 2020 2030, and 2035 are from SANDAG Series 13 Regional Growth Forecast (Updated in October 2013). Download Date: 03/30/2016 SANDAG Data Surfer. http://datasurfer.sandag.org/

[36] Series 13 Regional Growth Forecast (Updated in October 2013). Number of Jobs in 2013 was interpolated from 2012 and 2020 data. Download Date: 03/30/2016 SANDAG Data Surfer. http://datasurfer.sandag.org/

Each category was projected to 2035 separately using a method specifically for the category. The activity data in the latest year with data available are used.

5.2.1 Electricity

Electricity consumption in the City of Solana Beach was projected separately by residential and commercial customers. For the residential customer class, the per capita electricity consumption in 2014 (3,026 kWh/person/year), the most recent year with SDG&E data, was calculated first by dividing the total electricity consumption in the residential class by the population in 2014.[37] The per capita electricity consumption in 2014 is held constant and used to project total consumption for future years.

For the commercial class, a similar method was used. The total commercial electricity consumption was forecasted based on job growth (Table 12) and the per job electricity consumption in 2014 (5,564kWh/job/year) for all years until 2035.

The total projected electricity consumption was then modified to include losses and exclude the electricity associated with local water distribution. The resulting consumption was multiplied by the Solana Beach specific electricity emission factors in 2014 (the latest year with available data) of 640 lbs CO2e/MWh, held constant, to obtain the total GHG emission for each year until 2035. The total projected electricity consumption and GHG emissions are given in (Table 13).

Table 13 Projected Electricity Consumption and GHG Emissions in Solana Beach (2020, 2030 and 2035)

Year	Total Projected Electricity Consumption (GWh)	GHG Emissions (MT CO_2e)
2020	91,271	26,483
2030	94,548	27,434
2035	96,171	27,905

EPIC, 2016

5.2.2 Natural Gas

The projection method for the natural gas category is similar to that for the electricity category.

The per capita residential natural gas consumption (132 therms/person/year) and the per job natural gas consumption (87 therms/job/year) in 2014 were held constant with population growth for the forecasts. The natural gas emission factor used in Section 4.2 was held constant. The projected total natural gas consumption in the residential and commercial class and the corresponding GHG emissions for forecast years are given in Table 14.

[37] Total population in 2014 is 13,059. SANDAG population estimates for Solana Beach (Updated in February 24, 2016). Download Date: 03/30/2016 SANDAG Data Surfer. http://datasurfer.sandag.org/

Table 14 Projected Natural Gas Consumption and GHG Emissions in Solana Beach (2020, 2030 and 2035)

Year	Natural Gas Consumption (MMTherms)		GHG Emissions (MT CO_2e)	
	Residential	Commercial	Residential	Commercial
2020	1.76	0.71	9,580	3,864
2030	1.84	0.73	10,006	3,973
2035	1.87	0.74	10,175	4,042

EPIC, 2016

5.2.3 Transportation

Vehicle Miles Traveled (VMT) forecast for 2020 and 2035 in the City of Solana Beach were provided by SANDAG. Other intermediate years were interpolated linearly. VMT was multiplied by the adjusted GHG emission rate derived from EMFAC2011 for all years until 2035. For new vehicles entering the fleet after calendar year 2014, including all vehicle classes and fuel types, their emission rate is assumed equal to new model year 2014 vehicles emission rates (calendar year 2014 and vehicle year 2014).[38] The total VMT, adjusted emission rate and corresponding GHG emissions for forecast years are given in Table 15.

Table 15 Total VMT, Emission Rate and GHG Emissions in Solana Beach (2020, 2030 and 2035)

Year	Total VMT (miles/day)	Emission Rate (g CO_2 /mile)	GHG Emissions (MT CO_2e)
2020	505,894	450	82,849
2030	563,491	425	87,150
2035	592,290	422	90,927

EPIC, 2016

5.2.4 Solid Waste

The solid waste disposed by the City of Solana Beach was projected based on per capita solid waste disposal of 2014 (2.9 kg/person/day) and the population growth from SANDAG Series 13 Forecast. Total emissions were calculated by multiplying solid waste disposal and the default mixed waste emission factor and gas capture rate provided in Section 4.4. The projected total solid waste disposal and GHG emissions for the forecast years are given in Table 16.

Table 16 Projected Waste Disposal from Solana Beach and GHG Emissions (2020, 2030 and 2035)

Year	Community Solid Waste Disposal (metric tons/year)	GHG Emissions (MT CO_2e)
2020	14,061	5,231
2030	14,686	5,464
2035	14,934	5,556

EPIC, 2016

[38] Avoid the impact of other vehicle regulations on BAU projection.

5.2.5 Water

The total water supplied to the City of Solana Beach was determined using the same method as in the above solid waste section. The total water supplied to the City of Solana Beach was projected based on the per capita water supply in 2012 (205 gallons/person/day for surface water and 36 gallons/person/day for recycled water), the latest year with data available, and the population growth from SANDAG Series 13 Forecast. The energy intensity for each element of the water system and electricity emission factor in 2014, was used and held constant for all years until 2035. The projected total water supplied and the corresponding GHG emissions for the forecast years are given in Table 17.

Table 17 Projected Water Supplied and GHG Emissions in Solana Beach (2020, 2020 and 2035)

Year	Total Water Supplied (million gallons)	GHG Emissions (MT CO_2e)
2020	1,179	3,244
2030	1,231	3,389
2035	1,252	3,446

EPIC, 2016

5.2.6 Wastewater

The total wastewater generation in the City of Solana Beach was determined using the same method as the solid waste and water sections. The total wastewater generation in the City of Solana Beach was projected based on the per capita wastewater generation in 2014 (92 gallons/person/year), the latest year with data available, and the population growth from SANDAG Series 13 Forecast. The total projected wastewater generation was then multiplied by the wastewater emission factor emission factor used in Section 4.6, (1.37 MT CO2e/million gallon) to obtain the total GHG emissions for all years until 2035.

The projected total wastewater generation and GHG emissions for the forecast years are given in Table 18.

Table 18 Projected Wastewater Generation and GHG Emissions in Solana Beach (2020 and 2035)

Year	Wastewater Generation (million gallons)	GHG Emissions (MT CO_2e)
2020	451	617
2030	471	645
2035	479	656

EPIC, 2016

6 DIFFERENCE FROM 2005 INVENTORY

A GHG inventory was prepared by ICLEI for Solana Beach using previous ICLEI methodology and 2005 data.[39] Emissions were calculated for both government operations and community. For the community inventory, the five categories included in the previous ICLEI methodology were residential, commercial,

[39] City of Solana Beach 2005 Greenhouse Gas Emissions Inventory. http://www.sdfoundation.org/Portals/0/Newsroom/PDF/Reports/SolanaBeachsm.pdf

transportation, solid waste and wastewater, different from sectors in the current ICLEI methodology. The emissions results from previous 2005 inventory (prepared by ICLEI) and current inventory (prepared by EPIC) are provided in Table 19.

Table 19 Total Emissions and Emissions Breakdown by Categories in 2005, 2010 and 2013

Category	2005 Inventory (prepared by ICLEI)	2010 Inventory (prepared by EPIC)	2013 Inventory (prepared by EPIC)
Electricity[40]	20,922	27,182	29,205
Natural Gas	14,861	15,504	15,614
Transportation	109,388	88,049	88,909
Water	Not available	4,736	4,862
Solid Waste	3,981	3,052	3,553
Wastewater	619	693	607
Total (MT CO_2e)	**149,771**	**139,216**	**142,750**

*Highlighted categories cannot be directly compared

EPIC 2016, ICLEI 2011

Total emissions are higher in 2005 than in the current inventories. However, this is due also to differences in methodology between the 2005 inventory and current inventories, therefore a direct comparison of the total emissions from the inventories is not possible. A summary of differences between methodologies in the 2005 inventory and the current inventories by sector is given in the following.

6.1 Electricity

For the electricity sector, the emissions are calculated by multiplying electricity consumption in the community with an emission factor, in both the 2005 and current inventories. However, not only is the consumption as expected, different, but also the emission factor is different. The electricity emission factor used in the 2005 inventory was 547 lbs CO2/MWh for SDG&E electricity and 724 lbs CO2/MWh for direct access electricity (WECC California[41]). These factors were significantly lower in 2005 compared with 2010 and 2013 (Table 3), therefore the total emissions in 2005 were lower as well. In particular, SDG&E's bundled electricity emission factor of 547 lbs/MWhfor 2005 is much lower than the value of 2014, although it is 2014 that reflects the increasing percentages of zero emissions electricity in the mix. Therefore, no statement about trends can be made in this category between the 2005 and later inventories.

6.2 Natural Gas

There are no methodological or emissions factor differences for this category. Therefore the difference between 2005 and 2010/2013 emissions is due to the difference in natural gas consumption.

[40] Even through electricity and natural gas are not one of the five sectors in previous ICLEI, they were calculated separately and given in the report.

[41] WECC, Western Electricity Coordinating Council, one of the eight Regional Entities with delegated authority from North American Electric Reliability Corporation (NERC) and FERC.

6.3 Transportation

For the transportation sector, the methodologies are very different. The current ICLEI method recommends using VMT from trips originated and/or ended within the community boundary, from either an activity-based travel demand model with trip origin and destination data or a trip-based travel demand model with trip origin and destination data (four step models). The activity-based model is to be preferred. In the 2005 inventory, the emissions were calculated based on "local" versus "state" road categories and included miles traveled through the city that the trips neither started nor ended in the city boundary.

Therefore, no statement about trends can be made in this category between the 2005 and later inventories.

6.4 Solid Waste

There are no methodological differences for this category and trends can be observed.

6.5 Water

Emissions from water consumption were not included as a main sector in the previous ICLEI methodology, therefore not included in 2005 inventory. Therefore, no statement about trends can be made in this category between the 2005 and later inventories.

6.6 Wastewater

For the wastewater sector, the methodology in 2005 and current inventory are very different. The emissions from wastewater generation in the 2005 inventory were downscaled from the 2008 San Diego Regional GHG inventory based on the local population. In the current inventories emissions were calculated based on the wastewater generation in Solana Beach and the facility-specific treatment emission factor. Therefore, no statement about trends can be made in this category between the 2005 and later inventories.

Appendix B

GHG Emissions Reduction Methodology

Methods for Estimating Greenhouse Gas Emissions Reduction from Solana Beach Climate Action Plan

May 2017

Prepared for the City of Solana Beach

Prepared by the Energy Policy Initiatives Center

About EPIC

The Energy Policy Initiatives Center (EPIC) is a nonprofit academic and research center of the USD School of Law that studies energy policy issues affecting the San Diego region and California. EPIC integrates research and analysis, law school study, and public education, and serves as a source of legal and policy expertise and information in the development of sustainable solutions that meet our future energy needs.

For more information, please visit the EPIC website at www.sandiego.edu/epic.

TABLE OF CONTENT

TABLES AND FIGURES

1 INTRODUCTION

This report provides a summary of the methods used to calculate greenhouse gas emissions reductions from a suite of measures included in City of Solana Beach's Climate Action Plan (CAP).

Section 2 provides emissions reduction targets in Solana Beach for 2020 and 2035. Section 3 provides a summary of anticipated emissions reductions from local, state and federal measures only for the year 2035, since Solana Beach achieves the 2020 target through state and federal measures only. Section 4 provides the common data sources and information used throughout the document. The detailed methods used to estimate emissions reduction from each measure and action are provided in Sections 5 and 6.

2 EMISSION REDUCTION TARGETS

In the Solana Beach CAP, the baseline year is set at 2010, and the target reduction is 15% below the 2010 level by 2020 and 50% below the 2010 level by 2035.These targets follow the targets set by the City of San Diego's Climate Action Plan of December 2015, which has shown consistency with state targets. Table 1 shows the Business-As-Usual (BAU)[1] emissions projection, reduction targets, and reductions needed for 2020 and 2035 in metric tons of CO_2e (MT CO_2e).[2]

Table 1 BAU Emissions, Reduction Targets and Emission Reductions Needed from the Solana Beach CAP

Year	BAU Emissions Projection (MT CO_2e)	Target Reduction (% below baseline)	Target Emissions Level (MT CO_2e)	Emissions Reductions Needed to Meet Target (MT CO_2e)
2010	139,216	-	-	-
2020	131,868[3]	15%	118,334	13,534
2035	142,707	50%	69,608	73,099

3 SUMMARY OF EMISSION REDUCTIONS

The summary of emissions reduction potential from federal, state and local measures on reaching the 2035 target set by Solana Beach is provided in Table 2.

[1] BAU is defined as the status quo with respect to policies in place or mandated in 2010. No policy changes are assumed to take place beyond those that were in place in 2010.

[2] The method to project emissions at 2020 and 2035 is provided in *City of Solana Beach Greenhouse Gas Emissions Inventory and Forecast (EPIC, 2016)* document.

[3] The BAU emissions decrease due to state and federal policies in place in 2010 as well as projection start years of 2012-2013. Please refer to the "Inventory and Forecast" document for further details.

Table 2 Summary of GHG Emissions Reductions by Strategy in the Solana Beach CAP (2035)[4]

Year	Emissions Reduction from Strategies ($MT CO_2e$)					Emissions Remaining after Reduction Strategies ($MT CO_2e$)	
	Strategy 1 (Transportation)	Strategy 2 (Energy and Buildings)	Strategy 3 (Waste & Wastewater, Water)	Urban Tree Planting	State and Federal Measures	Emissions Remaining after All Reduction Measures	Target Emission Levels
2035	19,644	21,213	4,183	986	27,021	69,659	69,608

There is a gap of less than 100 MT CO_2e to reach the 2035 target. Solana Beach will consider the purchase of carbon offsets as an option for the City Council to consider and decide on in order to close this gap. Figure 1 provides a visualization of the targets and the reductions provided in Tables 1 and 2.

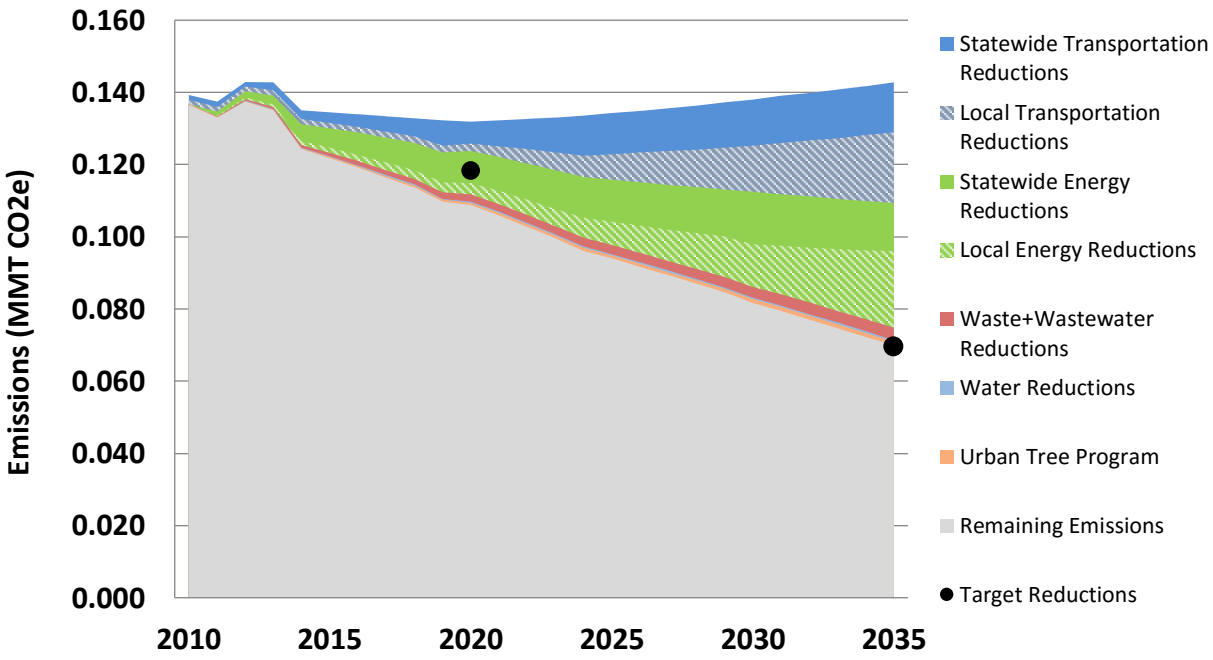


Figure 1 Business-As-Usual Emissions Projection and GHG Reduction Potential in Solana Beach CAP

In Figure 1, the BAU emissions are represented along the top of the graph. The two black dots on the graph represent the target emission levels for 2020 and 2035. The colored wedges represent the reduction amount in metric tons CO_2e from each mitigation strategy. The gray wedge represents the remaining emissions after all the measures have taken place over time. Table 3 presents a detailed summary of the projected greenhouse gas emission reductions from each measure and action, including federal, state and local measures and their contribution to the overall reduction.

[4] Reduction measures are provided only for 2035, since the 2020 targets are achieved for Solana Beach from state and federal measures only.

Table 3 Summary of GHG Emission Reduction from Measures in the Solana Beach CAP (MT CO_2e)

Federal & State Measures	**2035**
Federal and State Vehicle Efficiency Standards	13,336
California Tire Pressure Program	415
California Renewables Portfolio Standards	11,629
California Utility Energy Efficiency Program	1,560
2013 Building Energy Efficiency Standards	6
Additional Achievable Energy Efficiency Savings from CA Appliance Standards	75
Local Measures	**2035**
Strategy 1: Transportation	
Electric Vehicles (EVs) and Alternative Fuel Vehicles (AFV)	17,495
Increase Commuting by Vanpools	608
Reduce Average Commuter Trip Distance by 1 mile	464
Increase Commuting by Mass Transit	429
Increase Preferred Parking for Electric Vehicles and Alternative Fuel Vehicles (AFV)	325
Retime Traffic Signals	144
Promote Telecommuting	86
Convert Municipal Gasoline Fueled Vehicle Fleet to Electric Vehicles	56
Increase Commuting by Walking	16
Increase Commuting by Bicycle	11
Promote Alternative Work Schedule	9
Strategy 2: Electricity and Natural Gas	
Community Choice Aggregation or Another Program Above RPS Compliance	10,466
Achieve 10.8 MW Residential Rooftop Solar PV Systems	5,858
Achieve 2 MW Commercial Rooftop Solar PV Systems	1,085
Solar Hot Water Heater (SHW) at Commercial Spaces	2,811
Solar Hot Water Heater (SHW) at New Homes and Home Retrofits	539
Reduction in Other Residential Natural Gas Use	359
Residential Energy Efficiency Retrofits	59
Commercial Energy Efficiency Retrofits	37
Strategy 3: Waste and Water	
Divert Waste from Landfills & Capture Landfill Gas Emissions	3,389
Capture Emissions from Wastewater Treatment	66
Current Water Rate and Billing Structure	407
Recycled Water Program Expansion	292
Water Conservation and Disclosure Ordinance	30
Urban Tree Planting Program	986
Carbon Offsets Purchase	51

4 BACKGROUND AND COMMON ASSUMPTIONS

A set of common assumptions and sources was used to calculate potential emission reductions for the measures and actions included in the CAP. The following section provides assumptions that were applied to measures related to electricity, natural gas, and transportation. Other actions with specific methods and data are provided in Sections 5 and 6.

4.1 Common Background Data

Table 4 presents a summary of common data used to estimate both overall greenhouse gas emissions and the reduction estimates for each specific action.

Table 4 Common BAU Data for City of Solana Beach CAP

Data Category	2010	2020	2035
Population[5]	12,867	13,376	14,207
Vehicle Miles Traveled (miles/day)[6]	480,747	505,894	592,290
Gross Generation (GWh)[7]	90	92	98
Total Occupied Housing Units[8]	5,650	5,687	6,005
Water Consumption (million gallons)[9]	1,061	1,179	1,252

4.2 Electricity and Natural Gas Related Measures

The following assumptions were used in calculating greenhouse gas reduction for actions related to the electricity and natural gas categories.

4.2.1 Greenhouse Gas Emission Factor for Electricity

The greenhouse gas emission factor for electricity, measured in pounds CO_2e per megawatt-hour (lbs CO_2e/MWh), is used in several ways throughout the CAP, including to determine the emissions associated with electricity production for the overall inventory and to estimate the effect of measures in the CAP to reduce electricity. This emission factor is based on electricity from three categories of supply: the utility (SDG&E), Community Choice Aggregation or another program, and solar PV supply (residential and commercial). Each category of supply has its own renewable content, which affects the overall emission factor. The following sections describe the method to develop an overall average emission

[5] Population in 2010 is from SANDAG Demographic & Socio Economic Estimates (Updated in September 9, 2015). Population in 2020 and 2035 are from SANDAG Series 13 Regional Growth Forecast (Updated in October 2013). Download Date: 03/30/2016. SANDAG Data Surfer. http://datasurfer.sandag.org/

[6] SANDAG Origin-Destination VMT. VMT data were provided for 2010, 2013, 2020 and 2035. VMT Data (miles/weekday) received by EPIC on 09/23/2015. All intermediate years were interpolated and converted to miles/day from miles/weekday using a "5 to 7 day conversion" as described in *City of Solana Beach Greenhouse Gas Emissions Inventory and Forecast (EPIC, 2016)*.

[7] Gross generation is the sum of the electricity from SDG&E sales, PV generation (residential + non-residential), additional load from Electric Vehicles (EVs) due to local EV measures and transmission and distribution losses. Baseline year PV generation is estimated using all SDG&E interconnected PV system capacities in Solana Beach.

[8] Total occupied single family and multi-family units in 2010 is from SANDAG Demographic & Socio Economic Estimates (Updated in September 9, 2015). Units in 2020 and 2035 are from SANDAG Series 13 Regional Growth Forecast (Updated in October 2013). Download Date: 03/30/2016. SANDAG Data Surfer. http://datasurfer.sandag.org/

[9] 2010 water consumption was provided by Santa Fe Irrigation District to EPIC in July 2015. 2020 and 2035 water consumptions were projected based on 2012 per capita water supply (latest year with data available) and population from SANDAG Series 13 Forecast.

factor. This method applies to the 2010 baseline as well as each year within the CAP horizon. As the percentage of renewable supply increases due to policy changes and the percentage of non-renewable supply decreases, the overall average emission factor of electricity supply decreases.

4.2.1.1 SDG&E (Utility) Supplied Electricity

The emission factor for SDG&E service territory includes emissions from several sources of supply 1) the emissions from SDG&E owned power plants, 2) emissions from electricity procured by SDG&E (specified and unspecified sources), and 3) emissions from electricity provided by other electricity providers – known as Direct Access (DA) where SDG&E provides transmission and distribution services.

The Renewables Portfolio Standard (RPS) requires all California's electric service providers to increase procurement from eligible renewable energy sources to 33% of total procurement by 2020, and 50% by 2030.[10]

4.2.1.2 Community Choice Aggregation (CCA) or Another Program

The City of Solana Beach CAP plans to assess and implement a Community Choice Aggregation (CCA) or other program to help achieve the goal of 100% renewable electricity by 2035.

CCA or another program would use the existing SDG&E distribution and transmission system to supply the electricity. We assume the program will begin in 2020. By 2035, 90% of the eligible customers would participate in the program[11] and the renewable content in the electricity supply from the CCA or another program is 100% renewable.

The quantity of renewable energy supplied by the CCA or another program would affect the overall average emission factor. By 2035, the CCA program would significantly affect the emission factor of electricity with 100% renewable energy supply. The Renewables Portfolio Standard (RPS) requires all California's electric service providers, including CCA, to meet the requirement. A portion of the total emissions reductions from achieving 100% renewable supply through CCA or another program are attributed to RPS compliance and the remaining reductions are attributed to local action.

4.2.1.3 Residential and Commercial PV (Local Measure)

Electricity generation from residential and commercial PV is part of the overall supply of electricity within Solana Beach. For the purpose of estimating emissions reduction in the CAP, electricity from PV is assumed 100% renewable and has no associated greenhouse gas emissions. Electricity from PV is also used to adjust the overall average emission factor for electricity.

4.2.1.4 Overall Average Emission Factor for Electricity

The overall average emission factor for electricity is a weighted average of all three supply categories described above: utility, CCA or another program, and residential and commercial PV. The emission factor was weighted by the percentage of gross generation supplied by each category and the percentage of renewable content in each category.

Table 5 presents the contribution from each category to gross generation and overall renewable content, as well as the weighted average emission factors for 2020 and 2035.

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[10] California Public Utilities Commission. RPS Program Overview. http://www.cpuc.ca.gov/RPS_Overview/ Senate Bill No. 350 - – Clean Energy and Pollution Reduction Act of 2015. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

[11] A 90% participation rate appears reasonable or slightly conservative based on the current opt-out rates in the most recent CCA programs in California. For example, the opt-out rate in the San Francisco CCA is 3% as of March 2017, while the CCAs planned to commence in 2017 assume an opt-out rate of 15%.

Table 5 Overall Average Emission Factor and Contribution from Each Category

Year	Category	SDG&E	CCA or Another Program	PV	Total	Overall Average Emission Factor (lbs CO_2e/MWh)
2020	% of Gross Generation Supplied	91%	-	9%	100%	469
	% Renewable Content	33%	-	100%	39%	
2035	% of Gross Generation Supplied	8%	69%	23%	100%	30
	% Renewable Content	50%	100%	100%	96%	

In 2020, the projected electricity supply from residential and commercial PV systems is expected to be 9% of gross generation. The CCA or another program is projected to start in 2020 so SDG&E supplies the rest with 33% RPS-compliance renewables. In 2035, the projected electricity supply from PV reaches a higher penetration level to 23%. [12]The renewable content in CCA or another program increases to reach 100%, while the renewable content in SDG&E's electricity supply increases to 50% to comply with the RPS target in SB350.[13]

This overall average emission factor was used to estimate the total reduction from measures affecting the overall emission factor, including from the Renewable Portfolio Standards (both utility and CCA or another program), from the CCA or another program and from PV. The projected emission reductions from each measure was calculated using gross generation and the difference between the 2010 baseline emission factor and overall average emission factor.

4.2.2 Greenhouse Gas Emission Factor for Natural Gas

For all measures related to natural gas, the emission factor of 0.0054 metric tons CO_2e per therm[14] was used for all years to estimate potential emissions reductions from reducing natural gas consumption.

4.3 Transportation Related Measures

The following assumptions were used in calculating greenhouse gas reductions for measures related to transportation, including Strategy 1 in local measures.

4.3.1 Vehicle Miles Traveled (VMT)

SANDAG provided VMT data for Solana Beach for all vehicle types based on the Origin-Destination (O-D) method for 2010, 2013, 2020 and 2035. The O-D VMT method as detailed in the U.S. Community Protocol estimates miles traveled based on where a trip originates and where it ends to more accurately

[12] The PV penetration level (gross generation supplied by electricity generation from rooftop solar) is based on the residential solar PV capacity target (10.8 MW) and commercial solar PV capacity target (2 MW) described in Section 6.2.2 and Section 6.2.3.

[13] SB350, California's Clean Energy and Pollution Reduction Act of 2015, requires that the amount of electricity generated and sold to retail customers per year from eligible renewable energy resources be increased from 33% in 2020 to 50% by December 31, 2030.

[14] ARB. 2014. Documentation of California's Greenhouse Gas Inventory. Fuel Combustion – Natural Gas. http://www.arb.ca.gov/cc/inventory/doc/docs1/1a1ai_instategenerationutilityowned_fuelcombustion_naturalgas_ch4_2013.htm

allocate on-road emissions to cities and regions with policy jurisdiction over miles traveled.[15] O-D VMT includes trips that originate and end within the designated boundary, in this case the Solana Beach's boundary (Internal-Internal), as well as trips that either begin within the designated boundary and end outside of it (Internal-External) or vice versa (External-Internal). Internal-External and External-Internal miles include the miles inside Solana Beach's boundary and outside Solana Beach's boundary but within San Diego region. The Internal-External/External-Internal miles are divided by 2 to evenly allocate the miles to the outside jurisdiction, as recommended in the U.S. Community Protocol. Total VMT included is then multiplied by 0.96[16] to convert from average weekday VMT to average week VMT, including weekends. The VMT from trips that begin and end outside the designated boundary (External-External) are excluded and emissions from this category of VMT are not allocated to the jurisdiction.

4.3.2 Greenhouse Gas Emission Factor for Transportation

The emission factor for vehicle miles traveled, expressed in grams of carbon dioxide equivalent per mile (g CO_2e/mile), is used in several ways throughout the CAP, including determining the emissions associated with on-road transportation for the overall inventory and to estimate the emissions impact of measures in the CAP that affect both the rate of emissions (e.g., vehicle efficiency standards) and vehicle miles traveled (e.g., program commuting by mass transit).

The California Air Resources Board EMFAC2011 model is used to determine the emission factor.[17] The EMFAC2011 model provides emissions reduction from Pavley I (model year 2009-2016) and the Low Carbon Fuel Standard (LCFS). Effects of the new Corporate Average Fuel Economy (CAFE) standards that will apply to vehicles produced from 2017 to 2025 were incorporated with the results from EMFAC2011 to account for the effect on emissions reduction.

Similar to the overall average electricity emission factor, to account for the effect of CAP actions in the transportation sector, an overall average emission factor for transportation is developed.

The emissions factor is weighted according to the relative shares of each action affecting the emissions rate, including Federal and States Vehicle Efficiency standards, the Low Carbon Fuel Standard (LCFS), and increase of Electric Vehicle (EV) and Alternative Fueled Vehicles (AFV) program from local measures. All miles (Table 4) are allocated among the three categories, similar to allocating the gross generation into three categories in the previous electricity measures section. This relation can also be used to determine the total greenhouse gas reductions resulting from the combination of the Federal and State Vehicle Efficiency standards, EV and AFV program.

Because vehicle efficiency improves over time and with the increased use of EVs and AFVs, the on-road transportation emission factor per mile decreases. Therefore, measures that reduce VMT offset a proportionally smaller greenhouse gas emissions reduction over time.

[15] ICLEI – Local Government for Sustainability USA. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0 (2012) Appendix D. Transportation and Other Mobile emission Activities and Sources.

[16] The "5 to 7 day conversion" factor was provided by SANDAD and described in the *City of Solana Beach Greenhouse Gas Emissions Inventory and Forecast (EPIC, 2016)*.

[17] EMFAC2011 is used because the source of VMT in EMFAC2011 is from Metropolitan Planning Organization (MPO)'s travel demand model. For the San Diego region, it is from the SANDAG Series 12 Growth Forecast Model, which is consistent with the source of VMT provided by SANDAG for Solana Beach CAP updates.

4.4 Rounding of Values in Tables and Figures

Within the tables, charts, and figures found throughout the appendices, rounding of values is often required. Within the actual calculations, however, values are not rounded at intermediary steps to avoid introducing unnecessary error. As a result of rounding, some totals may not equal the values summed.

5 FEDERAL AND STATE MEASURES

Federal and state measures are expected to reduce greenhouse gas emissions significantly over the timeframe of the Solana Beach CAP. This section provides a summary of the methods used to estimate the greenhouse gas reductions associated with the following actions:

- Federal and State Vehicle Efficiency Standards
- California Tire Pressure Program
- California Renewables Portfolio Standards
- California Energy Efficiency Program
- 2013 Building Energy Efficiency Standards
- Additional Achievable Energy Saving from Energy and Appliance Standards

5.1 Federal and State Vehicle Efficiency Standards

California's AB 1493 (2002, Pavley I) required manufacturers to achieve tailpipe emissions standards for greenhouse gases. In May 2009, the federal Corporate Average Fuel Economy (CAFE) Standards were adjusted to conform to California's Pavley I. California then amended AB 1493 (Pavley I) to conform to the federal CAFE standard from 2012 to 2016, on condition that it receives a waiver to set its own vehicle standards after 2016 and enforce its standards for model years 2009 to 2011. CAFE mandates the sales-weighted average fuel economy in miles per gallon (mpg) for passenger cars and light-duty trucks in a manufacturer's fleet. New passenger vehicles must meet a sales weighted average of 39 mpg and light duty trucks must meet a value of 30 mpg, resulting in a fleet average 34.5 mpg. If achieved solely by fuel economy, this corresponds to tailpipe CO_2e emissions of 250 grams per mile (g/mi) in 2016 from those vehicles.

Multipliers were used to separate out the effects of Pavley I/CAFE and the Low Carbon Fuel Standard (LCFS) from the EMFAC2011 output emissions. The GHG emissions reductions due to the LCFS were then excluded as the LCFS is no longer considered to affect tailpipe emissions. Effects of the new Corporate Average Fuel Economy (CAFE) standards that will apply to vehicles produced from 2017 to 2025 were incorporated in addition to the results from EMFAC2011, which only included the effects of the CAFÉ standards through 2016. Miles driven by EVs or AFVs were not considered a part of this standard. The emissions reductions from federal and state fuel economy standards for Solana Beach is estimated as 13,335 MT CO_2e in 2035.

5.2 ARB Tire Pressure Program

The California Air Resources Board (ARB) Tire Pressure Regulation[18] that went into effect in September 2010 leads to improved fuel efficiency and reduces greenhouse gas emissions. In its *Status of the Updated Scoping Plan 2010*, ARB estimated that this requirement, which applies to all vehicles less than 10,000 pounds and is implemented by all automotive service providers, would reduce statewide

[18] California Air Resources Board. Tire Inflation Regulation. https://www.arb.ca.gov/cc/tire-pressure/tire-pressure.htm

emissions by 0.6 MMT CO_2e in 2020. [19] We scaled statewide emissions reductions to Solana Beach using the ratio of Solana Beach's VMT to the State of California's VMT.[20] Table 6 summarizes the key assumptions and results.

Table 6 Key Assumptions and Results for CARB's Tire Pressure Program

Year	Statewide GHG Reduction (MMT CO_2e)	Fraction of City VMT to Statewide VMT	% of Statewide Goal Achieved	GHG Reduction (MT CO_2e)
2035	0.6	0.06%	100%	415

5.3 California Renewables Portfolio Standard

Signed into law in 2011, the Renewables Portfolio Standard (RPS) requires all of California's electric service providers to increase procurement from eligible renewable energy sources to 33% of total procurement by 2020.[21] In 2015 Governor Brown signed into law SB 350, which increases renewable electricity targets to 50% by 2030.[22] The estimates of emissions reduction are based on these state policies: 33% RPS requirements being achieved by 2020 and the new proposed state target of 50% renewables being reached by 2030.

In the CAP, all electricity supplies are considered as the level of activity in one category directly affects the electricity supplied by other categories and the overall average emission factor for electricity. The RPS is based on total sales by all electricity supply providers including the utility and CCA or another program. The total emissions reductions from these policies are affected by the level of rooftop solar PV penetration as well. The emissions reduction from RPS include both utility and CCA or another program compliances (Table 7).

Table 7 Electric Service Providers and the GHG Reduction from RPS in 2035

Electric Service Provider	GHG Reduction from RPS (MT CO_2e)
Utility (SDG&E)	1,163
CCA or Another Program	10,466
Total	**11,629**

5.3.1 Utility (SDG&E) Compliance with Renewable Portfolio Standard

The projected greenhouse gas emissions reduction from utility (SDG&E) supplied electricity are calculated based on its contribution to gross generation and its renewable content. Reduction estimates are based on SDG&E and other suppliers reaching the 33% RPS target by 2020 and 50% RPS target by

[19] California Air Resources Board, 2008. Status of Scoping Plan Measures, pg. 4, Available at http://www.arb.ca.gov/cc/scopingplan/status_of_scoping_plan_measures.pdf.
[20] California Department of Transportation, 2010. Highway Performance Monitoring System (HPMS). Available at http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2010PRD.pdf.
[21] Senate Bill No. 2. Available at http://www.leginfo.ca.gov/pub/11-12/bill/sen/sb_0001-0050/sbx1_2_bill_20110412_chaptered.pdf.
[22] Senate Bills 350 – Clean Energy and Pollution Reduction Act of 2015. Available at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350..

2030. Between 2030 and 2035, the renewable content for SDG&E supply was held constant at 50% for calculating the projected emissions reduction.

To calculate the emissions reduction from the utility compliance with RPS, the total emissions reduction from utility, CCA and PV programs were allocated using the method described in the "Greenhouse Gas Emissions Factor for Electricity" section. Table 8 summarizes the key assumptions, values used, and results.

Table 8 Key Assumptions and Results for Utility Compliance with RPS

Year	% of Gross Generation Supplied by SDG&E	Electricity Supplied (GWh)	% Renewable Content in Supply	GHG Reduction from Utility Compliance with RPS (MT CO_2e)
2035	8%	7.5	50%	1,163

5.3.2 CCA or Another Program Compliance with Renewable Portfolio Standard

As the CCA or another program projected to start in 2020, it is also subject to the Renewable Portfolio Standard and a portion of the total emissions reduction would be attributed to RPS compliance. The emissions reduction attributed to the RPS compliance and to local measure (renewable content above RPS compliance) are based on percent of renewable content in the RPS requirement and the percent of renewable content in CCA or another program. The breakdown of RPS Compliance and Local Action-Above RPS Compliance is given in
Table 9. A detailed method on the total emissions reduction from CCA or another program is given in Section 6.2.1.

Table 9 Breakdown of Emissions Reduction from CCA Program

Category	2035	
	% Renewable in the Supply	GHG Reductions (MT CO_2e)
CCA or Another Program – RPS Compliance	**50%**	**10,466**
CCA or Another Program – Above RPS Compliance	50%	10,466
Total	100%	20,932

5.4 2013 Building Energy Efficiency Standards

The Building Energy Efficiency Standards (Title 24, Part 6) before 2013 are incorporated into the BAU emissions projection. The additional emissions reduction from the 2013 Building Energy Efficiency Standards was calculated for the CAP horizon. Reductions from 2014 to 2024 were scaled from statewide electricity and natural gas savings, based on the 2014-2024 California Energy Commission's

Energy Demand Forecast,[23] using a ratio of Solana Beach natural gas and electricity demand to that of the state. The same statewide electricity and natural gas saving for year 2024 were applied to each year for the period 2025 – 2035, reductions from 2025 to 2035 were calculated using the same method as 2014-2024 but based on the 2024 annual savings amount. Table 10 summarizes the key assumptions and results. As the renewable content in electricity increases, the emissions reduction from energy efficiency standards decreases.

Table 10 Key Assumptions and Results for 2013 Building Energy Efficiency Standards

Year	% of Statewide Electricity Demand in Solana Beach	Electricity Saving from 2013 Building Standards in Solana Beach (MWh)	% of Statewide Natural Gas Demand in Solana Beach	Natural Gas Saving from 2013 Building Standards in Solana Beach (Therms)	GHG Reduction from 2013 Building Standards (MT CO_2e)
2035	0.03%	398	0.02%	117	6

5.5 Additional Achievable Energy Efficiency Saving from Energy and Appliance Standards

The California Energy Commission's Energy Demand Forecast includes Additional Achievable Energy Efficiency (AAEE) from the initiatives and programs that are neither finalized nor funded but are reasonably expected to occur. In the 2014-2024 Energy Demand Forecast, the AAEE savings include estimated saving from 1) 2016, 2019 and 2022 Title 24 standards 2) 2016 Title 20 standards and 3) adopted and future federal appliances standards.[24] Similar estimates for energy savings from the 2013 Building Energy Efficiency Standards, the statewide AAEE savings from standards (mid savings scenarios) are scaled to Solana Beach using the same scaling factor as in Table 10. Table 11 summarizes the key assumptions and results. As the renewable content in electricity increases, the emissions reductions from energy efficiency standards decrease.

Table 11 Key Assumptions and Results for Additional Achievable Energy Efficiency Saving from Energy and Appliance Standards

Year	% of Statewide Electricity Demand in Solana Beach	Electricity Saving from AAEE Saving in Solana Beach (MWh)	% of Statewide Natural Gas Demand in Solana Beach	Natural Gas Saving from AAEE Saving in Solana Beach (Therms)	GHG Reduction from AAEE Saving (MT CO_2e)
2035	0.03%	3,697	0.02%	4,779	75

5.6 California Utility Energy Efficiency Programs

On October 16, 2014 the CPUC adopted Decision 14-10-046 in Rulemaking 13-11-005135, which establishes electricity and natural gas reduction targets for the investor-owned utilities in California for 2015. SDG&E is the utility in San Diego region administer energy efficiency programs. To determine the emissions reduction associated with the efficiency programs, we estimated the energy saving potential

[23] California Energy Demand 2014-2024 Final Forecast Table 26. Estimated Statewide Electricity Saving from 2013 Title 24 Building Standards Updates for 2015, 2018, 2020 and 2024.
http://www.energy.ca.gov/2013publications/CEC-200-2013-004/CEC-200-2013-004-V1-CMF.pdf

[24] California Energy Demand 2014-2024 Final Forecast. Chapter 4.
http://www.energy.ca.gov/2013publications/CEC-200-2013-004/CEC-200-2013-004-V1-CMF.pdf

from the program. The goals included in this decision were based on an energy saving goals study conducted by Navigant.[25] The study broke overall energy efficiency goals into two categories: (1) programs and (2) codes and standards (other than appliance and building standards). The final 2015 energy reduction target for SDG&E included in CPUC Decision 14-10-046 was slightly lower than the values in the Navigant study. To account for this difference, the study values were adjusted for 2015-2024 by the ratio of those in the Decision with those in the Navigant study. The utility total estimated energy reduction was scaled to Solana Beach using a ratio of Solana Beach's natural gas and electricity demand to that of the SDG&E service area. Table 12 summaries the key assumptions and results. As the renewable content in electricity increases, the emissions reduction from energy efficiency standards decreases.

Table 12 Key Assumptions and Results for Utility Energy Efficiency Program

Year	% of SDG&E Service Area Electricity Demand in Solana Beach	Electricity Saving from SDG&E Efficiency Program in Solana Beach (MWh)	% of SDG&E Service Area Natural Gas Demand in Solana Beach	Natural Gas Saving from SDG&E Efficiency Program in Solana Beach (Therms)	GHG Reduction from SDG&E Efficiency Program (MT CO_2e)
2035	0.4%	19,897	0.3%	238	1,560

6 LOCAL MEASURES

The following section includes the local measures that lead to the emissions reductions in 2035 from the following main strategies: Transportation, Electricity and Natural Gas, and Waste and Water, and an urban tree planting program. With the assumptions and measures in this CAP, there is a gap of less than 100 MT in achieving the target in 2035. It is assumed that Solana Beach will purchase carbon offsets to close the gap for 2035.

6.1 Strategy 1: Transportation

The measures and actions in Strategy 1 aim to reduce vehicle miles traveled (VMT) and vehicle fuel use in Solana Beach.

6.1.1 Electric Vehicles (EVs) and Alternative Fuel Vehicles (AFVs)

Solana Beach aims to increase the percentage of VMT driven by Electric Vehicles (EVs) and other Alternative Fuel Vehicles (AFVs) to 30% of total VMT by 2035. It is assumed that less than 1% of Solana Beach's VMT was attributed to EVs and AFVs in 2010.[26] This measure would require the city to work with SANDAG to help in increasing EVs in the region in order to achieve the increase in Solana Beach, as well as identify incentives for Solana Beach residents' increasing use of EVs.

The electricity consumption associated with increasing EVs (additional EV load) was allocated to the electricity category, as part of estimated gross generation (Table 4). The emissions reduction from this action was described in Greenhouse Gas Emissions Factor for Transportation section, based on the

[25] Navigant Consulting, 2013. California Energy Efficiency and Potential Goals Study.

[26] This assumption is based on allocating California Energy Demand 2014-2024 Final Forecast mid-case scenario statewide electricity consumption for EVs to Solana Beach and Clean Vehicle Rebate Project (CVRP) database, the number of EVs in Solana Beach at 2010 is smaller than 10.

percentage of total VMT driven by EV and the impact of the zero emission miles on the overall average emission factor for transportation. Table 13 summarizes the key assumptions and results.

Table 13 Key Assumptions and Results for EVs and AFVs

Year	% VMT Driven by EVs or AFVs	VMT Driven by EVs or AFVs (miles/year)	GHG Reduction (MT CO_2e)
2035	30%	64,708,354	17,495

6.1.2 Increase Commuting by Vanpool

By participating in vanpools, the labor force in Solana Beach can reduce its commuting VMT. The goal of the CAP is to increase vanpooling to 20% of labor force by 2035, assuming an average vanpool size of 8 people and an average vanpool commuter distance of 50 miles.[27] Vanpools are most effective where they avoid long commute distances by single-occupant vehicles. This would require the city to work with SANDAG to identify the longest commute distances and associated employers in order to add vanpools. To determine VMT avoided by vanpooling, the difference in percent ridership compare with baseline year was multiplied by the labor force, average commute distance and 255 work days per year. The resulting VMT avoided was converted to GHG emissions reductions using the overall average emission factor. Table 14 summarizes the key assumptions and results.

Table 14 Key Assumptions and Results for Increasing Commuting by Vanpools

Year	Total Labor Force	% of Labor Force Vanpooling	Average Van Pool Size	VMT Reduced by Vanpooling (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	7,498	20%	8	2,501,802	242	608

6.1.3 Reduce Average Commuter Trip Distance by 1 mile

This action is aimed to reduce average commuter trip distance of the labor force by 1 mile. The current average commute distance in Solana Beach is 15 miles, and this measure would lead to an average commute distance of 14 miles in 2035. The city could achieve this through increasing density over time. The resulting VMT avoided due to reduced commuter miles was converted to GHG emissions reduction using the overall average emission factor. Table 15 summarizes the key assumptions and results.

Table 15 Key Assumptions and Results for Reduce Average Commuter Trip Distance

Year	Total Labor Force	VMT Reduced by Reduce Average Commute Distance (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	7,498	1,911,932	242	464

[27] The 2035 labor force in Solana Beach was estimated using a scaling factor of labor force to population, and SANDAG population forecast. The scaling factor is based Solana Beach 2010-2014 labor force and population estimates. http://www.labormarketinfo.edd.ca.gov/data/unemployment-and-labor-force.html

6.1.4 Increase Commuting by Mass Transit

The CAP aims to achieve 10% mass transit ridership by its labor force by 2035 through incentives. It is assumed the mass transit ridership is 1.1% in 2010.[28] To calculate emissions reductions, increasing mass transit ridership was multiplied by the labor force to determine number of commuters using mass transit. Commuters using mass transit were multiplied by the average commute distance in 2035 (14 miles) and work days per week to determine annual VMT avoided. VMT avoided due to increase commuting by mass transit was converted to GHG emissions reduction using the overall average emission factor. Table 16 summarizes the key assumptions and results.

Table 16 Key Assumptions and Results for Increasing Commuting by Mass Transit

Year	Total Labor Force	% of Labor Force Using Mass Transit	VMT Avoided by Increase Mass Transit (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	7,498	10%	1,755,625	242	429

6.1.5 Increase Preferred Parking for Electric Vehicles (EVs) and Alternative Fuel Vehicles (AFVs)

To promote the use of high-efficiency and clean vehicles, the CAP plans to increase the preferred parking space for EVs and AFVs city-wide. The city would convert 20% of the eligible city parking spots to preferred parking for EVs and AFVs, a total of 375 parking spaces converted of the estimated 1875 spots. Avoided annual VMT was calculated based on commuter trips using conventional vehicles reduced and converted to emission reduction. Table 19 summarizes the key assumptions and results.

Table 17 Key Assumptions and Results for Increase Preferred Parking for EVs and AFVs

Year	EVs and AFVs Preferred Parking Space Converted	VMT Avoided by EVs and AFVs Preferred Parking (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	375	1,337,750	242	325

6.1.6 Retime Traffic Signals

The CAP aims to retime 4 traffic signals by 2035. The City would have to identify the traffic lights along arterials that could be re-timed. Retimed traffic signal will have a traffic flow smoothing effect leading to reduced fuel use by on-road vehicles at the intersections. The effect of retiming traffic signals on fuel reduction at the intersection was estimated based on SANDAG's studies on traffic signal optimization.[29] Table 18 summarizes the key assumptions and results.

[28] American Community Survey. Solana Beach. Means of transportation to work. 2010. https://factfinder.census.gov/

[29] Silva-Send, N., et al., *Cost effectiveness comparison of certain transportation measures to mitigate greenhouse gas emissions in San Diego County, California.* Energy Policy (2013). SANDAG Traffic Signal Optimization Program. The estimated fuel saved per intersection is 7,835 gallons/day.

Table 18 Key Assumptions and Results for Retiming Traffic Signals

Year	Number of Retimed Traffic Signals	Equivalent Fuel Savings in Solana Beach (gallons/year)	GHG Reduction (MT CO_2e)
2035	4	11,439,100	144

6.1.7 Promote Telecommuting

The CAP aims to increase the workers who have telecommutable jobs to participating in telecommuting to 10% by 2035. The participation rate at baseline year 2010 was assumed at 5%. City actions could include incentives and educational activities to promote telecommuting. It was assumed that 33% of the jobs in the San Diego region, therefore also in Solana Beach, are telecommutable, based on SANDAG studies.[30] The participating labor force was assumed to telecommute 2 days a work week by 2035. To calculate the annual VMT avoided by telecommuting, the number of telecommuters was multiplied by days per week telecommuted, the average commute distance, and the number of work weeks per year. VMT avoided due to increase telecommuting was converted to GHG emissions reduction using the overall average emission factor. Table 19 summarizes the key assumptions and results.

Table 19 Key Assumptions and Results for Telecommuting

Year	% of Telecommutable Jobs	% of Eligible Labor Force who telecommute	VMT Avoided by Telecommuting (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	33%	10%	353,325	242	86

6.1.8 Convert Municipal Gasoline Fueled Vehicle Fleet to Electric Vehicles

The City of Solana Beach maintains a vehicle fleet for municipal operations use. Converting municipal gasoline fueled vehicle fleet to Electric Vehicles (EVs) or Alternative Fuel Vehicles (AFVs) will reduce gasoline use and reduce GHG emissions. The CAP assumes that the city will take action to reduce by 50% the current gasoline consumption by 2035 by converting the municipal fleet to EVs and AFVs. The current fleet gasoline consumption is approximately 12,000 gallons and we assumed the fuel needs for municipal operations will remain the same through 2035.[31] The GHG emissions from fleet gasoline use was calculated based on total gasoline use and the emission factor for gasoline.[32] Table 20 summarizes the key assumptions and results.

Table 20 Key Assumptions and Results for Convert Municipal Fleet to EVs and AFVs

Year	Fleet Gasoline	Total GHG Emissions from Fleet Gasoline Use	Reduction in Gasoline Use	GHG Reduction (MT CO_2e)

[30] Silva-Send, N., et al., *Cost effectiveness comparison of certain transportation measures to mitigate greenhouse gas emissions in San Diego County, California.* Energy Policy (2013).
[31] Current (2016) fleet gasoline consumption was provided by City of Solana Beach.
[32] Emission factor for gasoline is 19.6 lbs CO_2e/gallon gasoline. U.S Energy Information Administration. https://www.eia.gov/tools/faqs/faq.cfm?id=307&t=11

	Consumption (gallons)	(MT CO_2e)		
2035	12,000	112	50%	56

6.1.9 Increase Commuting by Walking

The CAP aims to increase percent of labor force commuting by walking from 3.4% in baseline 2010 to 5% in 2035[33]. The City would have to identify the labor force within Solana Beach working in Solana Beach and identify areas to improve their walkability. It was assumed that the average round trip of commuter walking distance is 0.67 miles. To calculate annual VMT avoided, number of commuters by walking was multiplied by round trip walking distance and work days per year. VMT avoided due to increase commuting by walking was converted to GHG emissions reduction using the overall average emission factor. Table 21 summarizes the key assumptions and results.

Table 21 Key Assumptions and Results for Increase Commuting by Walking

Year	Total Labor Force	% of Labor Force Commute by Walking	VMT Avoided with Commuting by Walking (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	7,498	5%	64,050	242	16

6.1.10 Increase Commuting by Bicycle

Solana Beach currently has 10 miles of bicycle lanes within its 3.5 square mile territory, therefore approximately 2.8 bike lane miles per square mile. Solana Beach has a plan being implemented to increase this number to 13 lane miles by 2019, or about 3.8 bike lane miles per square mile. The CAP assumes an additional 1 mile per square mile to be achieved by 2035, or 4.8 bike lane miles per square mile. This converts to 16.8 bike lane miles within its territory by 2035.[34] The increase in percentage of commuters using bikes is assumed to be proportional to the increase in bike lanes mile per square mile.[35] To calculate annual VMT avoided, the increase in percentage of commuters by bicycle was multiplied by a 2-mile commute distance avoided[36] and 255 work days per year. VMT avoided due to increase commuting by bicycle was converted to GHG emissions reduction using the overall average emission factor. Table 22 summarizes the key assumptions and results.

Table 22 Key Assumptions and Results for Increase Commuting by Bicycle

Year	Additional Bike Lane Miles per Square Mile	VMT Avoided by Bike Strategy (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	2	44,357	242	11

[33] American Community Survey. Solana Beach. Means of transportation to work. 2010. https://factfinder.census.gov/

[34] The current (2016-2017) bike lane miles in the city are 10 (3 bike lane miles/square mile). Bike lane miles were provided by City of Solana Beach based on GIS analysis and the CAE Estimated Network.

[35] Elasticity of adding each additional mile of Class II bike lanes per square mile to increase in bicycle commuting is based on Dill and Carr (2003). *Bicycle Commuting and Facilities in Major U.S. Cities: If you build them, commuters will use them – another look.*

[36] Assumes commuters traveling only a short distance will choose to bike.

6.1.11 Promote Alternative Work Schedule

The CAP aims to increase the percentage of labor force with an alternative work schedule to 1% by 2035. This represents 75 employees with an alternative schedule in 2035. The City could achieve this by working with SANDAG to identify commuters who can have an alternative schedule at their place of employment, and through educational and marketing activities. To estimate the potential emissions reduction, it is assumed four (4) miles were driven in off days by each commuter, and that a standard work week is five (5) days. To calculate annual VMT avoided, the number of commuters on alternative work schedule was multiplied by work days per year and the difference between the average commute distance and miles driven on off days. VMT avoided due to alternative work schedule was converted to GHG emissions reduction using the overall average emission factor. Table 23 summarizes the key assumptions and results.

Table 23 Key Assumptions and Results for Promote Alternative Work Schedule

Year	Total Labor Force	% of Labor Force with Alternate Work Schedule	VMT Avoided by Alternate Work Schedule (miles/year)	Overall Average Emission Factor (g CO_2e/mile)	GHG Reduction (MT CO_2e)
2035	7,498	1%	38,239	242	9

6.2 Strategy 2: Energy & Buildings

The measures and actions under Strategy 2 aim to reduce residential and commercial energy consumption as well as increase renewable supply in the electricity beyond RPS compliance level. The following provides information about the data and methods used to calculate the related energy and emissions reduction.

6.2.1 Community Choice Aggregation (CCA) or another Program above RPS Compliance

As described in the Section 4.2.1 - Greenhouse Gas Emission Factor for Electricity above, electricity from renewable in Solana Beach is supplied by several sources, including the renewable electricity supply by the utility (SDG&E), a community choice aggregation (CCA) or another program and the installation of residential and commercial solar PV systems. Given the assumptions included in the CAP for those categories, 39% of electricity supply would be renewable by 2020 and 96% of electricity supply would be renewable by 2035.

To estimate the emissions reduction potential from CCA or another program above RPS compliance amounts, it is necessary to account for the interaction among the categories of supply. The percentages of electricity and renewable content attributed by category are given in Table 5. As mentioned above in the *Greenhouse Gas Emissions Factor for Electricity* section, 90% of eligible customers are projected to participate in the CCA or another program starting in 2020. To estimate the greenhouse gas reductions, it is assumed that all the electricity provided by a CCA or another program is 100% renewable by 2035. As described above, Governor Jerry Brown recently signed legislation to increase the renewable portfolio standard supply targets to 50% renewable electricity by 2030.[37] Table 24 below shows the role of each category of supply in 2035.

[37] Senate Bills 350 – Clean Energy and Pollution Reduction Act of 2015. Available at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350.

Table 24 Contribution of Electricity Supply Categories and Renewable in 2035

Category	2035		
	% of Total Electricity Supply	% of Supply from Renewable	% of TOTAL supply from Renewable
Utility (SDG&E)	8%	50%	4%
CCA or Another Program	69%	100%	69%
PV	23%	100%	23%
Total	100%	-	96%

To estimate the projected emissions reduction from CCA or another program, the total emissions reduction from the categories above were allocated using the method described in the "Greenhouse Gas Emissions Factor for Electricity" section. Because CCA or another program is required to comply with the statewide RPS requirement, a portion of the total emissions reduction from the CCA program is attributed to this policy, while the remaining emissions impact (above RPS compliance) is allocated to local action. The emissions reduction from CCA or another program above RPS compliance is presented in Table 25.

Table 25 Breakdown of Emission Reduction for CCA Program

Category	2035	
	% Renewable in the Supply	GHG Reductions (MT CO_2e)
CCA or Another Program – RPS Compliance	50%	10,466
CCA or Another Program – Above RPS Compliance	**50%**	**10,466**
Total	100%	20,932

6.2.2 Achieve 10.8 MW Residential Rooftop Solar PV Systems

It is expected that the city will reach 10.8 MW of residential rooftop solar PV systems installed by 2035. In the baseline year 2010, residential solar PV capacity was approximately 0.4 MW from approximately 18 interconnected systems.[38] In the past few years, residential solar system installation has increased rapidly, with more than 70 systems interconnected in 2015 alone and a total of 1.6 MW at the end of 2015. We assume this trend will continue with 0.5 MW capacity added every year in the residential sector.[39]

[38] California Distributed Generation Statistics. SDG&E NEM Interconnected Data Set (current as of September 2016). Data downloaded in November 2016. http://www.californiadgstats.ca.gov/downloads/

[39] The 2035 residential solar capacity goal, 10.8 MW, is equivalent to approximately 1800 PV systems total. If all systems are installed at single family homes, half of the projected single-family homes (about 6,000 in 2035) will have PV systems by 2035. PV systems can also be added to multifamily complex and common areas.

To estimate emissions reduction from the installation of residential solar PV systems, the capacity is converted to estimated electricity generation using a capacity factor of 20%.[40] The emissions reductions from both residential and commercial PV systems is allocated using the method described in the "*Greenhouse Gas Emissions Factor for Electricity*" section. The emissions reduction from residential PV is then allocated based on residential and non-residential PV capacity. Table 26 summarizes the key assumptions and results.

Table 26 Key Assumptions and Results from Residential Rooftop Solar PV Systems

Year	Total Residential PV Capacity (MW)	Electricity Supplied by Residential PV (MWh)	GHG Reduction (MT CO_2e)
2035	10.8	18,922	5,858

6.2.3 Achieve 2 MW Commercial Rooftop Solar PV Systems

The CAP targets to achieve 2 MW of commercial rooftop solar PV systems installed by 2035 through incentives. In baseline year 2010, the commercial solar PV capacity was less than 0.1 MW with less than five systems interconnected.[41] 10 new systems have been interconnected at commercial spaces since 2010 and new opportunities for commercial solar PV systems are available city-wide.

Emissions reduction from the installation of commercial PV systems was calculated using the same method as described in Section 6.2.2. Table 27 summarizes the key assumptions and results.

Table 27 Key Assumptions and Results for Commercial Rooftop Solar PV Systems

Year	Total Commercial PV Capacity (MW)	Electricity Supplied by Commercial PV (MWh)	GHG Reduction (MT CO_2e)
2035	2	3,504	1,085

6.2.4 Solar Hot Water Heater (SHW) at Commercial Spaces

On average, 6% of commercial building energy use is for water heating.[42] The CAP aims to retrofit 20% of its existing commercial spaces with solar hot water heaters (SHW) thus reducing water heating energy consumption at the retrofitted commercial spaces by 10%. It was assumed that 60% of existing water heaters are fueled by natural gas, while the rest 40% are fueled by electricity.

To calculate emissions reductions, the total electricity and natural gas saving due to the SHW retrofits are calculated and converted to emissions reduction using the overall average electricity emission factor and natural gas emission factor. In 2035, as the renewable content in electricity reaches to 96%, the

[40] The net capacity factor is the ratio of actual output over a period of time to its potential to full installed (i.e. nameplate) capacity continuously over the same period of time.
[41] California Distributed Generation Statistics. SDG&E NEM Interconnected Data Set (current as of September 2016). Data downloaded in November 2016. http://www.californiadgstats.ca.gov/downloads/
[42] U.S. Energy Information Administration. Commercial Buildings Energy Consumption Survey (2012). https://www.eia.gov/consumption/commercial/data/2012/index.php?view=consumption#e1-e11

overall average electricity emission factor decreases, therefore, the emission reduction from electricity saving decreases as well. Table 28 summarizes the key assumptions and results.

Table 28 Key Assumptions and Results for Solar Hot Water Heater (SHW) at Commercial Space

Year	Total Electricity Saved from SHW Retrofits (MWh)	GHG Reduction from Electricity Saving (MT CO_2e)	Total Natural Gas Saved from SHW Retrofits (therm)	GHG Reduction from Natural Gas Saving (MT CO_2e)	Total GHG Reduction (MT CO_2e)
2035	343,758	5	515,637	2,807	2,811

6.2.5 Solar Hot Water Heater (SHW) at New Homes and Home Retrofits

The City will develop programs to retrofit 25% of existing homes with solar hot water heaters (SHW) and 25% of the new homes with SHWs installed by 2035. We assumed that 2% of the existing homes and 1% of new homes in the city already have SHW heaters at baseline year 2010. Similar to the assumptions in SHW retrofits in commercial spaces, 60% of existing water heaters are fueled by natural gas, while the rest 40% are fueled by electricity. An average energy reduction per unit for replacing an electric water heater with SHW is 2,300 kWh, and an average reduction per unit for replace a natural gas water heater is 112 therms.

The method to calculate emissions reduction is similar to the method in Section 6.2.4. Table 29 summarizes the key assumptions and results.

Table 29 Key Assumptions and Results for SHW at New Homes and Home Retrofits

Year	% of Existing Homes Retrofit	Total Homes Retrofitted with SHW	% of New Homes Retrofit	Total New Homes with SHW Installation	GHG Reduction from Electricity Savings (MT CO_2e)	GHG Reductions from Natural Gas Saving (MT CO_2e)	Total GHG Reduction (MT CO_2e)
2035	25%	1,501	25%	15	17	522	539

6.2.6 Reduction in Other Residential Natural Gas Use

In California, approximately 22% of household end-use natural gas consumption is from non-space heating or water heating natural gas use. Other natural gas use includes cooking appliances, clothes washers, dryers, dishwashers and small devices.[43] The CAP assumed that the City will take measures, such as incentives, to reduce 15% of the non-space/water heating natural gas use by 2035. Based on the 2010-2013 GHG emissions inventory, on average 77% of natural gas use in Solana Beach is from the residential sector. To calculate the emissions reductions, the total natural gas savings is converted to emissions reductions using the natural gas emission factor. Table 30 summarizes the key assumptions and results.

Table 30 Key Assumptions and Results to Reduce Non-space/water Heating Natural Gas Use

[43] U.S. Energy Information Administration. Residential Energy Consumption Survey (2009). End-use consumption by fuel. https://www.eia.gov/consumption/residential/data/2009/index.php?view=consumption

Year	Reduction in Non-space/water Heating Natural Gas Use	Total Natural Gas Reduction (therm)	Total GHG Reduction (MT CO_2e)
2035	15%	150,000	359

6.2.7 Residential Energy Efficiency Retrofits

The residential energy efficiency retrofit goal in the CAP include retrofits in both single-family (SF) and multi-family (MF) homes. The CAP assumes a 15% energy reduction in the SF and MF homes that participate in energy retrofit programs.

By adopting a Residential Energy Conservation and Disclosure Ordinance, all homes that are remodeled or sold will be required to disclose energy use. We assumed 3% of the existing homes are sold annually and 1% are remodeled annually.[44] To avoid double counting, we assumed the existing homes were only be resold or remodeled once within the CAP horizon period. By 2035, half of the existing homes at baseline year will be affected by the energy disclosure. However, only the owned-occupied homes would perform energy retrofits upon resale or remodel, as renters may not have incentives or ownership to perform energy retrofits.[45] Of the owner-occupied homes that disclose energy use, best practice indicates that about 12% will perform energy retrofits and implement energy efficiency activities.[46]

Emissions reductions from annual electricity savings were calculated for each year by multiplying the number of retrofits, average electricity reduction per home and the overall average emission factor. As the renewable content in electricity increases, the emissions reductions from energy retrofits decrease accordingly. Similarly, emissions reductions from annual natural gas savings were calculated by multiplying the number of retrofits, average natural gas reduction per home, natural gas emission factor. Emissions reductions from electricity and natural gas was summed to determine total emissions reductions.

Table 31 and summarizes the key assumptions and results.

Table 31 Key Assumptions and Results for Residential Energy Efficiency Retrofits

Year	Total Occupied SF+MF Units	Total Owner Occupied SF+MF Units	Total Units Implemented Energy Retrofits	Total Electricity Saving (MWh)	Total Natural Gas Saving (therms)	Total GHG Reduction from Energy Saving (MT CO_2e)
2035	6,005	3,603	218	234,032	10,175	59

[44] 3% of existing homes are sold annually is based on a County of San Diego 2012-2013 average according to San Diego Association of Realtors. 1% remodeled annually is based on a City of San Diego average. Both assumptions are used in the City of San Diego Climate Action Plan (2015).

[45] Approximately 60% of the housing units are owner-occupied housing units. 2010 U.S census. https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

[46] ACEEE. (2011) Austin Energy Conservation Audit and Disclosure. http://docketpublic.energy.ca.gov/PublicDocuments/Migration-12-22-2015/Non-Regulatory/12-AB1103-1/2012/TN%2068669%2011-26-12%20Case%20Study%20-%20Austin%20Energy%20Conservation%20Audit%20and%20Disclosure%20(ECAD)%20Ordinance.pdf Assumption is used in the City of San Diego Climate Action Plan (2015).

6.2.8 Commercial Energy Efficiency Retrofits

Similar to Section 6.2.7, we assumed the city will adopt a commercial energy conservation and disclosure ordinance. It is assumed that 4% of commercial space is sold every year and that 12% of those sold will perform energy retrofits and implement energy efficiency activities.[47]

Emissions reductions from annual electricity savings was calculated for each year by multiplying the percent of commercial space affected, 15% reduction in electricity consumption, and the overall average emission factor. As the renewable content in electricity increases, the emissions reduction from energy retrofits decreases accordingly. Similarly, emissions reduction from annual natural gas savings was calculated by multiplying the percent of commercial space affected, 15% reduction in natural gas consumption, and natural gas emission factor. Emissions reduction from electricity and natural gas was summed to determine total emissions reduction. Table 32 summarizes the key assumptions and results.

Table 32 Key Assumptions and Results for Non-Residential Efficiency Retrofits

Year	% commercial space disclose energy use	% commercial space received retrofit	% Energy Reduction per square foot	Total Electricity Saving (MWh)	Total Natural Gas Saving (therms)	Total GHG Reduction from Energy Saving (MT CO_2e)
2035	50%	6%	15%	430,733	6,737	37

6.3 Strategy 3: Waste, Wastewater and Water

To reduce emissions from waste, wastewater and water categories, the CAP includes several measures to 1) reduce solid waste entering landfills, 2) reduce methane emissions from wastewater treatment, and 3) reduce city-wide water consumption.

6.3.1 Divert Waste from Landfills and Capture Landfill Gas Emissions

The CAP aims to divert 90% of solid waste from entering landfills with 85% gas capture rate at the landfills. We assumed the waste diversion rate at baseline year 2010 as 55% and the landfill gas capture rate as 75%.[48] The City will adopt measures, such as a waste reduction plan, to achieve the diversion rates, and work with the City of San Diego to help achieve the landfill capture rate.

To calculate the emissions reduction from increasing diversion rate and gas capture rate, the emissions from the solid waste category using targeted rates were estimated using the same method as in the GHG inventory. The difference between emissions from the targeted rates and BAU emissions projection is the emissions reduction. Table 33 summarizes the key assumptions and results.

Table 33 Key Assumptions and Results for Waste Diversion and Capture Landfill Gas

[47] Commercial property sales data from City of San Diego is used as proxy. ACEEE. (2011) Austin Energy Conservation Audit and Disclosure. http://docketpublic.energy.ca.gov/PublicDocuments/Migration-12-22-2015/Non-Regulatory/12-AB1103-1/2012/TN%2068669%2011-26-12%20Case%20Study%20-%20Austin%20Energy%20Conservation%20Audit%20and%20Disclosure%20(ECAD)%20Ordinance.pdf Assumption is used in the City of San Diego Climate Action Plan (2015).

[48] Most of the waste disposed by Solana Beach residents and businesses is sent to Otay and Sycamore Landfills. The estimated landfill gas capture efficiency at both landfills is 76% based on EPA's Mandatory Greenhouse Gas Reporting. https://www.epa.gov/ghgreporting The baseline diversion rate in the City of San Diego's Climate Action Plan was used as representative of that in Solana Beach.

Year	Total Solid Waste Disposal after Diversion	Solid Waste Diversion Rate	Landfill Gas Capture Rate	TGHG Reduction (MT CO_2e)
2035	10,701	90%	85%	3,389

6.3.2 Capture Methane from Wastewater Treatment

The goal of the CAP is to achieve a 100% methane capture rate from wastewater treatment by 2035, by working with the wastewater treatment operators to find ways to achieve this. We assumed the capture rate was 90% in the baseline year.[49] Emissions reductions from the targeted capture rate was calculated by taking the difference between the baseline capture rate (90%) and the targeted capture rate, and multiplying by the BAU emissions projection for wastewater in that year. Table 34 summarizes the key assumptions and results.

Table 34 Key Assumptions and Results for Capturing Methane from Wastewater Treatment

Year	Target Wastewater Methane Capture Rate	GHG Reduction (MT CO_2e)
2035	100%	66

6.3.3 Existing Water Rate and Billing Structure

In October 2015, the board of directors of the Santa Fe Irrigation District approved a rate proposal to raise the rates by an average of 9% annually over the next three years beginning in February 2016[50], therefore achieving a compound increase of 30% in the three years 2016-2018. The price elasticity of water is set at -0.2, as an increase in the water rate will reduce water consumption.[51]

Reduction in water use will reduce the energy associated with upstream water supply, water treatment and distribution. We assumed the water sources provided by Santa Fe Irrigation District would not change over the CAP horizon, with the same mix of local surface water and imported water from the San Diego County Water Authority. The emissions reduction is calculated by taking the difference between emissions from the water category in the BAU emissions projection and emissions from the water category after the rate increase. Table 35 summarizes the key assumptions and results.

Table 35 Key Assumptions and Results for New Water Rate and Billing Structure

Year	BAU per Capita Water Consumption (GPCD)	Per Capita Water Consumption after Rate Increases	Total GHG Reduction (MT CO_2e)

[49] It is assumed that the San Elijo treatment plant used by Solana Beach achieves the same digester gas capture rate as the City of San Diego's Point Loma Wastewater Treatment Plant in 2010.

[50] Del Mar Times. Water district for Rancho Santa Fe, Solana Beach proceeds with proposed rate increase. October 9, 2015. http://www.delmartimes.net/news/local-news/sddmt-santa-fe-irrigation-district-rate-increase-2015oct09-story.htm Santa Fe Irrigation District customers in Solana Beach, Rancho Santa Fe face another rate hike. November 8, 2016. l http://www.delmartimes.net/news/sd-cm-nc-water-district-20161108-story.html

[51] Dale et al. (2009) *Price Impact of the Demand for Water and Energy in California Residences.* http://www.energy.ca.gov/2009publications/CEC-500-2009-032/CEC-500-2009-032-F.PDF

2035	241	213	407

6.3.4 Water Conservation and Disclosure Ordinance

Similar to the Energy Conservation and Disclosure Ordinance described in Section 6.2.7, disclosure of water use upon resale and replacing existing water fixtures with low-flow and efficiency water fixtures will reduce water use. We assumed 3% of the homes are sold annually (the same as in Section 6.2.7) and the reduction in water use would be 2% for residential water use.[52]

Similar to Section 6.3.3, emissions reductions are calculated by taking the difference between emissions from the water category after the rate increase and after the additional water savings from the ordinance. Table 36 summarizes the key assumptions and results.

Table 36 Key Assumptions and Results for Water Conservation and Disclosure Ordinance

Year	Per Capita Water Consumption after Rate Increases	Per Capita Water Consumption after Rate Increase and Disclosure Ordinance	Total GHG Reduction (MT CO_2e)
2035	213	211	30

6.3.5 Recycled Water Program Expansion

This measure aims to reduce 10% of potable water supply by 2035, such as commercial and multi-family common areas landscape irrigation water use, by expanding current recycled water program. Replacing potable water with recycled water reduces the upstream, conveyance and treatment energy use associated with the potable water supply. Table 37 summarizes the key assumptions and results.

Table 37 Key Assumptions and Results for Recycled Water Program Expansion

Year	Additional Recycled Water Supply (million gallons)	Total GHG Reduction (MT CO_2e)
2035	93	292

6.4 Urban Tree Planting Program

The most recent urban tree canopy assessment in San Diego region, based on high-resolution Light Detection and Ranging (LiDAR), shows that Solana Beach has 22% existing urban tree canopy.[53] This measure aims to achieve 30% of developed areas covered by urban tree canopy by 2035. The total developed area in Solana Beach is projected to be 2,107 acres in 2035.[54] The GHG sequestration

[52] Estimated based on City of Berkeley's Commercial and Residential Conservation Ordinances that result in 2% decrease in water use per year for all households. http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=70982

[53] The assessment was done in 2014 for all urban areas in the San Diego County using method developed by University of Vermont and USDA Forest Service. https://www.sandiego.gov/sites/default/files/san_diego_tree_canopy_assessment_05oct2016.pdf

[54] SANDAG Series 13 Regional Growth Forecast (Updated in October 2013). Download Date: 03/30/2016. SANDAG Data Surfer. http://datasurfer.sandag.org/

potential from achieving the additional urban tree canopy by 2035 was calculated using a CO_2e absorption rate per acre obtained from a study for the California Energy Commission (CEC).[55] Table 38 summarizes the key assumptions and results.

Table 38 Key Assumptions and Results for Urban Tree Planting Program

Year	% Urban Tree Canopy Cover	Developed Area Covered by Urban Tree Canopy (acres)	CO2e Absorption per Acre (MT CO_2e)	GHG Reduction (MT CO_2e)
2035	30%	632	1.56	986

[55] Winrock International (2004). *Baseline Greenhouse Gas Emissions and Removals for Forest, Range, and Agricultural Lands in California*. California Energy Commission, PIER Energy-Related Environmental Research. http://www.energy.ca.gov/reports/CEC-500-2004-069/CEC-500-2004-069F.PDF Based on this study, typical hardwood trees absorb about 1.56 tons CO_2 per acre.

Appendix C
Implementation Matrix

City of Solana Beach Greenhouse Gas Reduction Measures - Implementation Matrix

Strategy	Measure	Action	2035 GHG Reductions ($MTCO_2e$)	Project Under CEQA	City Department Responsibility	City of Solana Beach Commission/Committees	Partner Entity	Estimated Cost	City Effort	Time-Frame	Example Actions
	T-1 Increase electric vehicles and alternative fuel vehicles miles traveled to 30 percent of total vehicle miles traveled	Collaborate with San Diego Association of Governments (SANDAG) to increase electric vehicles (EVs) in the region.	17,495	No	City Manager's Office Public Works Department	Climate Action Commission Budget and Finance Commission	SANDAG	Low	Low-Medium	Mid-Term	The City will work with SANDAG for strategy and funding opportunities to increase EVs in the City.
		Provide incentives for the City's residents to increase use of EVs.					SANDAG			Short-Term	Post resources on the City's website.
		Support public and private sector provisions of alternative fueling stations in the City and adjacent cities.					Neighboring cities			Long-Term	The City will seek funding and provide assistance to the public and private sector of alternative fueling stations.
		Explore grant funding for electric vehicle chargers.					SANDAG SDG&E			Mid-Term	The City will seek funding from the California Energy Commission's Electric Vehicle Charging Infrastructure grant or other similar grant programs.
		Advocate for an EV car sharing fleet network to serve the City.						Medium	Medium	Long-Term	The City will purchase and maintain EVs. Public education and outreach of the EV car sharing fleet. Post resources on the City's website.
		Require EV charging stations and EV charger-ready wiring in commercial/multi-family and residential developments.			Community Development Department						Update building code to implement the policy.
	T-2 Increase commuting by vanpools to 20 percent of labor force	Collaborate with SANDAG to identify the longest commute distances and associated employers to add vanpooling.	608	No	City Manager's Office	Climate Action Commission Business Liaison Council Standing Committee	SANDAG	Low	Low-Medium	Short-Term	The City will work with SANDAG for strategy and funding opportunities to implement a vanpooling program. Public outreach to local businesses to encourage vanpooling. Post resources on City's website.
		Collaborate with SANDAG on successfully implementing its North Coast Transportation Demand Management (TDM) plan, and connect the City's employers and residents to travel-planning resources.									Post resources on the City's website.
		Review Key Performance Indicators (KPIs) in SANDAG's TDM implementation plan at least once annually.							Low	Ongoing	Summarize KPI findings in a memorandum annually.
		Explore modifying the Solana Beach Municipal Code parking standard requirements to incentivize provision of parking stalls for carpool or vanpool vehicles as a credit toward parking requirements.		Yes	Community Development Department			Medium	High	Short-Term	Modify the policy, program, and operational framework; adopt a code change; implement the program; and provide public education and outreach.
		Advocate for I-5 high-occupancy vehicle lanes at least to and from City on-ramp and off-ramps.		No	City Manager's Office	Climate Action Commission	SANDAG	Low	Low	Short-Term	The City will work with SANDAG to find opportunities to advocate for high-occupancy vehicle lanes.
	T-3 Reduce average commuter trip distance by one mile	Improve land use and transportation planning to provide a well-connected transportation network. Higher-density and mixed-use neighborhoods with complete street design provide infrastructure for vehicles, bicycles, and pedestrians, allowing a shift from single-occupancy vehicles.	464	Yes	Community Development Department Public Works Department	Climate Action Commission		Medium	Medium	Long-Term	Continue to build out the community to seek balanced performance of automobile, public transit, bike, and pedestrian forms of transportation. Public outreach to local businesses to encourage telecommuting and educate them about how it reduces greenhouse gas emissions. Post resources on the City's website.
		Implement the General Plan Land Use Element, specifically Goal LU-3.0 and associated policies									
		Advocate for funding of bus enhancements (i.e., Express [limited stops]) or Bus Rapid Transit (BRT) on the 101 Coast Highway.		No	City Manager's Office		MTS, NCTD, and SANDAG	Medium	Medium	Mid-Term	Encourage NCTD to enhance bus service on the 101 route to increase ridership.
		Advocate to San Diego Metropolitan Transit System (MTS), North County Transit District (NCTD), and SANDAG to improve transit service and promote east-west shuttle on Lomas Santa Fe Drive.						Medium	Medium	Long-Term	Express the importance of partnership with MTS, NCTD, and SANDAG and how the expanded use of public transit reduces greenhouse gas emissions. Encourage MTS, NCTD, and SANDAG to implement a pilot program.

City of Solana Beach Greenhouse Gas Reduction Measures - Implementation Matrix

Strategy	Measure	Action	2035 GHG Reductions ($MTCO_2e$)	Project Under CEQA	City Department Responsibility	City of Solana Beach Commission/Committees	Partner Entity	Estimated Cost	City Effort	Time-Frame	Example Actions
Transportation	T-4 Increase commuting by mass transit to 10 percent of labor force	Seek opportunities to collaborate with SANDAG on successfully implementing its North Coast TDM plan, and connect the City's employers and residents to travel-planning resources.	429			Climate Action Commission	SANDAG	Low	Low-Medium	Short-Term	Post resources on the City's website.
		Improve connectivity (by public transit, bicycle infrastructure, and pedestrian walkways) to the Solana Beach train station for access to commuter rail.		Yes, if infrastructure is needed	Community Development Department		MTS, NCTD, and SANDAG	Medium	High	Long-Term	Design sidewalks, bike lanes, and public transit routes to connect to the Solana Beach train station.
		Implement the General Plan's Circulation Element for a "Complete Streets" approach in designing streets, which considers every transportation mode and user for applicable arterial streets and incorporates multi-modal design and principles in all projects.		Yes	Public Works Department				High	Mid-Term	Adopt a policy that requires sidewalks, crosswalks, and bike lanes on both sides of the street.
	T-5 Increase preferred parking for electric vehicles and alternative fuel vehicles by converting 20 percent of eligible parking spots	Identify eligible on-street parking spots and spots in City-owned lots for conversion to preferred parking for EVs and AFVs.	325	Yes	City Manager's Office Community Development Department Public Works Department	Climate Action Commission		Medium	Medium	Mid-Term	The City will identify optimal locations, such as central commercial areas, to convert parking spots to preferred parking for EVs and AFVs. Clear signage will be posted at the preferred parking spots.
		Explore modifying the Solana Beach Municipal Code parking standard requirements to incentivize parking stalls for EVs and charging stations as a credit toward parking requirements.								Short-Term	Modify the policy, program, and operational framework; adopt the code change; implement the program; and provide public education and outreach.
		Install dedicated stalls for EV parking and charging stations at City facilities.					SANDAG SDG&E			Mid-Term	The City will identify optimal locations, such as near central commercial areas, to install and maintain the EV charging stations.
		Conduct outreach and education for the City's businesses and commercial property owners to encourage the conversion of private parking spaces to EV and AFV preferred parking.		Yes, if infrastructure is needed				Low	Low	Short-Term	Provide public education and outreach.
	T-6 Retime four traffic signals	Conduct a traffic study to identify candidate traffic lights along arterials that could be re-timed.	144	No	Public Works Department	Climate Action Commission	SANDAG	Medium	Medium	Mid-Term	Prepare a traffic study to identify candidate traffic lights.
		Retime identified traffic signals to reduce delays and vehicle idling.									Retime identified traffic signals.
	T-7 Promote telecommuting to achieve 10 percent participation	Collaborate with SANDAG on successfully implementing its North Coast TDM plan (SANDAG 2013), and connect the City's employers and residents to travel-planning resources.	86	No	City Manager's Office	Climate Action Commission Business Liaison Council Standing Committee	SANDAG	Low	Low	Short-Term	Post resources on the City's website.
		Review KPIs in SANDAG's TDM implementation plan at least once annually.								Ongoing	Summarize KPI findings in a memorandum annually.
		Work with local office-based businesses to encourage telecommuting. Telecommuting should not impede on normal business practices, thus, may not be suitable for businesses that require physical employee presence, such as retail storefronts and warehouses.								Short-Term	Public outreach to local businesses encourage telecommuting and how it reduces greenhouse gas emissions. Invite SANDAG to outreach events to promote the iCommute program.
		Conduct educational outreach to residents and businesses to disseminate information about resources such as SANDAG's iCommute program to reduce commuter trips.					SANDAG				
	T-8 Convert municipal gasoline fueled vehicle fleet to electric vehicles to achieve 50 percent reduction in gasoline consumption	Replace the City's municipal fleet to EVs and AFVs when feasible, thereby reducing fleet-wide emissions.	56	No	City Manager's Office	Climate Action Commission Budget and Finance Commission		Medium	Medium	Mid-Term	The City will purchase EV and AFV vehicles when replacing its municipal fleet.
		Adopt a clean vehicle purchasing policy for new fleet vehicles.									Adopt a policy detailing requirements and processes.

City of Solana Beach Greenhouse Gas Reduction Measures - Implementation Matrix

Strategy	Measure	Action	2035 GHG Reductions ($MTCO_2e$)	Project Under CEQA	City Department Responsibility	City of Solana Beach Commission/Committees	Partner Entity	Estimated Cost	City Effort	Time-Frame	Example Actions
	T-9 Increase commuting by walking to five percent of labor force	Implement the General Plan's Circulation Element for a "Complete Streets" approach in designing streets, which considers every transportation mode and user for applicable arterial streets and incorporates multi-modal design and principles in all projects.	16	Yes	Community Development Department Public Works Department	Climate Action Commission		Medium	Medium	Mid-Term	Adopt a policy that requires sidewalks, crosswalks, and bike lanes on both sides of the street.
		Implement the General Plan's Circulation Element and develop and implement a Pedestrian Master Plan that would comprehensively review and plan for pedestrian improvements and identify mobility linkages to promote walkability and safety for pedestrians.									Develop and implement the Pedestrian Master Plan by connecting pedestrian routes throughout the City.
	T-10 Increase commuting by bicycling by increasing bike lanes to approximately 17 miles	Implement the General Plan's Circulation Element and continue to update and implement the City's Bicycle Transportation Plan that identifies optimal bicycle routes to optimal destinations in the City, connects the regional bicycle path network, and prioritizes effective bicycle path routes for implementation.	11	Yes	Community Development Department Public Works Department	Climate Action Commission		Medium	Medium	Mid-Term	Update and implement the Bicycle Transportation Plan by connecting optimal bicycle routes in the city.
		Adopt and implement the Comprehensive Active Transportation Strategy that provides the foundation for improved bicycle and pedestrian facilities within the City and connections to adjacent jurisdictions and greater regional networks over the next 15 years.					SANDAG	Medium	Medium	Long-Term	Adopt and implement the Strategy.
		Make existing bike lanes more user-friendly, including options such as: • Widening bike lanes; • Enhancing safety elements and markings; and • Identifying locations to install additional bicycle racks and repair stations.						Medium	Medium	Mid-Term	Implement user-friendly features for bike lanes such as widening bike lanes, enhancing safety elements, and identifying locations for additional bicycle racks and repair stations.
	T-11 Promote alternative work schedule to achieve participation from one percent of the labor force	Identify employers in the City that could be candidates for alternative work schedules.	9	No	City Manager's Office	Climate Action Commission Business Liaison Council Standing Committee	SANDAG	Low	Low	Short-Term	Identify businesses in the community that could be good candidates for alternative work schedules.
		Conduct surveys for City residents to identify opportunities for alternative work schedules for commuters that work outside the City.									Distribute surveys to City residents.
		Collaborate with SANDAG to encourage alternative work schedules for the City's employers.									Facilitate alternative work schedules for City employees.
		Seek opportunities to collaborate with SANDAG on successfully implementing its North Coast TDM plan, and connect the City's employers and residents to travel-planning resources.									Post resources on the City's website.
		Conduct educational outreach to residents and businesses to disseminate information about resources such as SANDAG's iCommute program to reduce commuter trips.									Public outreach to local businesses encourage telecommuting and how it reduces greenhouse gas emissions. Invite SANDAG to outreach events to promote the iCommute program.
		Review KPIs in SANDAG's TDM implementation plan at least once annually.								Ongoing	Summarize KPI findings in a memorandum annually.

City of Solana Beach Greenhouse Gas Reduction Measures - Implementation Matrix

Strategy	Measure	Action	2035 GHG Reductions ($MTCO_2e$)	Project Under CEQA	City Department Responsibility	City of Solana Beach Commission/Committees	Partner Entity	Estimated Cost	City Effort	Time-Frame	Example Actions
Energy and Natural Gas	E-1 Implement a Community Choice Aggregation program, subject to City Council approval	Continue with implementation of a CCA to achieve the 100% renewable energy goal, based on the technical analysis conducted previously.	10,466	Yes, if a CCA is formed	City Manager's Office	Climate Action Commission Budget and Finance Commission		Medium	High	Long-Term	Reach out to cities and the County to develop a regional CCA.
		Explore opportunities to collaborate with other cities in the region for a regional CCA for San Diego County.					SANDAG				Implement CCA identified in technical analysis.
		Explore opportunities to service renewable energy from our region.		No				Low	Low	Short-Term	The City will collaborate with SANDAG to explore opportunities to service renewable energy.
	E-2 Achieve 10.8 megawatt (MW) residential rooftop solar photovoltaic systems	Work with SDG&E and local non-profit organizations to reach 100 percent of households annually with targeted educational and marketing materials (e.g., website or e-blast).	5,858	No	City Manager's Office	Climate Action Commission	SDG&E	Low	Low	Ongoing, Short-Term	Develop educational material and post on City's website or send out e-blast.
		Provide expedited permitting incentives for installation of rooftop solar PV systems on residential buildings.			Community Development Department			Low	Low-Medium		Explore options for online submittal of applications. Develop a streamlined review process for solar projects.
		Conduct educational outreach to residents about incentives available for installation of PV systems.			City Manager's Office		SDG&E	Low	Low	Short-Term	Develop public outreach to educate residents about PV systems.
		Explore the development of an ordinance requiring installation of solar PV systems for major remodel/renovation projects.		Yes	Community Development Department			Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
	E-3 Achieve 2 MW commercial rooftop solar photovoltaic systems	Work with SDG&E to reach 100% of businesses annually with targeted educational and marketing materials (e.g., website or e-blast).	1,085	No	City Manager's Office	Climate Action Commission Business Liaison Council Standing Committee	SDG&E	Low	Low	Ongoing, Short-Term	Develop educational material and post on City's website or send out e-blast.
		Provide expedited permitting incentives for installation of rooftop solar PV systems on commercial buildings.			Community Development Department			Low	Low-Medium		Explore options for online submittal of applications. Develop a streamlined review process for solar projects.
		Conduct educational outreach to local businesses about incentives available for installation of PV systems.			City Manager's Office		SDG&E	Low	Low	Short-Term	Develop public outreach to educate local businesses about PV systems.
		Explore the development of an ordinance requiring installation of solar PV systems for major remodel/renovation projects.		Yes	Community Development Department	Climate Action Commission		Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
	E-4 Solar hot water heating at 20 percent of existing commercial spaces	Work with SDG&E to reach 100% of businesses annually with targeted educational and marketing materials (e.g., website or e-blast).	2,811	No	City Manager's Office	Climate Action Commission Business Liaison Council Standing Committee	SDG&E	Low	Low	Ongoing, Short-Term	Develop educational materials and post on City's website or send out e-blast.
		Promote the installation of SHWs by publicizing incentives, rebates, and financing options, such as Property Assessed Clean Energy (PACE) financing, California Solar Initiatives (CSI), or CSI-Thermal Program, for existing commercial buildings by posting on the City's website or e-blast					PACE and CSI Programs				Post resources on the City's website or send out e-blast.
		Explore the development of an ordinance requiring installation of SHWs for major remodel/renovation projects.		Yes	Community Development Department	Climate Action Commission		Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.

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Electricity a	E-5 Solar hot water heating at 25 percent of new homes and home retrofits	Work with SDG&E to reach 100% of households annually with targeted educational and marketing materials (e.g., website or e-blast).	539	No	City Manager's Office	Climate Action Commission	SDG&E	Low	Low	Ongoing, Short-Term	Develop educational materials and post on City's website or send out e-blast.
		Promote the installation of SHWs by publicizing incentives, rebates, and financing options, such as PACE financing, CSI, or CSI-Thermal Program, for existing residential buildings by posting on the City's website or e-blast.					PACE and CSI Programs				Post resources on the City's website or send out e-blast.
		Explore the development of an ordinance requiring installation of SHWs for new homes and major remodel/renovation projects.		Yes	Community Development Department			Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
	E-6 Reduction in non-space/water heating residential natural gas use by 15 percent	Provide incentives to reduce 15% of non-space/water heating natural gas use, such as dryers, ovens, and cooktops, for new and existing residential buildings by 2035.	359	No	City Manager's Office	Climate Action Commission	SDG&E	Medium	Low-Medium	Ongoing, Short-Term	Post resources on the City's website or send out e-blast.
		Provide expedited permitting incentives for replacement of natural gas space/water heaters.									Explore options for online submittal of applications. Develop a streamlined review process for solar projects.
		Explore the development of an ordinance requiring non-natural gas appliances in new residential development.		Yes	Community Development Department			Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
	E-7 Residential energy efficiency retrofits to achieve 15 percent reduction	Adopt a Residential Energy Conservation and Disclosure Ordinance that requires single- and multi-family homes that are remodeled or sold to disclose energy use. By disclosing energy use, owner-occupied homes may result in energy retrofits and implement energy efficiency activities.	59	Yes	Community Development Department	Climate Action Commission		Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
		Work with SDG&E to reach 100% of households annually with targeted educational and marketing materials (e.g., website or e-blast).		No	City Manager's Office		SDG&E	Low	Low	Ongoing, Short-Term	Develop educational materials and post on City's website or send out e-blast.
		Publicizing incentives, rebates, and financing options, such as PACE financing, CSI, or CSI-Thermal Program, for existing residential buildings by posting on the City's website or e-blast.					PACE and CSI Programs				Post resources on the City's website or send out e-blast.
	E-8 Commercial energy efficiency retrofits to achieve 15 percent reduction	Adopt a Commercial Energy Conservation and Disclosure ordinance. By disclosing energy use, commercial buildings may result in energy retrofits and implement energy efficiency activities.	37	Yes	Community Development Department	Climate Action Commission Business Liaison Council Standing Committee		Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
		Work with SDG&E to reach 100% of businesses annually with targeted educational and marketing materials (e.g., website or e-blast).		No	City Manager's Office		SDG&E	Low	Low	Ongoing, Short-Term	Develop educational material and post on City's website or send out e-blast.
		Publicizing incentives, rebates, and financing options, such as PACE Financing, CSI, or CSI-Thermal Program, for existing commercial buildings by posting on the City's website or e-blast.					PACE and CSI Programs				Post resources on the City's website or send out e-blast.
		Increase use of solar technology on municipal-owned buildings.				Climate Action Commission	SDG&E	Medium	Medium	Mid-Term	Explore opportunities to install solar technology on municipal-owned buildings.

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Waste and Water	W-1 Divert waste from landfills and capture landfill gas emissions	Adopt a policy that requires all City-sponsored events (and City-funded non-profit events) to be zero waste (e.g., use recyclable and compostable materials and provide corresponding waste receptacles), and promote zero-waste events to community organizations and businesses.	3,389	No	Public Works Department Community Development Department	Climate Action Commission Business Liaison Council Standing Committee	Local Landfill Operators Solid waste haulers Local restaurants Regional Solid Waste Association (RSWA)	Medium	High	Ongoing, Short-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
		Adopt a policy that requires a minimum of 75% of construction and demolition waste be recycled or re-used.								Short-Term	
		Develop an Organics Diversion Program to eliminate organic waste from landfills.									Use examples, such as City of Davis, as a case study and guide for implementation in Solana Beach.
		Start and implement a pilot education program on organics recycling.						Low	Medium		
		Develop a food waste prevention plan for restaurants in the City and collaborate with other municipalities to develop a regional plan.						Medium	High		Use examples, such as Orange County, as a case study and guide for implementation in Solana Beach.
		Provide public education to promote textile recycling.			City Manager's Office			Low	Medium	Ongoing, Short-Term	Public education to promote textile recycling.
		Advocate to the agencies that own and operate landfills serving the City to encourage increased methane capture at the landfills.								Long-Term	Send a letter on behalf of the City Council advocating for agencies that own and operate landfills serving Solana Beach to encourage increased methane capture.
	W-2 Implementation of existing water rate and billing structure	Work with the Santa Fe Irrigation District to raise the water rate in the City at a rate of 2 percent per year.	690	No	City Manager's Office	Climate Action Commission	Santa Fe Irrigation District	Low	Medium	Short-Term	Meet with the Santa Fe Irrigation District to discuss increasing billing rate structure for the City.
	W-3 Expand recycled water program expansion to reduce potable water consumption by 10 percent	Expand current recycled program and purple pipe infrastructure		No	Community Development Department Public Works Department	Climate Action Commission Business Liaison Council Standing Committee	San Diego County Water Authority Metropolitan Water District	Medium-High	Medium-High	Long-Term	Advocate to encourage replacing potable water with recycled water and provide education and outreach.
	W-4 Capture 100 percent of emissions from wastewater treatment	Advocate to the City of San Diego's Point Loma Wastewater Treatment Plant and San Elijo Treatment Plant for 100% methane capture at wastewater treatment plants that serve the City of Solana Beach.	66	No	City Manager's Office	Climate Action Commission	Metro Wastewater Joint Powers Authority Point Loma Wastewater Treatment Plant and San Elijo Treatment Plant	Low	Medium	Long-Term	Send a letter on behalf of the City Council advocating for agencies that own and operate wastewater treatment plants serving Solana Beach to encourage increased methane capture.
	W-5 Water conservation	Implement a Water Conservation and Disclosure Ordinance to disclose water use upon resale of residential buildings.	24	Yes	Community Development Department	Climate Action Commission		Medium	High	Mid-Term	Develop a policy, program, and operational framework; adopt an ordinance; implement the program; and provide public education and outreach.
		Implement PACE Programs in the City and continue to assess other efficiency financing tools for possible use in the community.		No	City Manager's Office	Climate Action Commission Business Liaison Council Standing Committee	PACE Program	Low-Medium	Low	Ongoing, Short-Term	Post resources on the City's website. Public education to promote program and financing option.
		Educate property owners about eligibility for PACE financing.									
		Actively promote water efficiency rebate programs offered by San Diego County Water Authority and Metropolitan Water District.					San Diego County Water Authority Metropolitan Water District				Post resources on the City's website. Invite San Diego County Water Authority and Metropolitan Water District to participate in City activities to promote their program.
		Maintain a water waste reporting public education and enforcement program to repair leaks and decrease over-irrigation.									Public education to promote program.
		Promote programs/resources to help customers convert to more water-efficient landscaping.									Public education to promote water-efficient landscaping.
Carbon Sequestration (Urban Tree Planting)	U-1 Carbon Sequestration (Urban Tree Planting)	Implement the Urban Tree Planting Program to achieve the City's goal to cover 2,107 acres of developed areas with urban tree canopy by 2035. The program would require new development to plant trees to achieve an equivalent canopy coverage. Furthermore, the City would plant trees at City-owned properties and public areas to achieve the same canopy coverage. Public areas would cover open space, streets, and parking lots.	986	No	Community Development Department Public Works Department	Parks & Recreation Commission Climate Action Commission	Parks & Recreation Commission	Medium	Medium	Mid-Term	Develop an Urban Forestry Plan, using the City of San Diego's plan as a reference guide