City of Solana Beach
Draft Climate Action Plan Update

Prepared for:

City of Solana Beach
635 S. Highway 101
Solana Beach, California 92075

Prepared by:

1230 Colombia St., Suite 440
San Diego, California 92101

5998 Alcalá Park
San Diego, California 92110

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Credits and Acknowledgements

City of Solana Beach

City Council

Lesa Heebner, Mayor
Jewel Edson, Deputy Mayor
Kristi Becker, City Councilmember
Jill MacDonald, City Councilmember
David A. Zito, City Councilmember

Climate Action Commission

Michael McClune, Chair
Mika Nagamine, Vice Chair
John Kellogg
Heidi Dewar
Greg Coleson
Lane Sharman
Ken Flagg
David A. Zito, City Councilmember

City Staff

Dan King, Assistant City Manager
Joseph Lim, Community Development Director
Tiffany Wade, Junior Planner
Nicole Grucky, Senior Management Analyst
Rimga Viskanta, Senior Management Analyst

Ascent Environmental

Poonam Boparai, Principal
Andrew Beecher, Sr. Climate Change Specialist
John Steponick, Climate Change Analyst
Corey Alling, Communications Specialist
Michele Mattei, Document Production Specialist
Riley Smith, Document Production Specialist

Energy Policy Initiatives Center (EPIC) – University of San Diego

Scott Anders, Director
Nilmini Silva-Send, PhD, Assistant Director/Adjunct Professor
Yichao Gu, Technical Policy Analyst

San Diego Association of Governments (SANDAG)

San Diego Gas & Electric Company (SDG&E)

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Acronyms and Abbreviations

%	percent
AB	Assembly Bill
AFV	alternative fuel vehicle
ARB	California Air Resources Board
BAU	business-as-usual
BRT	Bus Rapid Transit
CA LCP	California Landscape Conversation Partnership
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CAL FIRE	California Department of Forestry and Fire Protection
Cal OES	California Governor's Office of Emergency Services
CalGreen	California Building Standards Code
CAP	Climate Action Plan
CCA	community choice aggregation
CCC	California Coastal Commission
CDFW	California Department of Fish and Wildlife
CEA	Clean Energy Alliance
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CERT	Community Emergency Response Team
CFCs	chlorofluorocarbons
CH_4	methane
City	City of Solana Beach
CNRA	California Natural Resources Agency
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CPUC	California Public Utilities Commission
CSI	California Solar Initiatives
DOC	Department of Conservation
EEM	Energy Efficient Mortgages
EO	Executive Order
EPIC	Energy Policy Initiatives Center
ESHA	Environmentally Sensitive Habitat Areas
EV	electric vehicle

ft	feet
GHG	greenhouse gas
GWP	global warming potential
HERO	Home Energy Renovation Opportunity
HFC	hydrofluorocarbon
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
JPA	Joint Powers Agreement
KPI	Key Performance Indicator
LCP	Local Coastal Program
LCP-LUP	Local Coastal Program – Land Use Plan
LED	Light-emitting diode
LGC	Local Government Commission
LOCA	Localized Constructed Analogs
LUP	Land Use Plan
M	meter
MMT	million metric ton
MPO	Metropolitan Planning Organization
MT	metric ton
MTS	San Diego Metropolitan Transit System
MW	megawatt
MWDSC	Metropolitan Water District of Southern California
N_2O	nitrous oxide
NCTD	North County Transit District
O_3	ozone
OBF	On-Bill Financing
ºC	degrees Celsius
ºF	degrees Fahrenheit
OPC	Ocean Protection Council
PACE	Property Assessed Clean Energy
PED	Planning, Engineering & Design
PFCs	perfluorocarbons
PPA	Power Purchase Agreements
ppm	parts per million
PTSD	Post-Traumatic Stress Disorder
PV	photovoltaic

RA	Resource Adequacy
RCP	Representative Concentration Pathway
RTP	Regional Transportation Plan
SANDAG	San Diego Association of Governments
SB	Senate Bill
SCS	Sustainable Communities Strategy
SDCWA	San Diego County Water Authority
SDG&E	San Diego Gas & Electric
SEJPA	San Elijo Joint Power Authority
SEWRP	San Elijo Water Reclamation Project
SF_6	sulfur hexafluoride
SFID	Santa Fe Irrigation District
SGC	Strategic Growth Council
SHW	solar hot water heater
TDM	Transportation Demand Management
TOU	Time-Of-Use
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
VCP	Vector Control Program
VMT	vehicle miles traveled
WSFWS	United States Fish and Wildlife Service
WUI	wildland-urban interface
ZEV	zero emission vehicle

Executive Summary

In 2017, the City of Solana Beach (City) was among the first cities in the region to adopt a Climate Action Plan (CAP). This Climate Action Plan Update (CAP Update), which serves as an update to the original CAP, provides a comprehensive roadmap to address the challenges of climate change in the city. Acting on climate change means both reducing GHG emissions from activities within the City and helping the community adapt to climate change and improve its resilience over the long term. The City takes the effects of climate change seriously and has dedicated resources to create a CAP Update that strives to achieve GHG reductions in alignment with State goals. On August 26, 2022, the Solana Beach City Council declared a Climate Emergency, which memorialized the City's commitment to addressing the threat of climate change head on. The City is undertaking preparation of this CAP Update to keep its commitment of regularly updating its original 2017 CAP every five years.

The CAP Update aims to address climate change by reducing GHG emissions from activities within the City, and by identifying threats and developing 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. 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. In 2016, California officially met the AB 32 target of reducing GHG emissions to 1990 levels by 2020 (CARB 2019).

As directed by SB 32 and AB 1279, the State aims to reduce annual GHG emissions to:

- **40 percent below 1990 levels by 2030; and**
- **85 percent below 1990 levels by 2045, with net-zero emissions achieved through carbon dioxide removal.**

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. In 2022, California formally adopted a long-term GHG reduction target of reaching net-zero GHG emissions by 2045 with the signing of Assembly Bill (AB) 1279 into law. The State's 2045 target includes an 85 percent reduction in anthropogenic GHG emissions below 1990 levels, with net-zero emissions being achieved with carbon dioxide removal through carbon sequestration in natural and working lands and mechanical capture and storage technology.

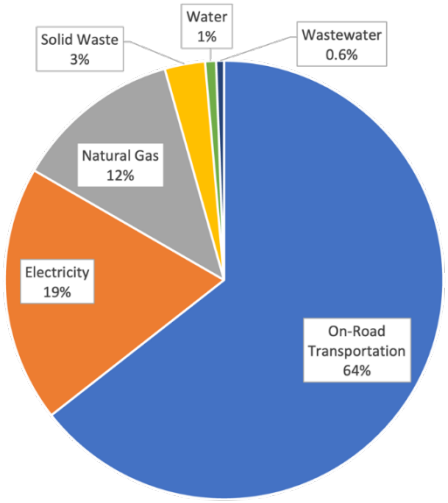
Over the last couple decades, the City has taken several steps to begin addressing climate change and achieving reductions in GHG emissions, both in the City's operations as well as the broader community. Dating as far back as 2005, the City has been involved in various efforts to quantify GHG emissions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

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

1. A baseline GHG emissions inventory was prepared for 2016.

- Approximately 106,100 metric tons of carbon dioxide equivalent ($MTCO_2e$) were emitted by communitywide sources in the City in 2016. 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 64 percent of the annual GHG emissions as determined from the annual inventory; while the electricity sector accounted for approximately 19 percent. Transportation emissions are based on the origin-destination analysis, where pass-through trips with no end point in the City are excluded.



Percentage may not add to totals due to rounding.
Energy Policy Initiatives Center, University of San Diego 2023

2. GHG emissions forecasts and reduction targets were identified for 2035 and 2045. The 2017 CAP included a 2035 target 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 City's 2035 target in this CAP Update was retained to align with the existing CAP and was developed to be on the statewide GHG reduction trajectory. The CAP Update also identifies a new long-term target for the year 2045.

   - Without any future actions (i.e., "business-as-usual" conditions), GHG emissions are expected to decrease below 2016 levels through 2035 and then level-off until 2045.

   - Local GHG emissions reduction targets for the CAP Update were established to be consistent with State legislation, SB 32 and AB 1279:

     - 50 percent below 2016 levels by 2035; and
     - 85 percent below 2016 levels by 2045.

Source: City of Solana Beach.

   - Legislative actions by State or federal agencies help to reduce future emissions below the 2035 target, but are not enough to achieve the 2045 target.

   - Achieving the 2045 target will require local action to help close the gap between legislative-adjusted emissions forecasts and the emissions limits established by the CAP Update's targets.

3. Local GHG emissions reduction strategies and measures were identified to help the City achieve the 2045 target, and further reduce near-term emissions.

- The San Diego County Regional Decarbonization Framework identifies regional policy initiatives that local jurisdictions can align with to support deep GHG reductions at the regional scale. These are known as "Decarbonization Pathways". The GHG reduction strategies of the CAP Update align directly with these pathways, which include:

  - Decarbonize Transportation,
  - Decarbonize Electric Supply,
  - Decarbonize Buildings,
  - Land Use and Natural Climate Solutions, and
  - Food Systems and Circular Economy.

The CAP Update contains a total of 13 local GHG reduction measures. Implementation of all measures, in addition to reductions that will be achieved by state legislation and regulations, will contribute towards achieving the 2035 and 2045 targets.

- GHG reduction measures and actions in the CAP Update are aligned with the five decarbonization pathways of the San Diego County Regional Decarbonization Framework. Under each pathway are strategies for reducing GHG emissions, with each strategy having at least one GHG reduction measure and associated actions that will be implemented to reduce local emissions.

- Successful implementation of the GHG reduction measures included in the CAP Update relies on participation from both the City and community members. Actions under GHG reduction measures are categorized by "actor", such that the ways residents and businesses can contribute to decarbonization through voluntary actions are clearly identified. The actions the City will take are intended to support community members in taking these voluntary actions, while also taking on efforts to decarbonize its own operations.

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 Update 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 resilience in the face of climate stressors:

   - 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.

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 Update 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 Update 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 Update, and continue to update the plan periodically (every five years).

Climate change is a global problem, but one that must be addressed on a local level.

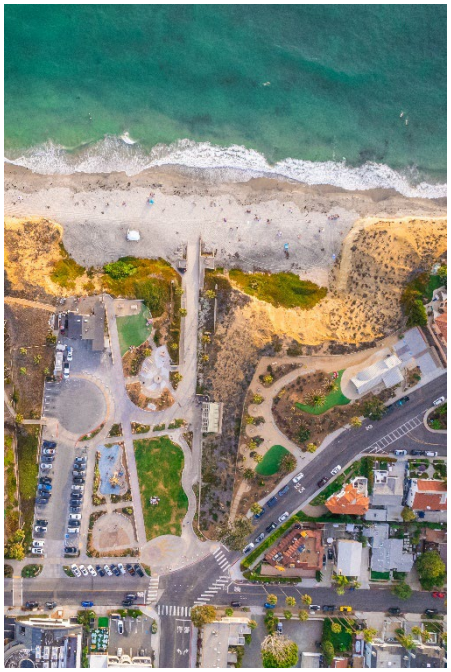
- Local action on climate change cannot be addressed insularly by one agency or community, but requires active and ongoing partnerships between residents, businesses, the City, and other agencies and organizations in the region. On a community-wide level, individuals and businesses can play an important 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 City is committed to supporting community members in these efforts, which can lead to better outcomes for the environment and the City.

- Engaging community members is key to the success of the CAP Update and reaching long-term GHG reduction targets. The CAP Update was developed with the input of community members through workshops, surveys, and the Climate Action Commission. The City will continue to engage community members through its various media outlets, public meetings, and events as implementation of the CAP Update continues.

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 (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 contribution towards climate change, as well as to adapt to future climate change impacts. 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. In November 2015, the Solana Beach Climate Action Commission was established to support development of the City's first Climate Action Plan and continues to play an important role in guiding how implementation of the plan is prioritized. 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 greenhouse gas (GHG) emissions, enhance resilience to climate change and track their progress publicly. In 2017, the City was among the first in the region to adopt a Climate Action Plan (CAP), which included ambitious GHG reduction targets. More recently in 2020, the City Council declared a Climate Emergency, which memorialized the City's commitment to addressing the threat of climate change head on.

The CAP Update 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.



Source: City of Solana Beach.

This Climate Action Plan (CAP Update) builds upon past and current City efforts in combating global climate change. The 2017 CAP, which forms the primary basis for this CAP Update, included numerous GHG reduction measures for the City to implement in order to reduce local GHG emissions in line with the State legislative targets of Assembly Bill (AB) 32 and Senate Bill (SB) 32. The 2017 CAP called for regularly monitoring progress and performing a comprehensive update every five years after adoption to keep the City's sustainability efforts aligned with the most recent technology, policy best practices, and State legislation. This CAP Update is intended to build upon the progress of the 2017 CAP and incorporate new and revised GHG reduction measures to align the City's GHG emissions with the most recent State legislation.

Climate change is one of the greatest challenges of the 21st century and 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 between 2.4 and 6.9 feet by 2100, increased annual average temperatures up to 10 degrees Farenheit (ºF) by 2090, prolonged droughts, and increased unpredictable weather patterns. These effects of climate change, among other climate-related stressors, not only pose a serious threat to the region's natural resources, but also to jobs, health, safety, economic prosperity, and provision of basic services. However, climate change also presents a major opportunity to transition to a low-carbon economy in a way that maximizes co-benefits and provides cost savings.

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

The CAP Update 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 develop a CAP Update that strives to achieve ambitious GHG reductions through collective action, specifically empowering local residents and businesses to play a major role in working towards a more sustainable future.

While the CAP Update uses the best information, research, and techniques available today, technologies and markets are constantly changing. As with the 2017 CAP, strategies identified in the CAP Update may become obsolete considering the development of new technologies that do not yet exist, or new State and federal laws that are enacted in the future. The overarching goals of the CAP Update, however, remain the same: to reduce GHG emissions and prepare for and adapt to climate change.

1.1 Supporting Regional Decarbonization

Source: City of Solana Beach.

In January of 2021, the San Diego County Board of Supervisors formally recognized the need for a regional approach to address climate change by voting to establish the San Diego Regional Decarbonization Framework (RDF). The RDF refers to the County's approach to guide regional decarbonization efforts in partnership with the UC San Diego School of Global Policy and Strategy, the University of San Diego (USD) Energy Policy Initiatives Center (EPIC), and Inclusive Economics. University of California, San Diego (UCSD) utilized six consultants with technical expertise in energy, transportation, and buildings systems to chart the pathways that reduce carbon in the region. To ensure equity is upheld in the RDF and the local government policies that follow, EPIC compared recommended RDF policies to existing climate action policies around the region to identify gaps that should be addressed so underserved communities are included.

The goal of the RDF is to achieve a balance of the carbon cycle in nature, so that the planet stops warming. The RDF utilized a three-pronged strategy: reducing emissions of carbon dioxide (CO_2) to zero; reducing "super-pollutants" such as soot and smog; and carbon storage and capture through natural and technological means. Decarbonization also has a number of co-benefits, such as the investments and employment opportunities created in the carbon-free economy. The RDF followed three major steps to develop its framework:

- **Technical Report** – The Technical Report is a scientific report prepared by experts to assess how the region can get to zero carbon emissions. Led by the UCSD School of Global Policy and Strategy, the draft Technical Report provided baseline assessments of GHG emissions and science-based pathways to reduce carbon emissions in the areas of transportation, electricity, buildings, and land use throughout the region. It is a technical analysis of how different parts of the energy system can contribute to decarbonization but does not identify the "right" pathway. Instead, it shows ways to achieve regional GHG emissions goals in multiple sectors to highlight trade-offs, co-benefits, decision points, risks, and synergies. The analyses and pathways should be updated as technologies evolve, or uncertainties are resolved or clarified (County of San Diego 2022a).
- **Workforce Development Study** – This study, titled *Putting San Diego County on the High Road: Climate Workforce Recommendations for 2030 and 2050*, explores the ways in which actions to lower GHG emissions in the region's industries can do so in ways that support the region's workers. This study builds off the data and modeling within the employment analysis of the Technical Report that looked at the net employment impacts in response to contractions in the fossil fuel industry and growth in the renewable energy sector (County of San Diego 2022b).

- **Implementation Playbook** – The Implementation Playbook is a menu of actions to reduce GHG emissions that can be taken by organizations, local governments and agencies, and anyone in the region who wants to reduce their carbon footprint. Like its name implies, it is a non-exhaustive list of options and not a detailed explanation of how each action can be implemented. This Implementation Playbook is akin to a list of plays a coach may have to choose from in a game. It does not represent a prescriptive approach to decarbonization for the San Diego region, nor does it anticipate all possible scenarios, outcomes, risks, or opportunities. The Implementation Playbook is critical because it is a quick guide of realistic options to reduce GHG emissions that can be tailored to the needs and situation of the organization (County of San Diego 2023).

The City of Solana Beach recognizes that regional collaboration is required to reduce GHG emissions in the County and is committed to working with all regional partners and stakeholders to achieve common objectives. To facilitate regional collaboration, the City is incorporating the RDF model into this CAP Update to identify actions the City can take that will contribute toward the region's decarbonization efforts.

The RDF framework is incorporated into this CAP Update through the structure of the sections which highlight five decarbonization pathways identified by the RDF:

- Decarbonize Transportation,
- Decarbonize Electricity Supply,
- Decarbonize Buildings,
- Land Use and Natural Climate Solutions, and
- Food Systems and Circular Economy.

These pathways in relation to the CAP Update are discussed further in Chapter 3.

1.2 Climate Change Science

The science behind climate change is largely based on the greenhouse effect, which is illustrated in Figure 1-1. The greenhouse effect is a natural process that insulates the Earth and helps regulate its temperature. After absorbing sunlight, the Earth emits heat in the form of infrared radiation. This radiation is then absorbed by a collection of naturally occurring atmospheric GHGs. These gases, which mainly consist of water vapor, CO_2, methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and chlorofluorocarbons (CFCs), all act as effective global insulators by absorbing some of the infrared radiation that is emitted by Earth and re-emitting it back down towards the planet. This process, where some heat is prevented from escaping out of the atmosphere, is what keeps temperatures on Earth conducive to life. Without the greenhouse effect, Earth would not be able to support life as we know it.

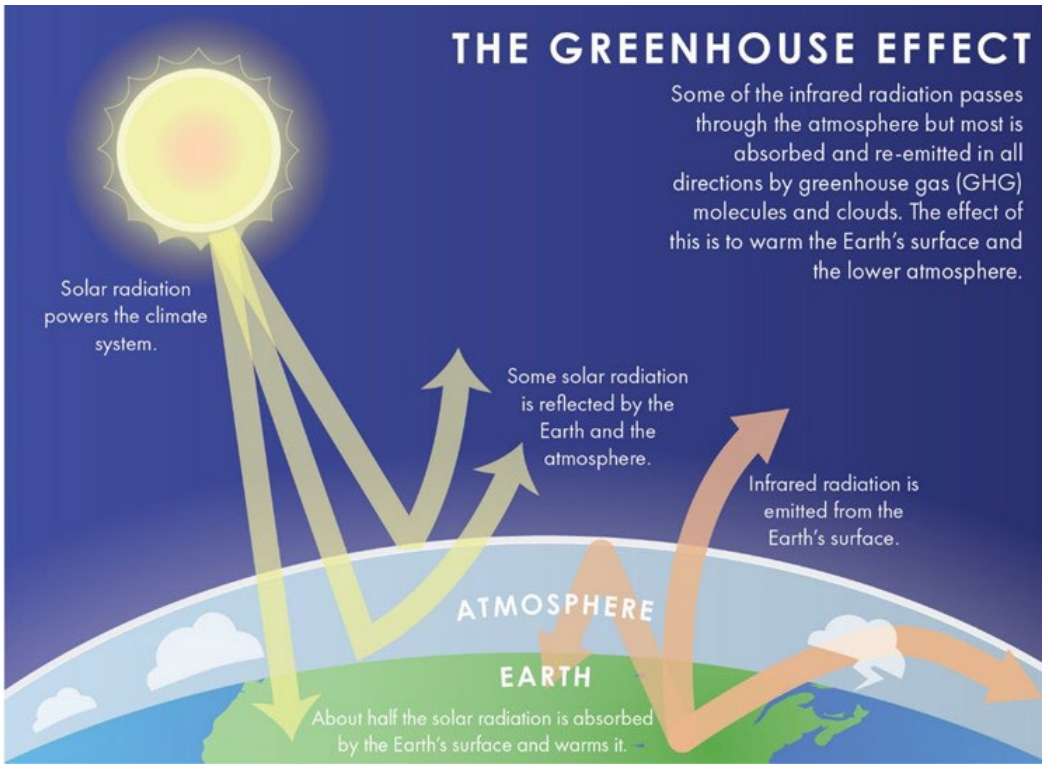
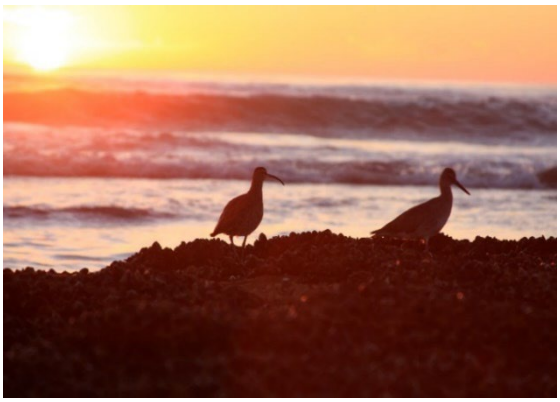


Figure 1-1: The Greenhouse Effect
Source: IPCC 2007; modified by Ascent in 2024.

The combustion of fossil fuels and other anthropogenic (i.e., human-caused) activities that have been occurring since the Industrial Revolution in the 19th century have introduced GHGs into the atmosphere at an increasingly accelerated rate. These significantly elevated levels of GHGs above natural ambient concentrations have intensified the greenhouse effect, causing the Earth's climate to warm at an unprecedented and unnatural rate. This effect, known as climate change, is the driver behind changes in more extreme weather patterns, the rapid melting of the polar ice caps, rising sea levels, and other impacts on humans, the natural environment, and the ecosystem services and human-made assets essential to environmental and human health and well-being.



Source: City of Solana Beach.

There is overwhelming scientific agreement that observed increases in atmospheric GHG concentrations and the consequential warming of Earth's atmosphere, oceans, and land are linked to human activities and influence, such as the burning of fossil fuels for transportation and energy. Human activities are estimated to have caused approximately 2 degrees Fahrenheit (°F) of warming across the globe compared to pre-industrial era levels (i.e., prior to the year 1900), and global average temperature is expected to increase by up to approximately 8 °F by the end of the century unless additional efforts to reduce GHG emissions are made (IPCC 2021). The GHG emissions that have created this warming—those released between the pre-industrial era and the present—will persist for hundreds to thousands of years and create further long-term impacts to the climate system (IPCC 2018). Chapter 2 of the CAP Update summarizes the City's GHG emissions that are contributing to global warming.

For decades, 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 Update discusses the predicted climate change effects in the City and strategies to adapt to the changing climate.

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

1.3 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 Update.

Virtually every nation signed the Paris Climate Agreement in 2015, to limit global temperature rise to a maximum of 2 degrees Celsius (ºC), or 3.7 ºF, from pre-industrial levels. A further reduction to a maximum increase of 1.5 ºC was determined to be needed and desirable given the severity of climate change impacts being experienced across the globe. On June 1, 2017, President Trump announced at the time 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, and eventually, the U.S. would formally rejoin the Paris Climate Agreement under President Biden on February 19, 2021.

1.3.1 California

Source: City of Solana Beach.

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 (CARB) 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. In 2016, California officially met the AB 32 target of reducing GHG emissions to 1990 levels by 2020 (CARB 2019).

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 CARB to update the AB 32 Scoping Plan to reflect the path to achieving the 2030 target. In September 2016, Governor Brown also signed 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, CARB 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.

As directed by SB 32 and AB 1279, the State aims to reduce annual GHG emissions to:

- **40 percent below 1990 levels by 2030; and**
- **85 percent below 1990 levels by 2045, with net-zero emissions achieved through carbon dioxide removal.**

The most recent and significant statewide GHG reduction target was established by AB 1279 of 2022, the California Climate Crisis Act, which codifies the state's long-term target of reaching net-zero emissions by 2045 through an 85% reduction in anthropogenic emissions below 1990 levels by 2045. Statewide carbon neutrality by 2045 was initially introduced through Executive Order B-55-18. The signing of AB 1279 into law now establishes the requirement of meeting this target for the State, and supersedes the long-term target established by Executive Order S-3-05. CARB released a subsequent Scoping Plan update in 2022, the *2022 Scoping Plan for Achieving Carbon Neutrality*. This most recent Scoping Plan establishes the State's strategy for the deep decarbonization needed to meet net-zero emissions.

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). CARB, 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. SANDAG adopted a subsequent update to the plan in December 2021 with the *Final 2021 Regional Plan.*

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 rebranded as *Safeguarding California*, and again updated in 2021 as *California's Climate Adaptation Strategy*. The 2021 Strategy integrates key elements of the latest sector-specific plans, such as the *Natural and Working Lands Climate Smart Strategy*, *Wildfire and Forest Resilience Action Plan*, *Climate Action Plan for Transportation Infrastructure,* and *Water Resilience Portfolio*.

Other relevant federal and State regulations relevant to the CAP Update are identified in Table 1.1.

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	Low Carbon Fuel Standards Program	The Low Carbon Fuel Standards Program was created by CARB as an outcome of AB 32, which establishes a credit trading program to reduce the life cycle carbon intensity of the statewide fuel supply. The program establishes a carbon intensity benchmark which reduces the carbon intensity of transportation fuels used in the state to 20% below 2010 levels by 2030.
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 CARB 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 CARB and requires CARB 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 100 and SB 1020	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 (RPS) such that 50 percent of retail electricity sales statewide are GHG-free by 2030 and doubling energy savings in electricity and natural gas end uses. The RPS target of SB 350 was expanded upon with SB 100, which established a 100 percent RPS target by 2045. SB 1020 accelerates the pace of reaching the target set by SB 100, establishing interim RPS targets of 90% by 2035 and 95% by 2040.
State	Advanced Clean Cars I and Advanced Clean Cars II	In January 2012, CARB approved the Advanced Clean Cars I regulation, 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. In 2022, the Advanced Clean Cars II regulation was adopted, which requires that by 2035, all new passenger cars, trucks and SUVs sold in California will be zero emissions.

1.3.2 City of Solana Beach

Over the past couple decades, 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. These efforts were accelerated with adoption of the 2017 CAP, which set sustainability initiatives as official City policy. This CAP Update consolidates these past efforts by establishing a new baseline GHG inventory for 2016 and forecasting emissions to 2035 and 2045 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.

Source: City of Solana Beach.

- 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. This agreement was launched in the United States on February 16, 2005 as a direct result of the Kyoto Protocol, the international agreement to address climate disruption. The Kyoto Protocol became law for the 192 parties that have ratified it to date.

- The City has continued its GHG emissions reduction efforts through the establishment of the Solana Beach Clean and Green Team. Created in 2007, the team, comprised of local residents and business owners, worked 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. In 2015, the Clean and Green Team spearheaded the formation and transition to the Climate Action Commission. The Commission is comprised of eight appointed members (i.e., 6 residents and 2 professionals) and one Councilmember, with the goal of assisting with the implementation of the Climate Action Plan. Along with City staff, the Commission, and the Clean and Green Team previously, have 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 Update, the Climate Action Commission has provided input and comments on recommended implementation and adaptation measures to meet the goals of the City.

- In 2015, the City became the first in the County to explore the feasibility of creating a Community Choice Aggregation program with the initiation of a feasibility study. The City officially launched the first CCA in the County (and San Diego Gas and Electric territory), called the Solana Energy Alliance (SEA) in 2018, with the stated goal of growing into a larger, regional JPA. The City Council, in its role as the SEA Board, set the minimum renewable percentage of procured energy at 50%, and 75% carbon-free energy. In November 2019, the City of Solana Beach partnered with the cities of Del Mar and Carlsbad to form one of the region's first Community Choice Aggregation JPAs for procuring electricity with a higher renewable source mix, the Clean Energy Alliance. CEA began delivering electricity to electricity accounts in the City in 2021 with a minimum of 50 percent of the electricity delivered generated from renewable energy sources.

- On August 26, 2022, the Solana Beach City Council declared a Climate Emergency, which memorialized the City's commitment to addressing the threat of climate change head on. The Resolution commits that the City will consider decisions through the lens of climate change, and dedicate resources as available to implementing the City's CAP. The Resolution focuses on taking a holistic approach to decarbonization and prioritizing infrastructure that can help both reduce GHG emissions and protect against climate change impacts.

Source: City of Solana Beach.

- Other notable City achievements include:
    - First in the County to establish the single-use plastic bag ban;
    - First in the County to complete a Community Choice Aggregation Feasibility Study, and launched the first CCA in the region;
    - 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 Water Efficient Landscape Ordinance to promote water conservation;
    - First in the 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;
    - Energy efficiency retrofits to all City facilities;
    - Adoption of a comprehensive single-use plastic utensil's ban.
    - Upgraded all municipal accounts to a 100% renewable energy electricity option in 2023; and
    - Replenished the beach areas with 700,000 cubic yards of sand to reduce coastal storm damages and reduce coastal erosion in 2024.
- 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.

- The City also joined the Compact of Mayors in 2015, agreeing on a set of climate change measures in concert with other members.

1.4 Climate Action Plan Purpose and Objectives

The CAP Update 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 Update 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 SB 32 and AB 1279 (i.e., reduce annual statewide GHG emissions to 40 percent below 1990 levels by 2030 and 85 percent below 1990 levels by 2045, with net-zero emissions achieved through CO_2 removal). The CAP Update aims to achieve the following local community wide GHG reduction targets:

- 50 percent below 2016 levels by 2035 (aligned with and extrapolated from SB 32); and
- 85 percent below 2016 levels by 2045 (aligned with AB 1279).

SB 32 and AB 1279 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 2016.

To achieve these objectives, the CAP Update identifies the following:

- A summary of baseline (i.e., 2016) 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.

As part of CAP Update 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 Update is making progress. See Chapter 5 for more information on administering, implementing, and monitoring the CAP Update.

1.5 Co-Benefits

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

While the measures included in the CAP Update 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 Update 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.

The benefits of the CAP Update include:

Co-benefits that can be achieved from GHG reduction measures:

- 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

- **Local Control.** The CAP Update 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 Update 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.
- **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 Update demonstrates that the City is aligned with the State targets for reducing GHG emissions.

1.6 Community Action and Public Involvement

1.6.1 Community Action

While global climate 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.

Climate change is a global problem, but one that must also be addressed on a local level.

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 Update, building off the original 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 Update 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.

1.6.2 Summary of Public Involvement

The CAP Update was developed with input from community members and 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, including providing feedback on the CAP Update. The Commission was formed by City Council action in November 2015, held its first meeting in March 2016, and has held regular monthly meetings since.

The City and the Climate Action Commission held two public CAP Update Workshops in April 2023 and November 2023, engaging the community and presenting the CAP Update methodology, GHG reduction targets, and proposed reduction measures to assist the City in achieving the State GHG reduction targets. These community workshops were advertised through the City's various media outlets, including social media and email list serves. During these workshops, the City received valuable input on what community members would like to see included in the CAP Update and how the community could be best supported to take the voluntary actions needed to meet GHG reduction targets.

Source: City of Solana Beach.

An online survey was also developed to solicit more targeted input on the proposed GHG reductions measure of the CAP Update. The survey was released in November 2023 to provide further engagement opportunities for community members that were unable to attend the in-person community workshop, or wanted to provide additional feedback on the proposed GHG reduction measures. Thirty (30) total responses were received for the online survey between November 14 and December 16, 2023.

The Draft CAP Update was circulated for public review from [Date] to [Date], 2024. Public comments were received, reviewed, and discussed at a City Council Meeting in [Date] and the Climate Action Commission meeting in [Date]. The City will continue to engage the community during and after CAP Update adoption.

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 2016 (i.e., baseline inventory), describes likely trends if emissions are not reduced for 2035 and 2045 (i.e., forecasts), and sets a path forward to reduce emissions for 2035 and 2045 (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?

Source: City of Solana Beach.

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 remain well below 3.6 degrees Fahrenheit (˚F) (2 degrees Celsius [˚C]) above pre-industrial levels, and that efforts should aim to achieve a warming limit of 2.7 ˚F (1.5 ˚C).

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

One of the main objectives of this Climate Action Plan Update (CAP Update) is to identify and reduce local contributions to global GHG emissions. This chapter is intended to serve as a foundation for the pathways, strategies, measures, and actions that will implement the commitment of the City to reducing GHG emissions. Measuring GHG emissions is a critical first step in developing the CAP Update 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 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.

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 Update 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 Update measures and actions are implemented.

The City's previous CAP established 2010 as the baseline year from which the City determines GHG reduction targets. This original baseline year has been updated to a new baseline year of 2016 for this CAP Update.

2.2 Inventory

AB 32, SB 32, and AB 1279 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 Update were developed from the 2016 baseline, which is assumed to be similar to 1990 levels based on statewide GHG emissions.

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 Update 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 or influence.

The City's 2016 inventory of GHG emissions is organized into the following sectors, shown in decreasing order by level of contribution:

The City's 2016 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 use in residential and commercial buildings, as well as electric vehicle charging.
- **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 Update. This does not mean that individual residents or businesses in the city should feel limited to only those measures and actions identified in this CAP Update, 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 warming trends on a global scale.

Source: City of Solana Beach.

2.2.1 City of Solana Beach 2016 GHG Emissions

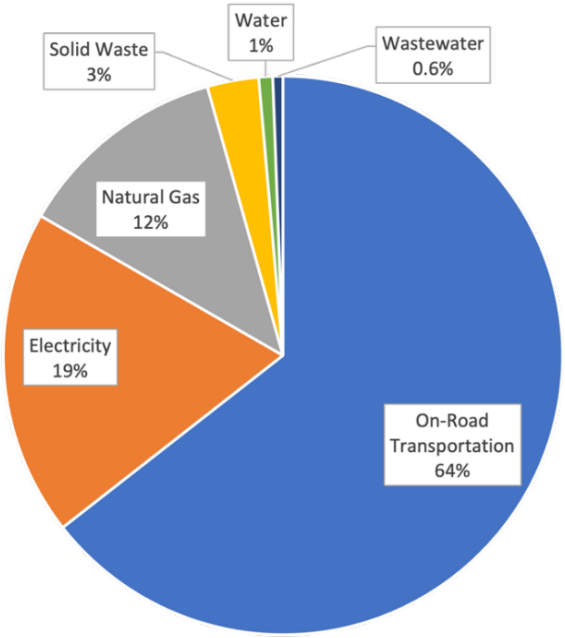
An important aspect of GHG accounting is the unit of measurement used to inventory and estimate emissions. CO_2 is the largest contributor to global warming and the most recognized GHG; however, there are five other primary GHGs that must be addressed to meet State reduction targets, including: CH_4, 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.

In 2016, community activities in the city accounted for 106,100 $MTCO_2e$. 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 64 percent of the City's emissions in 2016, while electricity consumption accounted for 19 percent of the emissions.

To put the City's emissions into perspective, 106,100 $MTCO_2e$ is equivalent to combusting 11.9 million gallons of gasoline, combusting 59,000 tons of coal, or a year's worth of carbon sequestration from 127,00 acres of U.S. forests. Assuming an average car gets about 25 miles to the gallon, the City's 2016 emissions are the same as a single car driving 272 million miles or driving to the moon and back 569 times (U.S. Environmental Protection Agency 2024).

The City's 2016 emissions are equal to the emissions of a car driving 272 million miles or driving to the moon and back 569 times.



Percentage may not add to totals due to rounding.
Energy Policy Initiatives Center, University of San Diego 2023

Figure 2-1: City of Solana Beach 2016 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 2016.

Table 2-1 2016 City of Solana Beach Greenhouse Gas Inventory

Emissions Sector	$MTCO_2e$	Percent (%)
Transportation	68,400	64
Electricity	20,000	19
Natural Gas	13,100	12
Solid Waste	3,200	3
Water	900	1
Wastewater	600	0.6
Total	**106,100**	**100**

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2023.

2.3 GHG Emissions 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 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 Update or legislative actions.

The BAU GHG emissions forecasts in the CAP Update assume a continued increase in population, housing units, employment, and vehicle activity. Projections are based on SANDAG's Series 14 Sustainable Communities Scenario Land Use Pattern.

Details on the forecast methodology and the indicators used to estimate each sector can be found in Appendix A.

2.3.1 Demographic Trends

GHG emissions forecasts were estimated for 2035 and 2045 using City-specific demographic and vehicle activity projections through 2045 from the San Diego Association of Governments (SANDAG) Series 14 Sustainable Communities Scenario Land Use Pattern. In general, the City is anticipated to experience modest growth by 2035 and 2045, 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 10 percent by 2035 and 11 percent by 2045 from 2016 levels. Total housing units are expected to increase by 13 percent by 2035 from 2016 levels and remain the same through 2045. Furthermore, employment is expected to increase by 6 percent in 2035 and 9 percent by 2045 from 2016 levels. Further details on the underlying SANDAG data used for emissions forecasts can be found in Appendix A.

From 2016 levels, population in the City is expected to increase by:
- **10 % by 2035, and**
- **11 % by 2045.**

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 Update. The applied legislative reductions include:

- Federal and State Vehicle Efficiency Standards;
- California Renewables Portfolio Standards;
- California Solar Policies and Programs;
- California Utility Energy Efficiency Program; and
- Solana Beach's Participation in Clean Energy Alliance.

Source: City of Solana Beach.

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. 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	2016	2035		2045	
		BAU Forecast	Legislative-Adjusted Forecast	BAU Forecast	Legislative-Adjusted Forecast
Transportation	68,400	54,000	19,800	54,000	2,800
Electricity	20,000	6,000	4,200	6,100	5,500
Natural Gas	13,100	15,100	14,600	15,300	14,800
Solid Waste	3,200	3,100	3,100	3,100	3,100
Water	900	900	900	900	900
Wastewater	600	700	700	700	700
Total	**106,100**	**79,800**	**43,300**	**80,100**	**27,800**
Percent change from 2016 (%)	-	*-25*	*-59*	*-24*	*-74*

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 2023.

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 2035, total emissions will decrease by 59 percent below 2016 levels. The overall decrease in emissions is primarily due to State and federal policies in place in 2023. Furthermore, emissions will decrease by 74 percent in 2045 from 2016 levels.

Taking legislative reductions into account, emissions are projected to decrease in the BAU forecast in 2035 to meet the State goals. Legislative actions are expected to further reduce the BAU forecast in 2045; however, reductions in emissions in 2045 are not, in and of themselves, enough to meet State goals.

2.4 Reduction Targets

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.**

This CAP focuses on reducing emissions by 50 percent below 2016 levels by 2035 and 85 percent below 2016 levels by 2045.

As directed in Senate Bill (SB) 32 and Assembly Bill (AB) 1279, the State aims to reduce annual statewide GHG emissions to:

- 40 percent below 1990 levels by 2030 and
- 85 percent below 1990 levels by 2045, with net-zero emissions achieved through carbon dioxide removal.

Source: City of Solana Beach.

Solana Beach's previous CAP utilized a 2010 GHG emissions inventory for target setting purposes; however, this CAP Update intends to utilize the more recent 2016 GHG emissions inventory for setting reduction targets. The purpose of using a more recent inventory is to capture more up-to-date conditions and allow for better tracking of GHG emissions over-time through programs such as SANDAG's ReCAP program. Therefore, community GHG reduction targets for the City's CAP Update are relative to the City's emissions in 2016.

While State legislative targets are based on 1990 statewide GHG emissions levels, Solana Beach, like most jurisdictions in California, does not have an emissions inventory from the year 1990 and must equate a more recent inventory to 1990 levels using statewide GHG emissions data. In 2016, the State's GHG emissions inventory showed that total statewide GHG emissions levels were nearly equivalent to 1990 levels (CARB 2019). As such, it reasonable to assume that local GHG emissions have evolved on a similar trend, and Solana Beach's 1990 total GHG emissions levels may be similar to those estimated in the 2016 community GHG inventory. Estimating equivalent reductions needed from the 2016 baseline, the City aims to reduce emissions to:

- 50 percent below 2016 levels by 2035 (aligned with and extrapolated from SB 32), and
- 85 percent below 2016 levels by 2045 (aligned with AB 1279).

A net-zero GHG reduction target is not considered economically feasible for Solana Beach for the year 2045. The State's strategy for meeting the AB 1279 target, as outlined in the 2022 Climate Change Scoping Plan, indicates that reaching net-zero emissions by 2045 can only be economically feasible with deployment of carbon dioxide removal through both carbon sequestration in natural lands and mechanical carbon capture and storage technologies (CARB 2022). As Solana Beach does not have the ability to substantially increase carbon sequestration on natural lands to the levels required to offset all emissions and does not have the geologic conditions needed for geologic carbon storage (CGS ND), a net-zero GHG emissions target is currently not feasible by 2045.

Attaining a 50 percent reduction in GHG emissions will require that emissions be reduced to approximately 53,100 $MTCO_2e$/year in 2035, which is about 53,100 $MTCO_2e$/year lower than 2016 levels.

To achieve long-term GHG reductions, the City will need to reduce emissions to 15,900 $MTCO_2e$/year by 2045, or about 90,200 $MTCO_2e$ (85 percent) below 2016 GHG emissions levels. The City achieves the 2035

target through State and federal legislative measures; however, reductions in emissions in 2045 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 A. Figure 2-2 below shows the GHG reduction targets alongside the breakdown of the City's emissions over time with the influence of State and federal legislation, discounting any actions and measures proposed in this CAP Update.

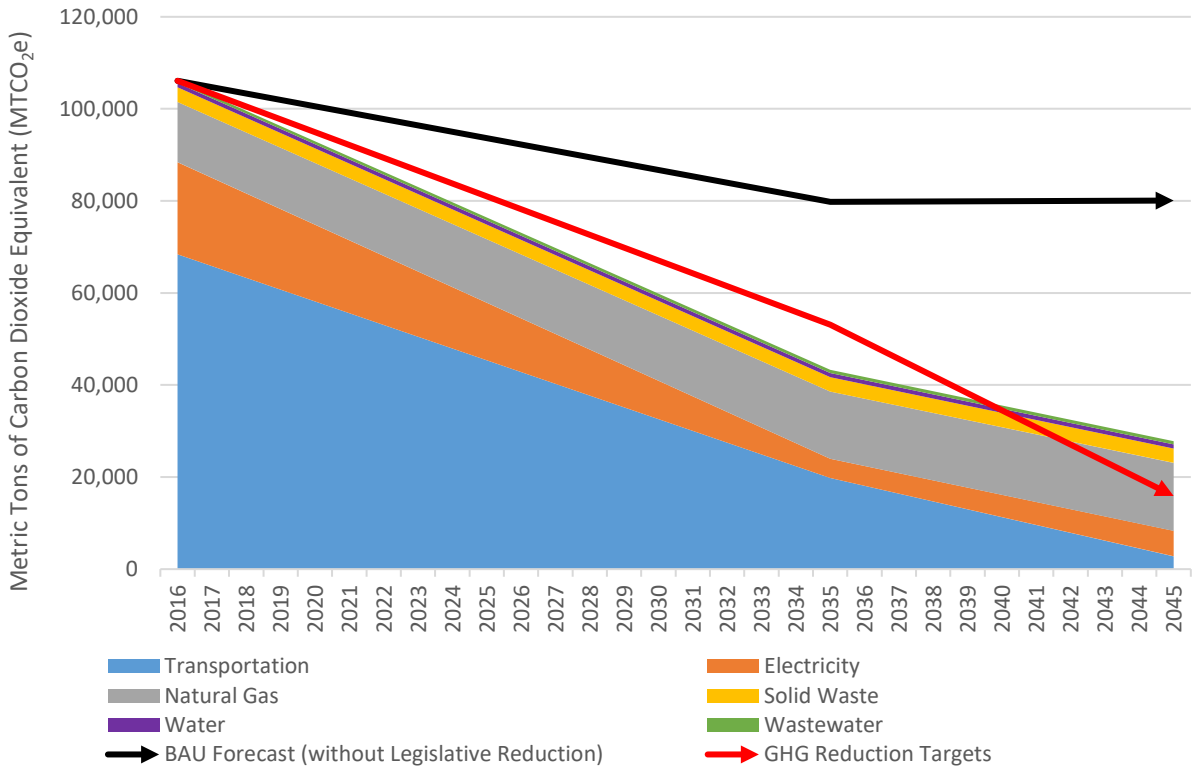


Figure 2-2: City of Solana Beach Legislative-Adjusted Business-as-Usual GHG Emissions Forecasts and Targets

Notes: GHG emissions sectors presented in this figure show the sector specific GHG emissions levels that are expected after the influence of State and federal legislation.

Source: EPIC 2023.

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Chapter 3
Reduction Measures

3.1 Introduction

This chapter outlines the pathways, strategies, and measures to be implemented by the City of Solana Beach (City) to achieve its greenhouse gas (GHG) reduction targets over the coming decades. They focus on locally based actions to reduce GHG emissions across various sectors as a complement to legislative actions taken by the State and federal governments. The actions include municipal operations actions and community-scale actions to address both public and private responsibility for addressing climate change. Through partnerships with and among residents, businesses, and other organizations, successful implementation will provide net benefits for all community members, such as improved environmental conditions, long-term cost savings, conserved resources, a strengthened economy, and greater quality of life, to contribute to a healthier planet. This Climate Action Plan Update (CAP Update) acknowledges and accounts for existing plans, programs, and activities that the City has already undertaken to reduce GHG emissions, and in some cases, builds or expands on them.

3.2 Summary of Greenhouse Gas Reductions

The City aims to reduce annual GHG emissions to:
- **50% below 2016 levels by 2035, and**
- **85% below 2016 levels by 2045.**

As described in Chapter 2, the City has established a 2035 GHG emissions reduction target (50 percent below 2016 levels) and a 2045 target (85 percent below 2016 levels) to reduce annual emissions levels consistent with State goals. Based on anticipated growth in emissions in the city and after accounting for expected reductions from State and federal legislation, the City is expected to exceed its 2035 GHG reduction target. The City will need to reduce GHG emissions through local action by approximately 11,900 metric tons of carbon dioxide equivalent ($MTCO_2e$) in 2045. After accounting for the proposed GHG reduction pathways in this CAP Update (and the strategies, measures, and actions contained within them; see Section 3.3 for more details), both the 2035 and 2045 reduction targets are expected to be met.

Table 3-1 shows the GHG reductions attributable to the pathways included in this CAP Update, along with reductions from federal and State regulations. 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 A.

Table 3-1 GHG Reductions from Proposed Reduction Pathways ($MTCO_2e$/year)

Pathway	2035	2045
Reductions from Federal and State Regulations	36,500	52,300
Decarbonize Transportation	1,475	1,672
Decarbonize Electric Supply	3,718	5,468
Decarbonize Buildings	4,217	7,723
Circular Economy & Food System	2,258	2,678
Land Use and Natural Solutions	964	1,021
Total Reductions	**49,100**	**70,900**

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2024.

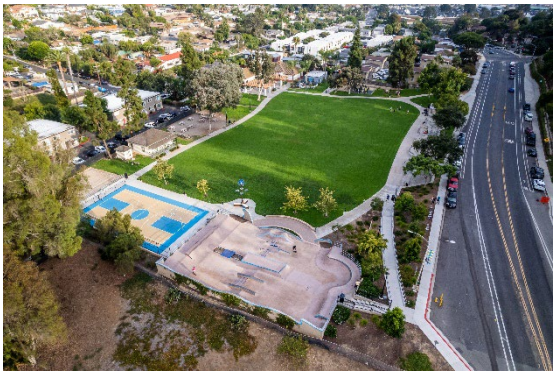
Table 3-2 Effect of CAP Update Measures on City of Solana Beach Emissions and Targets ($MTCO_2e$)

Emissions	2035	2045
BAU Emissions Forecast	79,800	80,100
Reductions from Federal and State Regulations	36,500	52,300
Legislative-Adjusted BAU Emissions Forecast (BAU Forecast – Legislative Reductions)	43,300	27,800
Baseline Emissions (2016)	106,100	106,100
City of Solana Beach GHG Reduction Target (Percent below 2016)	50%	85%
Target Emissions	53,100	15,900
Reductions from CAP Update Measures	12,632	18,562
City of Solana Beach Emissions with CAP Update (Legislative-Adjusted BAU – CAP Reductions)	30,668	9,238
Additional GHG Reductions Needed to meet Target (Target Emissions – CAP Reductions)	-22,432 (Target exceeded)	-6,662 (Target exceeded)

Notes: Columns may not add to totals due to rounding.
BAU = Business-As-Usual
CAP Update = Climate Action Plan Update
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: EPIC 2024.

3.3 Decarbonization Pathways, Strategies, and Measures

The way in which GHG reduction efforts are proposed as part of this CAP Update is in the form of a hierarchical framework that includes pathways, strategies, measures, and actions. Pathways at the top of the hierarchical framework are the overarching "sectors" where GHG emissions reductions can be achieved. Each pathway consists of one or two strategies that articulate the high-level goals related to that pathway, which are then organized further by measures (i.e., more specific expressions of strategies) and actions (i.e., implementation mechanisms to achieve measures). The five pathways for decarbonization and GHG emissions reductions are as follows (the pathways are color-coded to differentiate content throughout the chapter):



Source: City of Solana Beach.

- **Decarbonize Transportation**
- **Decarbonize Buildings**
- **Decarbonize Electric Supply**
- **Land Use & Natural Climate Solutions**
- **Circular Economy & Food System**

Successful implementation of the measures identified across each of the five pathways will result in local GHG emissions reductions, in addition to reductions that would be achieved by State legislation and regulations (i.e., legislative adjustments). All these reductions are presented visually in Figure 3-1 and are considered a "best-case scenario" where a sufficient number of community members adopt voluntary actions to help reduce citywide GHG emissions. As shown in the figure, achievement of the 2035 target (i.e., 50 percent below 2016 levels) will be achieved solely through legislative reductions, but successful implementation of CAP Update measures is critical to achieving the 2045 target of 85 percent below 2016 levels (see Section 2.4 for more details on GHG reduction targets). Aside from achieving GHG reduction targets, implementation of CAP Update measures will also result in numerous co-benefits such as improved public health outcomes, reduced air pollutant emissions, reduced costs, and green jobs, and reemphasize the City's commitment to long-term sustainability.

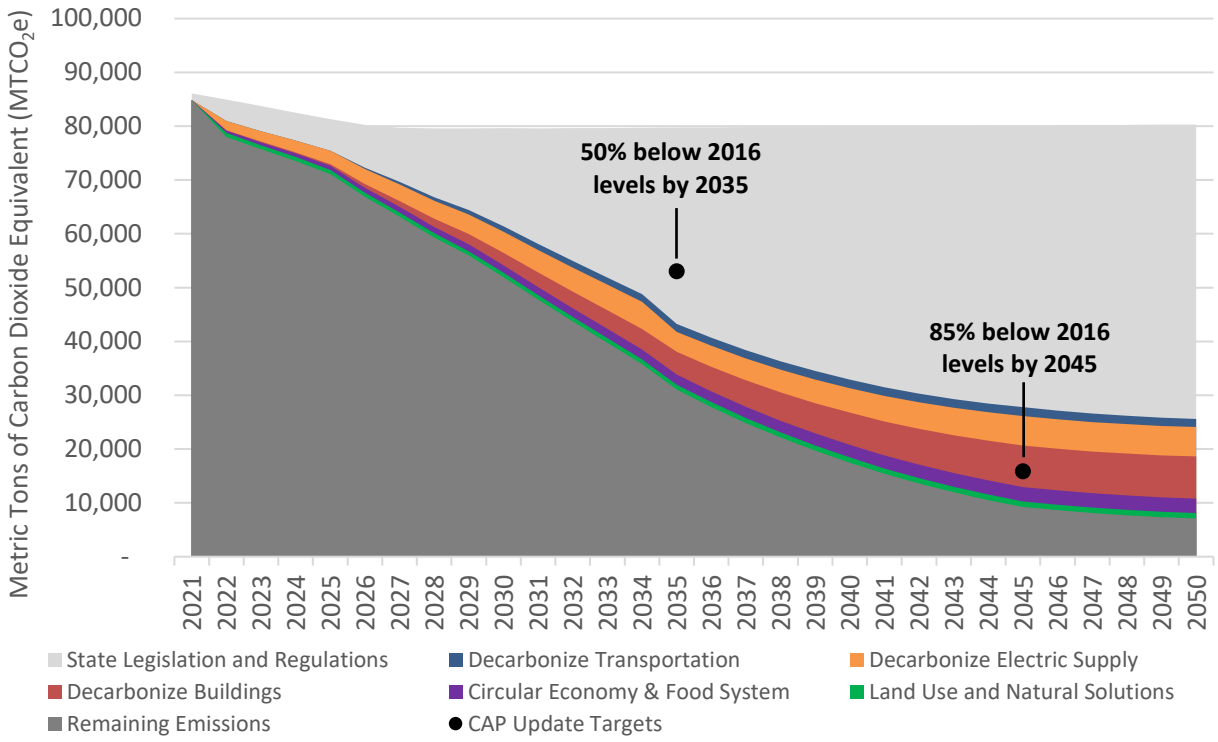


Figure 3-1: GHG Emissions Reductions by Pathway

Source: EPIC 2024.

Successful implementation of the measures presented in this CAP Update will require a coordinated, multi-pronged approach between actions the City itself can take, along with voluntary actions that are recommended to be taken by residents and local businesses/organizations. Figure 3-2 displays the same reductions shown in Figure 3-1organized by "actor" rather than pathway. As shown in the figure, while successful implementation of CAP Update measures where the City is the actor will result in some level of GHG emissions reductions, much of the local reductions will need to come from voluntary actions taken by residents and local businesses/organizations, which is especially crucial in achieving the 2045 GHG reduction target of 85 percent below 2016 levels.

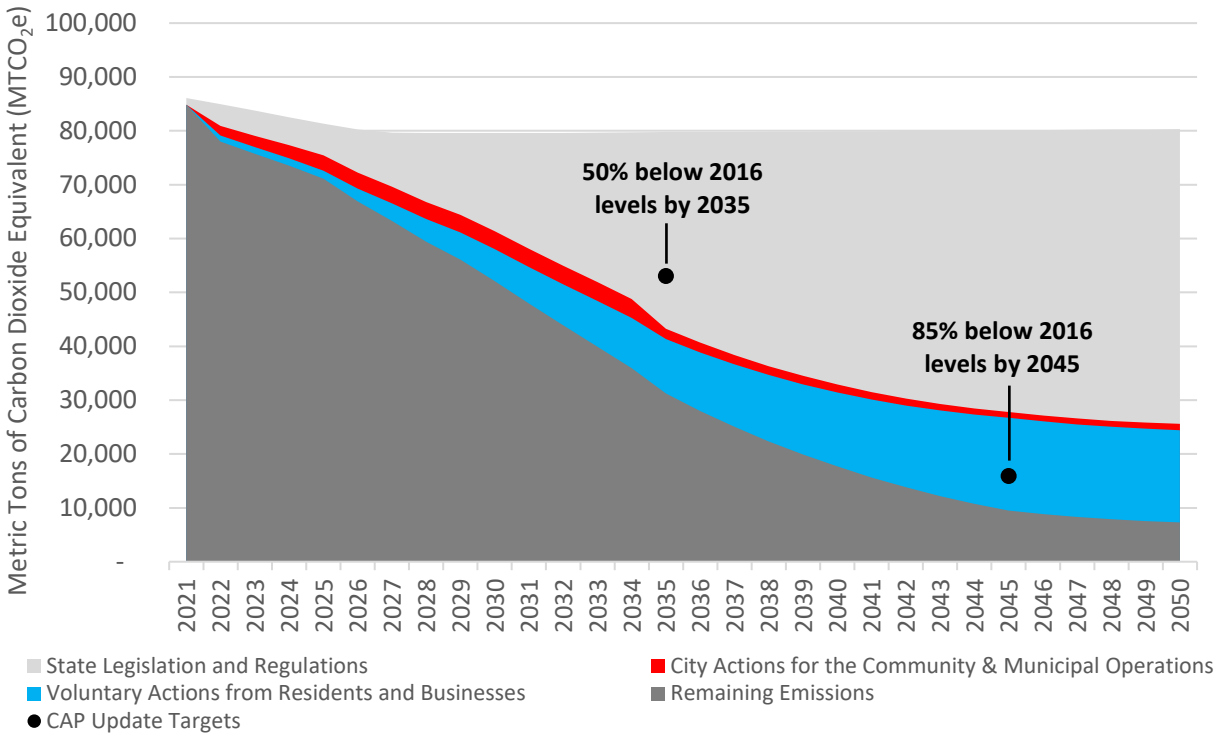


Figure 3-2: GHG Emissions Reductions by Actor

Source: EPIC 2 024.

The remainder of this chapter presents all the CAP Update measures and actions, organized by pathway. It should be noted that GHG emissions reductions associated with both the 2035 and 2045 target years were quantified at the action level, summed at the measure level, and are presented in the tables throughout this chapter. Some actions (and overarching measures) that were not technically quantifiable but would still realistically result in some level of GHG emissions reductions are denoted as a "supporting action" or "supporting measure." Additionally, the actor associated with successful implementation of each action is presented throughout. Brief, contextual descriptions are provided for each pathway, strategy, and measure presented in each section and subsection.

3.3.1 Decarbonize Transportation Pathway

Decarbonize Transportation Vision

- All residents of Solana Beach can afford to purchase or lease an EV. Their EV can be charged at home or at conveniently located public charging stations.
- Businesses in the city recognize that EV charging stations are a resource to attract customers to their business.
- Businesses with local employees are willing to accommodate various working styles, including working from home (to reduce commuting), and install EV charging stations for employees and customers who need them at the workplace.
- Popular destinations within Solana Beach, such as shopping centers and schools, are easily accessible by electric buses, safe bicycle lanes, and pedestrian pathways.

While all pathways presented in this CAP Update are critical to reducing local GHG emissions, the **Decarbonize Transportation** pathway is arguably the most important. Transportation is the most significant contributor to GHG emissions in the city, accounting for 64 percent of the City's total GHG emissions in 2016. While State legislation and regulations will significantly reduce transportation related GHG emissions in the future, the City still has a role to play in further reducing these emissions locally. Table 3-3 displays all the measures and their associated GHG emissions reductions (for 2035 and 2045) for this pathway, organized by strategy.

Table 3-3 Summary of GHG Reduction Measures – Decarbonize Transportation Pathway

Strategy	Measure #	Measure	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
VMT Reduction	T-1	Adopt a hybrid work schedule/virtual meeting policy.	879	1,002
	T-2	Use alternative modes (includes bike/e-bike share program) for non-work trips.	596	671
	T-3	Provide intra-city electric shuttle covering destinations and schools in the city.	Supporting Measures	
	T-4	Electrify school buses.		
Low-Carbon Emission Vehicles	T-5	Increase electric vehicles and electric vehicle charging infrastructure.		
		Total GHG Emissions Reductions ($MTCO_2e$)	**1,475**	**1,672**

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
VMT = vehicle miles traveled
Source: Calculations conducted by EPIC; table compiled by Ascent.

VMT Reduction Strategy

The first strategy within the Decarbonize Transportation pathway is Vehicle Miles Traveled (VMT) Reduction. VMT is a measure of the demand for vehicle travel on public roadways, and generally, more VMT results in more GHG emissions. Reducing VMT is an important element of minimizing GHG emissions from transportation, and this outcome is reflected in Measures T-1 through T-4 below.

Source: City of Solana Beach.

Measure T-1: Adopt a hybrid work schedule/virtual meeting policy.

When it comes to work, eliminating the need for mandatory, in-person attendance (where feasible) can be an effective strategy in reducing VMT, and thereby, GHG emissions. The actions under this measure include adopting remote or hybrid work policies and prioritizing virtual meetings, where possible.

Table 3-4 Actions Under Measure T-1: Adopt a Hybrid Work Schedule/Virtual Meeting Policy				
Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
T-1 OB	Adopt a remote/hybrid work policy for employees that allows employees to work remotely 2 days a week (telecommute eligible jobs only).	Organizations and/or Businesses	342	386
T-1 R	Work remotely 2 days a week (Solana Beach residents with telecommutable jobs only).	Residents	537	616
T-1.1	Provide incentives to businesses to adopt a telecommute program/remote work policy.	City (for Community)	Supporting Actions	
T-1.2	Adopt a remote/hybrid work policy that allows employees to work remotely one day per week.	City (Municipal Operations)		
T-1.3	Prioritize virtual meetings for regularly scheduled non-public meetings.	City (Municipal Operations)		
	Total GHG Emissions Reductions ($MTCO_2e$)		**879**	**1,002**

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
OB = Organizations/businesses
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

Measure T-2: Use alternative modes (including bike/e-bike share program) for non-work trips.

Promoting and boosting alternative modes of transportation within the City, such as biking or walking, is another important tool in reducing VMT and transportation related GHG emissions, which are reflected in the actions under this measure.

Table 3-5 Actions Under Measure T-2: Use Alternative Modes for Non-Work Trips				
Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
T-2 R	Increase bike and walk trips to 30% of all daily trips.	Residents	596	671
T-2.1	Promote alternative environmentally friendly transportation such as bicycles, e-bicycles, shuttle services connecting major destinations and residential areas and schools, public transit.	City (for Community)	Supporting Actions	
T-2.2	Expand pedestrian and bikeway network.	City (for Community)		
T-2.3	Conduct an analysis at the community scale to determine options to employ the 15-Minute City concept.	City (for Community)		
	Total GHG Emissions Reductions ($MTCO_2e$)		**596**	**671**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

Measure T-3: Provide intra-city electric shuttle covering destinations and schools in the city.

In addition to promoting remote work and active transportation, reducing VMT can also result from increasing the number of higher-capacity vehicle options, which can reduce the number of "drive-alone" vehicle trips, or

trips where the driver is the only vehicle occupant. The action under Measure T-3 below includes expanding these options, such as e-shuttles, school buses, and other forms of transportation.

Table 3-6 Actions Under Measure T-3: Provide Intra-City Electric Shuttle Covering Destinations and Schools in the City

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
T-3.1	Expand transportation offerings such as e-shuttles within the community and school buses, and increase specialized transportation options for older adults.	City (for Community)	Supporting Action	
		Total GHG Emissions Reductions ($MTCO_2e$)	**N/A**	**N/A**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
N/A = not applicable
Source: Calculations conducted by EPIC; table compiled by Ascent.

Measure T-4: Electrify school buses.

Providing safe and low-carbon transportation options for the youth of Solana Beach is a longer-term initiative that will be explored with local school districts. This may include exploring opportunities for re-instating school buses, and facilitating electrification of these buses. The action under Measure T-4 will also include providing educational programs on how students can safely travel to and from school through active transportation modes.

Table 3-7 Actions Under Measure T-4: Electrify School Buses

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
T-4.1	Work with school districts to expand school bus options and provide bike, walk, and e-bike to school education programs for all students.	T-4.1	Supporting Action	
		Total GHG Emissions Reductions ($MTCO_2e$)	**N/A**	**N/A**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
N/A = not applicable
Source: Calculations conducted by EPIC; table compiled by Ascent.

Low-Carbon Emission Vehicles Strategy

The second strategy within the Decarbonize Transportation pathway is Low-Carbon Emission Vehicles. While reducing VMT plays a vital role in reducing GHG emissions from transportation, it goes hand-in-hand with shifting fuels powering on-road vehicles from fossil fuels to low- or zero-emission fuels. This notion is underscored in Measure T-5 below, which is intended to support statewide initiatives to expand zero-emission vehicle (ZEV) adoption and fueling/charging infrastructure.

Measure T-5: Increase electric vehicles and electric vehicle charging infrastructure.

To promote more widespread use of low- or zero-emission vehicles, this measure and its associated actions are related to expanding electric vehicles (EVs) adoption and EV charging infrastructure—the most common form of low- or zero-emission vehicles currently available on the market. GHG emissions reductions for Measure T-5 are not quantified directly as increases in ZEV adoption are already considered in the legislative-adjusted BAU emissions forecast (see Appendix A for more details)

Table 3-8 Actions Under Measure T-5: Increase Electric Vehicles and Electric Vehicle Charging Infrastructure

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
T-5 OB[1]	100% ZEV purchased by 2035.	Organizations and/or Businesses	Supporting Actions	
T-5 R[1]	100% ZEV purchased by 2035.	Residents		
T-5.1	Provide information to the residents on ZEV rebate opportunities (federal and State incentives)	City (for Community)		
T-5.2	Work with the community to install and maintain at least 253 additional publicly-accessible charging stations by 2030 including both level 2 and DC fast chargers on public and private property.	City (for Community)		
T-5.3	Apply for CA/NEVI funding for public chargers as part of NEVI's I-5 corridor plan.	City (for Community)		
T-5.4	Work with SDG&E/CEA to identify the areas that need updated infrastructure for supplying enough electricity for charging stations.	City (for Community)		
T-5.5[2]	50% ZEVs purchased by 2024; 100% ZEVs purchased by 2027.	City (Municipal Operations)		
		Total GHG Emissions Reductions ($MTCO_2e$)	**N/A**	**N/A**

[1] Supports State Advanced Clean Car II Regulations
[2] Supports State Advanced Clean Fleets Regulation
$MTCO_2e$ = metric tons of carbon dioxide equivalent
CEA = Clean Energy Alliance
DC = direct current
N/A = not applicable
NEVI = National Electric Vehicle Infrastructure Formula Program
OB = Organizations/businesses
R = Residents
SDG&E = San Diego Gas and Electric
ZEV = zero-emission vehicle.
Source: Calculations conducted by EPIC; table compiled by Ascent.

3.3.2 Decarbonize Buildings Pathway

Decarbonize Buildings Vision

- All commercial and residential appliances are converted to electric and/or energy efficient options.
- Homeowners and businesses are able to adequately afford and take advantage of new electrification and energy efficiency improvement opportunities.
- All new residential and nonresidential construction within Solana Beach is fully electric.

Decarbonize Buildings is another important pathway in this CAP Update because, similar to transportation, building energy is a significant contributor to GHG emissions within the city. Specifically, emissions from electricity and natural gas sources accounted for 32 percent of the City's total GHG emissions in 2016. While State legislation and regulations will reduce building energy related GHG emissions in the future, the City still has a role to play in further reducing these emissions locally. Table 3-9 below displays all the measures and their associated GHG emissions reductions (for 2035 and 2045) for this pathway, organized by strategy.

Table 3-9 Summary of GHG Reduction Measures – Decarbonize Buildings Pathway				
Strategy	Measure #	Measure	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
Increase Energy Efficiency	B-1	Implement energy efficiency measures.	1,064	2,124
Electrify Appliances & Equipment	B-2	Build all-electric new construction.	878	1,063
	B-3	Replace gas appliances at end-of-life with electric appliances.	2,275	4,536
		Total GHG Emissions Reductions ($MTCO_2e$)	**4,217**	**7,723**

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: Calculations conducted by EPIC; table compiled by Ascent.

Increase Energy Efficiency Strategy

The first strategy within the Decarbonize Buildings pathway is Increase Energy Efficiency. Increasing energy efficiency will reduce the amount of fossil fuels used to power buildings that rely on them, thereby reducing GHG emissions and energy costs for community members. Measure B-1 includes actions aimed at increasing energy efficiency in buildings.

Measure B-1: Implement energy efficiency measures.

The City intends to provide residents with the means to improve energy efficiency of their homes and businesses by sharing information about available rebates and incentives and implementing structural change to influence energy conservation actions. The City will explore developing energy rate structures that incentivize shifting energy consumption to times when more renewable sources are online and available. In addition, as the City will explore development of energy and water building benchmarking and performance standards for existing buildings. These concepts are reflected in the actions below.

Table 3-10 Actions Under Measure B-1: Implement Energy Efficiency Measures				
Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
B-1 OB	Replace 50% commercial appliances at end-of-life with more energy efficient and EnergyStar appliances.	Organizations and/or Businesses	44	87
B-1 R	Replace 50% residential appliances at end-of-life with more energy efficient and EnergyStar appliances	Residents	1,020	2,037
B-1.1	Consider Energy and Water Building Benchmarking and Performance Standards for existing buildings.	City (for Community)	Supporting Actions	
B-1.2	Promote incentives to improve the efficiency of electricity consumption (e.g., smart load management, energy monitoring devices, LED lighting).	City (for Community)		
B-1.3	Promote rate structures that incentivize shifting of loads to sunny times (e.g., dynamic pricing).	City (for Community)		
		Total GHG Emissions Reductions ($MTCO_2e$)	**1,064**	**2,124**

Notes: Columns may not add to totals due to rounding.
LED = light-emitting diode
$MTCO_2e$ = metric tons of carbon dioxide equivalent
OB = Organizations/businesses
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

3.2.2 Electrify Appliances & Equipment Strategy

The second strategy within the Decarbonize Buildings pathway is Electrify Appliances & Equipment. This strategy includes Measures B-2 and B-3, which are related to constructing all-electric new buildings and replacing gas appliances with electric appliances, respectively. Successful implementation of these measures would meaningfully reduce GHG emissions from building energy use.

Measure B-2: Build all-electric new construction.

Ensuring that new construction—both residential and nonresidential—is built to be all-electric is crucial in reducing GHG emissions from building energy use. Fossil fuel infrastructure is still common in many buildings for basic necessities, such as cooking or heating, so divesting future construction away from this infrastructure in favor of all-electric alternatives would result in significant GHG reductions.

Table 3-11 Actions Under Measure B-2: Build All-Electric New Construction

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
B-2.1	Implement Building Electrification Ordinance 528 for new construction.	City (for Community)	878	1,063
		Total GHG Emissions Reductions ($MTCO_2e$)	**878**	**1,063**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: Calculations conducted by EPIC; table compiled by Ascent.

Measure B-3: Replace gas appliances at end-of-life with electric appliances.

This measure and its associated actions are aimed at replacing fossil-fueled powered appliances and equipment, which release GHGs, with electric alternatives, which do not produce GHG emissions when used.

Table 3-12 Actions Under Measure B-3: Replace Gas Appliances at End-of-Life with Electric Appliances

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
B-3 OB	Replace 50% of gas appliances at end-of-life with electric appliances.	Organizations and/or Businesses	Supporting Actions	
B-3 R	Replace 50% of residential appliances (e.g., water heating, space heating, space conditioning, pool heating, pool pumping) at end-of-life with electric appliances.	Residents	2,275	4,536
B-3.1	Identify and cultivate programs, financing, and technologies which will promote the replacement of methane gas with electricity.	City (for Community)	Supporting Actions	
B-3.2	Promote incentives to electrify gas appliances and equipment.	City (for Community)		
		Total GHG Emissions Reductions ($MTCO_2e$)	**2,275**	**4,536**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
OB = Organizations/businesses
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

3.3.3 Decarbonize Electric Supply Pathway

Decarbonize Electric Supply Vision

- Every resident and business chooses to purchase 100% renewable electricity through Clean Energy Alliance.
- Carbon-free electricity generated through on-site solar makes up more than half of the Solana Beach's electricity supply
- Residents and businesses are confident knowing grid reliability will rarely be an issue through deployment of solar, battery storage, and microgrids.

In tandem with decarbonizing buildings (e.g., building all-electric new construction), the **Decarbonize Electric Supply** pathway involves replacing electric service options with lower- or zero-carbon options to ensure that the source of the electricity produces minimal GHG emissions. Table 3-13 displays all the measures and their associated GHG emissions reductions (for 2035 and 2045) for this pathway, organized by strategy.

Table 3-13 Summary of GHG Reduction Measures – Decarbonize Electric Supply Pathway

Strategy	Measure #	Measure	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
Increase Renewable Energy Sources	E-1	Increase to 100% renewable electricity citywide.	1,029	N/A
Increase PV Capacity and Decentralize Energy Storage Capacity	E-2	Increase installation of photovoltaic and battery storage.	2,688	5,468
		Total GHG Emissions Reductions ($MTCO_2e$)	**3,718**	**5,468**

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
N/A = not applicable
Source: Calculations conducted by EPIC; table compiled by Ascent.

Increase Renewable Energy Sources Strategy

The first strategy within the Decarbonize Electric Supply pathway is Increase Renewable Energy Sources. Ensuring that electricity is produced and delivered by renewable energy sources, rather than by fossil fuels, is an important component in reducing GHG emissions within the city. Measure E-1 directly reflects the idea of increasing renewable energy sources.

Measure E-1: Increase to 100% renewable electricity citywide.

Equally as important as physical electrification efforts throughout the city (e.g., as described in the Decarbonize Buildings pathway) are efforts to ensure that the electricity being used within the city is produced and delivered by renewable sources that do not produce GHG emissions. These efforts, with the ultimate goal of increasing to 100 percent renewable electricity citywide, are described further in the actions under this measure.

Table 3-14 Actions Under Measure E-1: Increase to 100% Renewable Electricity Citywide

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
E-1 OB	Achieve 97% participation in CEA default option.	Organizations and/or Businesses	985	N/A
E-1 R	Achieve 97% participation in CEA's default option.	Residents		
E-1.1	Make CEA's 100 percent renewable/carbon free electricity option the default option for Solana Beach by 2035.	City (for Community)		
E-1.2	Enroll all municipal electricity accounts to CEA's 100% renewable/carbon free option by 2025.	City (Municipal Operations)	44	N/A
	Total GHG Emissions Reductions ($MTCO_2e$)		**1,029**	**N/A**

Notes: Columns may not add to totals due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent
N/A = not applicable
OB = Organizations/businesses
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

Increase Photovoltaic Capacity and Decentralize Energy Storage Capacity Strategy

The second strategy within the Decarbonize Electric Supply pathway is Increase Photovoltaic (PV) Capacity and Decentralize Energy Storage Capacity. Increasing the amount of local solar power that is produced, along with expanding the use of decentralized, clean energy storage, can simultaneously reduce GHG emissions and build longer-term resilience to potential planned or unplanned grid outages. Measure E-2 directly reflects this goal.

Measure E-2: Increase installation of photovoltaic and battery storage.

The actions under Measure E-2 outline more specific ways in which PV capacity can be increased and energy storage capacity can be decentralized within the city, including promoting the growth of rooftop PV, identifying sites for community solar, incentivizing energy storage, and further considering microgrids installation in the city.

Table 3-15 Actions Under Measure E-2: Increase Installation of Photovoltaic and Battery Storage				
Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
E-2 OB	Achieve total 43 MW PV capacity (approximately equivalent to 50% electric self-sufficiency in the city).	Organizations and/or Businesses	2,688	5,468
E-2 R	Achieve total 43 MW PV capacity (approximately equivalent to 50% electric self-sufficiency in the city).	Residents		
E-2.1	Identify sites suitable for Community Solar (including over parking lots) to meet the City's electric demand that is not met by rooftop PV.	City (for Community)	Supporting Actions	
E-2.2	Promote the growth of rooftop PV in Solana Beach toward what is needed for greater than 50% electric self-sufficiency.	City (for Community)		
E-2.3	Promote local incentives for energy storage (including cars and buses).	City (for Community)		
E-2.4	Consider third-party microgrid(s) in Solana Beach.	City (for Community)		
E-2.5	Complete an analysis to identify and evaluate opportunities to install renewable energy generation and energy storage projects at municipal facilities, including parking lots.	City (Municipal Operations)		
		Total GHG Emissions Reductions ($MTCO_2e$)	2,688	5,468

$MTCO_2e$ = metric tons of carbon dioxide equivalent
MW = megawatt
OB = Organizations/businesses
PV = photovoltaic
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

3.3.4 Land Use & Natural Climate Solutions Pathway

Land Use & Natural Climate Solutions Vision

- All residents and visitors get to enjoy the abundance of trees and greenery Solana Beach has to offer, while taking advantage of the numerous co-benefits they will provide, such as improved air quality and shade on hot, sunny days.
- All vegetation in the city is able to thrive and be resilient when exposed to climate stressors, such as high heat, dry spells, or heavy precipitation.

The **Land Use & Natural Climate Solutions** pathway is unlike the other pathways presented in this chapter because instead of reducing GHG emissions from existing inventory sectors like the other pathways, it is focused on removing GHGs from the atmosphere through expanding trees and vegetation throughout the city (which can ultimately be equated as GHG emissions reductions, as shown in Table 3-16 below, but *technically* is not). The table below displays the two measures and their associated GHG emissions reductions (for 2035 and 2045) for this pathway, organized by strategy.

Table 3-16 Summary of GHG Reduction Measures – Land Use & Natural Climate Solutions Pathway				
Strategy	Measure #	Measure	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
Restore and Enhance Natural and Working Lands	CS-1	Increase urban canopy cover.	964	1,021
	CS-2	Use native or drought tolerant species at landscape areas.	Supporting Measure	
		Total GHG Emissions Reductions ($MTCO_2e$)	964	1,021

$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: Calculations conducted by EPIC; table compiled by Ascent.

Restore and Enhance Natural and Working Lands Strategy

To help promote land use and natural climate solutions, the sole strategy for this pathway is Restore and Enhance Natural and Working Lands. If planted and responsibly maintained on a broad scale, trees and vegetation can capture and store extraordinary amounts of carbon from the atmosphere and can also result in a wide array of co-benefits. Related to this, Measures CS-1, CS-2, and their associated actions are presented below.

Measure CS-1: Increase urban canopy cover.

This measure and its associated actions are intended to significantly expand vegetation and the urban tree canopy within the city. While trees and vegetation do not reduce GHG emissions in the traditional sense, they do capture and remove carbon from the atmosphere, which can be equated to "reductions" based on the scale of tree and vegetation expansion.

Table 3-17 Actions Under Measure CS-1: Increase Urban Canopy Cover				
Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
CS-1 OB	Increase urban canopy cover to 30% of developed land (now 22%). Use native, climate-appropriate, low-water, and non-invasive trees and shrubs in landscaping.	Organizations and/or Businesses	964	1,021
CS-1 R	Increase urban canopy cover to 30% of developed land (now 22%). Use native, climate-appropriate, low-water, and non-invasive trees and shrubs in landscaping.	Residents		
CS-1.1	Conduct an inventory to assess tree cover in the city.	City (for Community)	Supporting Actions	
CS-1.2	Provide free trees or incentives for trees for residents and commercial developments.	City (for Community)		
CS-1.3	Develop a comprehensive communitywide urban forestry plan and adopt a tree canopy coverage percentage target.	City (for Community)		
CS-1.4	Increase plantings of climate-appropriate trees, shrubs, and low-water non-invasive shade trees in public parks and spaces.	City (Municipal Operations)		
		Total GHG Emissions Reductions ($MTCO_2e$)	**964**	**1,021**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
OB = Organizations/businesses
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

Measure CS-2: Use native or drought tolerant species at landscape areas.

Measure CS-2 aims to encourage community members that manage landscaped areas to plant drought tolerant and low-water use vegetation through consideration of a water benchmarking program. This program could take various forms with the overall goal of making community members more aware of the amount of water used for landscaping and urge them to replace high water consuming landscaped areas with more climate friendly options.

Table 3-18 Actions Under Measure CS-2: Use Native or Drought Tolerant Species at Landscape Areas

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
CS-2	Consider Energy and Water Building Benchmarking and Performance Standards for existing buildings.	City (for Community)	Supporting Action	
		Total GHG Emissions Reductions ($MTCO_2e$)	**N/A**	**N/A**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
N/A = not applicable
Source: Calculations conducted by EPIC; table compiled by Ascent.

3.3.5 Circular Economy & Food Systems Pathway

Circular Economy & Food Systems Vision

- All residents are educated and conscious of the core principles of waste reduction, including reduction, reuse, upcycling, and recycling.
- 90% of waste generated in Solana Beach is diverted from landfills for more beneficial reuse.

In general, a circular economy refers to a sustainable model of resource production and consumption. For this CAP Update specifically, the Circular Economy & Food System pathway is related to reducing solid waste through landfill diversion, organic materials source reduction, reuse, upcycling, and recycling, and reducing food waste. Solid waste accounted for 3 percent of the City's total GHG emissions in 2016, and successfully implementing the measure presented in Table 3-18 below could help meaningfully reduce solid waste emissions in the City, as shown with the associated GHG emissions reductions for 2035 and 2045.

Table 3-19 Summary of GHG Reduction Measures – Circular Economy & Food Systems Pathway

Strategy	Measure #	Measure	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
Waste Reduction	W-1	Divert solid waste from landfill.	2,258	2,678
		Total GHG Emissions Reductions ($MTCO_2e$)	**2,258**	**2,678**

$MTCO_2e$ = metric tons of carbon dioxide equivalent
Source: Calculations conducted by EPIC; table compiled by Ascent.

Waste Reduction Strategy

To help promote a circular economy and food system, the sole strategy for this pathway is Waste Reduction. Reducing waste and promoting sustainability through waste-related processes (e.g., recovery of food waste) can provide major contributions to GHG reduction. Measure W-1 and its associated actions directly reflects this goal.

Measure W-1: Divert solid waste from landfill.

The actions under Measure W-1 are primarily geared towards diverting solid waste from landfills and educating the community on organic materials source reduction, reuse, upcycling, and recycling, and food waste and recovery. Diverting organic waste from landfills directly avoids methane emissions from waste decomposition.

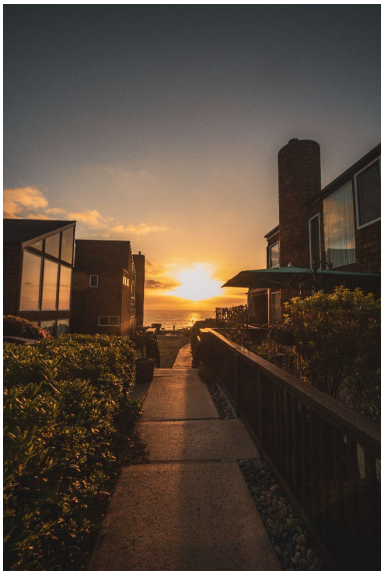
Table 3-20 Actions Under Measure W-1: Divert Solid Waste from Landfill

Action #	Action Description	Actor	GHG Emissions Reductions ($MTCO_2e$)	
			2035	2045
W-1 OB	Divert 90% waste from landfill by 2045 (equivalent to achieving 1.8 lbs per capita per day waste disposal, today 4.6 lbs/day).	Organizations and/or Businesses	2,258	2,678
W-1 R	Divert 90% waste from landfill by 2045 (equivalent to achieving 1.8 lbs per capita per day waste disposal, today 4.6 lbs/day).	Residents		
W-1.1	Develop an education program to raise awareness about organic materials source reduction, reuse, upcycling, and recycling.	City (for Community)	Supporting Actions	
W-1.2	Develop a communitywide, coordinated education campaign to raise awareness about food waste and recovery.	City (for Community)		
	Total GHG Emissions Reductions ($MTCO_2e$)		**2,258**	**2,678**

lbs = pounds
$MTCO_2e$ = metric tons of carbon dioxide equivalent
OB = Organizations/businesses
R = Residents
Source: Calculations conducted by EPIC; table compiled by Ascent.

Chapter 4
Adaptation

4.1 Introduction



Source: City of Solana Beach.

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. 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). As a result of Executive Order (EO) S-13-08, the California Natural Resources Agency (CNRA) developed the Safeguarding California Plan (CRNA 2018a), which integrates the State's climate adaptation strategy with public and private entities at the local, regional, state and federal levels. However, because impacts of climate change vary by location due to physical, social and economic characteristics, it is important to identify the projected severity these impacts could have in the City.

Periodic scientific examinations of the potential impacts of climate change in California are carried out by statewide climate change assessments. The fourth and most recent assessment—California's Fourth Climate Change Assessment—includes findings for nine regions and different communities, including the San Diego Region and Coast and Ocean Communities. For the San Diego region, these key findings are summarized in Section 4.3. Some of the climate change effects in this report refer to this Fourth California Climate Change Assessment (CRNA 2018b) and references therein. Additional references are as noted. Furthermore, Cal-Adapt (Cal-Adapt 2019) a climate change scenario planning tool, was used to acquire city and location specific information which was not available in the Assessment. Using Localized Constructed Analogs (LOCA), Cal-Adapt downscales global climate simulation model data to local and regional resolution for two possible climate change projections, one in which emissions peak around 2040 and then decline (Representative Concentration Pathway [RCP] 4.5) and another in which emissions continue to rise throughout the 21st century (RCP 8.5) in a business-as-usual scenario.

4.2 Climate Effects and Solana Beach Adaptation Strategies

This section describes how the regional climate change effects highlighted in **Section 4.3** could be felt locally. It also defines the specific steps necessary to prepare for the future effects of a changing climate. These adaptation strategies build upon current efforts to be proactive, more sustainable, and resilient. It is important to note that many of these strategies also have the potential to provide other important co-benefits to the community. The City's General Plan already 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 City's climate adaptation strategies are grouped into the nine categories listed below. The effect of these categories on public health and safety will be collectively described in the Public Health and Safety section.

- Increase in Temperatures and Extreme Heat;
- Variable Water Supplies;
- Increased Risk of Wildfire;
- Coastal Erosion and Sea Level Rise;

- Flooding;
- Increased Energy System Demand;
- Threats to Public Health and Safety;
- Threats to Coastal Habitat; and
- Climate Justice.

4.2.1 Increase in Temperatures and Extreme Heat

Climate change will impact regional temperatures in a number of ways including average temperatures, highs and lows, geographic patterns and extreme heat events. Annual temperatures in the San Diego region are projected to climb steadily. By the end of the century, yearly average temperatures are expected to increase by 4 to 6 ºF (~2.2 to 3.3 ºC) under RCP 4.5, the low emissions scenario, and by 7 to 10 ºF (3.6 to 5.8 ºC) under RCP 8.5, the high emissions scenario.

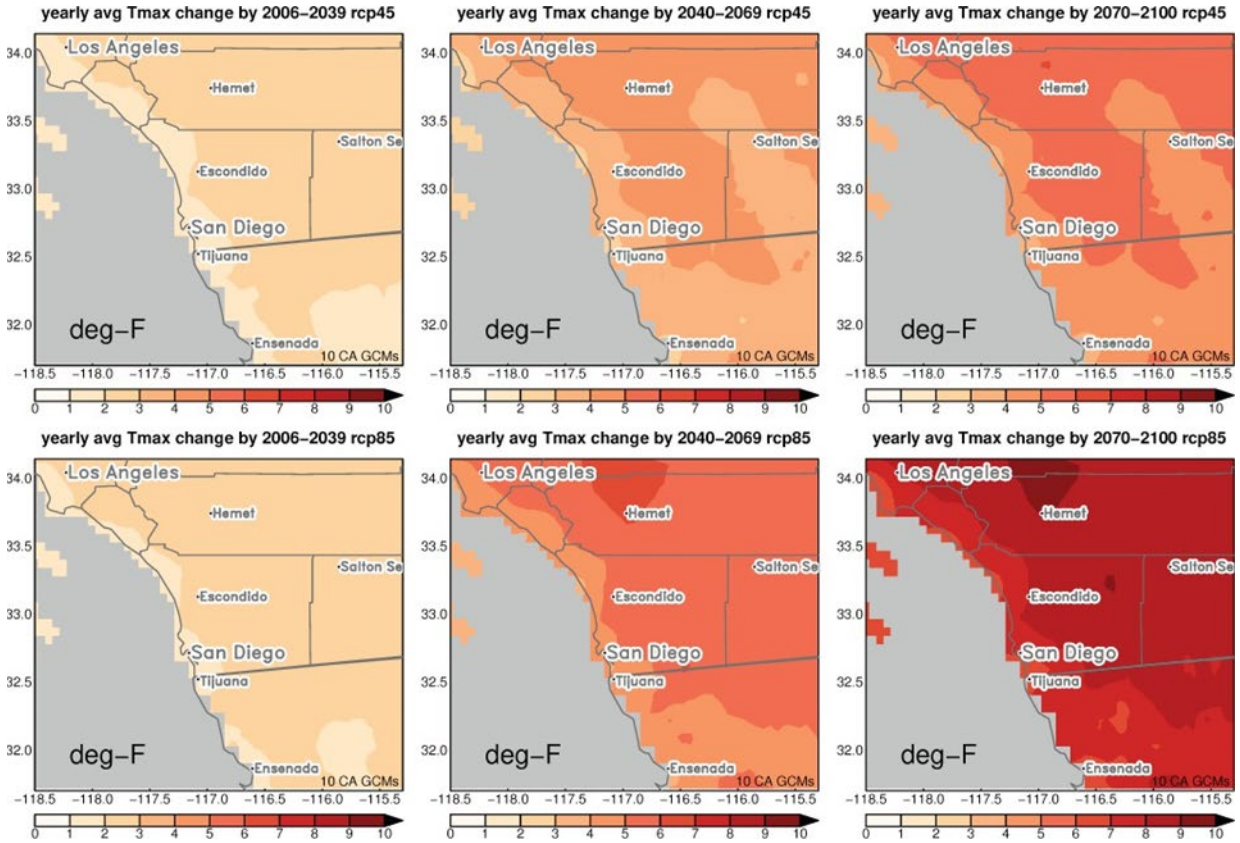


Figure 4-1: A map showing the average Tmax increase at early, mid and end of century relative to 1976-2005 climatology for RCP 4.5 (top) and RCP 8.5 (bottom).

Source: Kalansky, et al. 2018.

Increase in lows and highs. In addition to the average temperature, average annual low and high temperatures are also projected to increase, with lows typically associated with nighttime temperatures. Average historical low and high temperatures for Solana Beach over the period of 1961 to 1990 are 53.4 ºF and 73.4 ºF, respectively. Cal-Adapt calculations for the period of 2070 to 2099 projects an annual average increase in low temperatures from 53.4 ºF to 58.1 ºF (RCP 4.5) and 61.2 ºF (RCP 8.5), and an annual average high temperature increase from 73.4 ºF to 77.8 ºF (RCP 4.5) and 80.6 ºF (RCP 8.5), respectively.

Geographic temperature variations. Atmospheric temperatures vary from the coast to inland areas usually because of prevailing winds bringing cooler oceanic air masses and marine cloud layers. As the planet

warms, the amount of summer warming in the interior regions of San Diego County is projected to exceed that along the immediate coastal margin by more than 32.9 ºF by mid-21st century. At the end of the century (2070-2100), under RCP 8.5, the average hottest day per year is projected to increase from 90-100 ºF to 100-110 ºF near the coast and from 105-115 ºF to 110-125 ºF in the deserts (Guirguis, et al. 2018a).

Increase in extreme heat events and heat waves. Climate change is also expected to result in an increase in extreme heat events (i.e., days per year when the maximum temperature is above the extreme heat threshold of 92.1 °F). Historically, Solana Beach has experienced an average of 5 extreme heat days from 1961 to 1990. Using LOCA downscaling for Solana Beach, Cal-Adapt projections show average number of extreme heat days increasing to 12 and 31 for the RCP 4.5 and RCP 8.5 scenarios, respectively, over the period between 2070 and 2099. Similarly, the maximum duration or longest stretch of consecutive extreme heat days is also expected to increase.

Four consecutive extreme heat days is considered to be a heat wave. Although the relationship between background warming and probability of a heat wave occurrence is currently not well understood (Guirguis, et al. 2018b), observations indicate that heat waves in the region have become more humid, with warmer nighttime temperatures (Gershunov, et al. 2009) (Gershunov & Guirguis 2012). High humidity can exacerbate the impacts of heat on health. Heat waves, which have historically occurred between late June and mid-October, are also projected to occur both earlier and later in the season.

There are some existing measures in place, regionally, to address the negative impacts of increased temperature. For example, the county has established regional cool zones (County of San Diego 2019) to provide residents a refuge during extreme heat events. The Solana Beach Library is the closest cooling zone. As increasingly humid heat waves drive up nighttime temperatures, it will also be important to identify cool zones that may be open at night. A number of other measures relating to human health and energy resources, for example, are addressed in other sections.

Strategies to Prepare for Increase in Temperatures and Extreme Heat

Strategy 1: Coordinate response with relevant agencies. Coordinate response with relevant agencies to better plan and prepare emergency services associated with extreme heat events including an influx of visitors to the beach. Efforts should include improving Heat-Health Alert Warning Systems and identifying key vulnerable populations and individuals within the City.

Strategy 2: Reduce urban heating and promote passive cooling. Incorporate green infrastructure strategies into new and existing infrastructure to mitigate the effects of extreme heat events by reducing the area of heat-absorbing paved surfaces and increasing landscaping. Examples include: 1) climate-appropriate landscaping like shade trees; 2) green and cool roofs; 3) heat-reflective surfaces and materials; and 4) promoting solar carports on new and existing parking lots, which both mitigates heat absorption and increases shaded areas.

Strategy 3: Incentivize energy efficient cooling. Use the California Building Standards Code (CalGreen) voluntary measures for residential and nonresidential buildings to improve energy efficiency (e.g., air sealing improvements, whole house fans, energy efficient air-conditioning units).

Strategy 4: Prepare population for extreme heat events. Educate City residents on the health risks associated with extreme heat events and strategies including advertising local cooling zones. Particular focus should be given to educating vulnerable populations including children, those with pre-existing conditions, and the elderly. The City should identify organizations who already connect with these individuals to facilitate outreach and education.

Strategy 5: Protect worker safety. Work with local and regional employers to ensure worker protection measures are in place for extreme heat events. Measures may include assurance of adequate water, shade, rest breaks, and training on heat risks for all employees working in the City.

4.2.2 Variable Water Supplies

While projections generally show little change in total annual precipitation in California or the Southwestern United States, climate change is projected to increase temperatures, evapotranspiration and the variability of precipitation in the region leading to periods of prolonged drought and extreme rain events both of which can have significant negative impacts to the City. A decrease in rain will impact local water supplies, habitat, and an increase in wildfire risk whereas an increase in rainfall could lead to localized flooding.

Fresh water is supplied to the City by the Santa Fe Irrigation District (SFID). Only a small proportion of this water supply (10 to 20%) comes from local sources which are dependent upon local precipitation and, consequently, is highly variable. The majority of water provided by the SFID comes from the San Diego County Water Authority (SDCWA). SDCWA sources most of its water from outside the county, predominantly from the Colorado River. Colorado River water is either provided via the Metropolitan Water District of Southern California (MWDSC) or via water transfer agreements with the Imperial Irrigation District. Additionally, there is a smaller external supplement to the SDCWA from the Sierra snowpack water through the MWDSC. Consequently, water availability to the City is linked both to local and regional changes in precipitation and weather patterns. All of these natural water supplies are projected to decrease due to a combination of the warmer climate in the region, changes in precipitation patterns, increased evapotranspiration, especially in the Colorado River watershed, changes in river flow timing caused by rainfall instead of snow at higher elevations, especially in the Sierras, and more frequent and severe periods of drought in the region. Future water supplies from the Sierras 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, timing, and availability of freshwater associated with the Sierra snowpack. Thus, the City will face increasing challenges providing adequate water supplies and users could face shortages in normal or dry years.

In preparation for a reduced and less predictable water supply, local water authorities are working to find alternative sources and diversify the water supply. In 2015, the Poseidon desalination plant in Carlsbad was opened and is currently producing 50 million gallons of water per day in the San Diego County Water Authority supply, which is about 10% of its total. Local water authorities are also moving towards purifying wastewater for potable reuse. The San Diego County Water Authority aims to increase potable reuse to 17% of the county water supply by 2035. Potable reuse is typically less expensive than desalination and is considered an important drought-proof compliment to a portfolio of water sources.

Some adaptation programs targeting variable water supplies are already in place at the City. Solana Beach and Encinitas operate the San Elijo Water Reclamation Project (SEWRP) through the San Elijo Joint Power Authority (SEJPA). Currently, some of the wastewater stream is processed into grey water that can be used for landscaping, agriculture, gardening, etc. by the surrounding communities in place of potable water. Other programs which may be accessed from the City's website include an online water waste reporting form; a City app with a feature to report water waste; information about the potential to capture and use graywater for irrigation; and requirements that new homes use drought tolerant landscape alternatives.

Strategies to Prepare for Variable Water Supplies

Strategy 1: Drought related public education. Educate the public about water conservation programs including graywater systems; methods to report water waste; rainwater catchment systems; and provide resources for the conversion to drought tolerant landscaping including type of vegetation and low flow irrigation systems.

Strategy 2: Increase local recycled water supplies. The SFID purchases recycled water from the SEJPA which is jointly owned by the City and its neighbor Encinitas. The City should advocate for increasing recycled water supplies with specific emphasis on the development of potable reuse.

Strategy 3: Enhance recycled water infrastructure and distribution. Increase recycled water distribution infrastructure throughout the City to maximize the use of recycled water that is produced at the SEJPA facility. As part of the City's Annual Work Plan, the City will analyze the ability to bring recycled water further into the City for potential commercial properties, park/medians and for all City facilities. It will also encourage private properties to hook up to recycled water where it is available.

Strategy 4: Conduct study of stormwater capture and reuse options and costs. Quantify stormwater capture potential and coordinate with SFID and the SEJPA to determine the desirability and feasibility to incorporate rainwater into the City's water supply. Explore centralized versus distributed stormwater capture possibilities. Evaluate costs/benefits of potential projects.

4.2.3 Increased Risk of Wildfire

Drought conditions and rising temperatures associated with climate change have already increased the likelihood of large wildfires. Wildfires in the San Diego region now occur throughout the year, but primarily during late summer and early fall. An increased incidence of wildfires contributes to property damage, direct injuries and mortality, and indirect health effects from air pollution. One of the main areas of concern is the wildland-urban interface (WUI). In Solana Beach, WUI exists along the northern and eastern edge where the City abuts San Elijo Lagoon, San Dieguito Park, and Rancho Santa Fe.

There are a number of entities within and adjacent to the City that have developed strategies to mitigate increased wildfire risk. The village of Rancho Santa Fe has completed a Forest Health Study and is working with adjacent groups, such as the San Dieguito River Park, as well as its residents to remove dead or dying trees and brush on private property or county land, especially in the river valleys, and replant with more sustainable varieties. The Nature Collective (formerly the San Elijo Lagoon Conservancy), in cooperation with the local Fire Department, works with residents to thin excessive vegetation from areas near homes and maintain defensible space.

San Diego Gas and Electric (SDG&E) maintains a real time county wide meteorological and wildfire monitoring system (see "Everything in Our Power" video on YouTube produced by SDG&E [SDG&E 2019]) to suppress wildfire potential and improve response time to fire initiation (www.alertwildfire.org). They also actively remove or trim the trees and other vegetation in the vicinity of the transmission lines and facilities that are part of its electrical grid. As a last resort, SDG&E can also cut power to communities to avoid wildfires. Finally, the Solana Beach Fire Department has a list of strategies and goals to both reduce GHG emissions and address increased wildfire risk.

In January 2009, the City along with the United States Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), County of San Diego and the San Elijo Lagoon Conservancy prepared the San Elijo Lagoon Vegetation Management Plan and signed a second more specific MOU for the purpose of establishing a vegetation management program for the lands in and adjacent to the lagoon (City of Solana Beach 2009). This program maximizes the protection of natural resources and minimizes the risk from wildfire in the City along the San Elijo Lagoon. Fire hazard related policies are consolidated in Chapter 4 of the City's Land Use Plan (LUP) (City of Solana Beach 2019).

Strategies to Prepare for Increased Risk of Wildfire

Strategy 1: Increase fire resistance through landscaping and building materials. Conduct a health survey of trees and vegetation within the city boundaries. Promote the use of fire-resistant building design,

materials, and landscaping, including defensible space, and provide associated educational materials to residents and those seeking permits. Explore low or no cost incentives. This should include the identification and removal of dead and dying trees and vegetation especially from the wildland-urban interface and replacement with more drought tolerant and appropriate species wherever possible.

Strategy 2: Continue to update the Multi-jurisdictional Hazard Mitigation Plan (MHMP). Update the MHMP (County of San Diego 2020a) every five years as required and work to implement all strategies in the City's current MHMP.

Strategy 3: Coordinate with relevant agencies and adjacent communities. Coordinate with agencies including the California Governor's Office of Emergency Services (Cal OES), the California Department of Forestry and Fire Protection (CAL FIRE), the Solana Beach Fire Department, and SDG&E as well as adjacent communities, such as Escondido, Encinitas, Del Mar, and Rancho Santa Fe on the development of a wildfire action plan, the mapping of areas at a high risk of experiencing wildfire impacts, mitigating risk (fuel reduction strategies) where possible, and protecting vulnerable populations and businesses during scheduled power outages for wildfire threats.

Strategy 4: Increase citizen participation in the Community Emergency Response Team (CERT). Promote and encourage citizens to enroll in the CERT program which educates citizens about disaster preparedness for hazards and trains them in basic disaster response skills.

Strategy 5: Fire prevention awareness. Educate the public on fire prevention and preparedness including: 1) mitigation strategies to reduce loss of life, property damage, and impacts to natural resources; 2) evacuations and early warning systems; 3) large animal evacuations; 4) fuel/vegetation management; 5) hardening of structures; and 6) ignition source reductions.

4.2.4 Coastal Erosion and Sea Level Rise

One consequence of climate change that will disproportionately impact coastal communities is sea level rise. Sea level rise is primarily caused by the addition of water from the melting of land based ice sheets and glaciers and the expansion of water from warming. While future projections vary, especially because of uncertainties in the rate of ice loss in the major ice sheets of the world, the recent report developed by the California Ocean Protection Council (OPC) projects that by the year 2100, sea levels may rise by approximately 2.4 to 6.9 feet, with the potential for an extreme scenario of 10.2 feet of sea level rise caused by more rapid ice sheet loss in Greenland and Antarctica (Ocean Protection Council 2018). While the California coast regularly experiences erosion, flooding, and significant storm events, sea level rise will exacerbate these natural forces, leading to significant social, environmental, and economic impacts. The state encourages the use of the more extreme scenarios for local planning of projects with a lifetime greater than 50 years.

Since the City of Solana Beach does not include the estuaries that form the northern and southern boundaries of the City, we focus only on the issues associated with the beaches and bluffs. Solana Beach has 1.7 miles of narrow beach, backed by 75-foot-tall bluffs, of which more than 50 percent are protected by some type of shoreline protection device (e.g., seawall) and nearly all have houses or condominiums built on top. While bluff erosion is a natural process, it has accelerated in Solana Beach over the last several decades due, in part to, the damming of rivers and armoring of bluffs which historically contributed to the natural sand supply. Sea level rise is expected to further accelerate this erosion. One recent USGS study projects that coastal cliffs from Santa Barbara to San Diego may crumble at more than twice the historical rate by the year 2100 as sea levels rise (Limber, et al. 2018).

In recognition of existing and future bluff erosion as a significant concern, the City has taken a number of steps to manage its actively eroding shoreline. For example, it has worked with the California Coastal

Commission (CCC) for over a decade to approve its Local Coastal Program (LCP) Land Use Plan (LUP). The City is currently working on the associated Implementation Plan, which is needed before the CCC will certify the LCP. This LUP outlines policies incorporating the best available science to address proposals for improvements to and redevelopment of the existing blufftop homes. These proposals and improvements include long-term shoreline and blufftop development standards that; 1) deter the complete armoring and hardening of the City's bluffs, 2) require alternatives analysis and site reassessment when considering any approval or reauthorization of lower, mid or upper bluff protective work, 3) restrict additions and improvements to non-conforming structures that perpetuate an inappropriate line of development in a hazardous location; and 4) clarify what legitimate repair/maintenance activities can continue on non-conforming blufftop residences (City of Solana Beach 2014).

In addition, the City and Encinitas have been working for almost two decades as the local sponsors of a 50-year U.S. Army Corps of Engineers (USACE) Coastal Storm Damage Reduction Project (US Army Corps of Engineers 2020). A full array of structural and non-structural measures including, but not limited to, managed retreat, breakwaters, artificial reefs, and seawalls were evaluated to determine if they met the project objectives and were economically justified given different sea level rise scenarios. The preferred alternatives were then evaluated to determine if implementation would result in environmental impacts. Beach nourishment with sand from offshore borrow sites was determined to be the least environmentally damaging and practical alternative. The plan and environmental permitting were completed and in February of 2020, it was announced that the USACE would allocate $400,000 in federal funding for the Planning, Engineering & Design (PED) phase of the project. The PED phase will require an additional $1.5 million in federal funding. Once the PED phase is complete, the City and other stakeholders can pursue federal permission to begin construction on the project and the federal funding needed to complete the project. The City recognizes that while beach replenishment is a good option for the short-term, in the long-term other options such as managed retreat will need to be more seriously explored. This is especially true as land reclamation, industrialization, population growth and urbanization also continue to fuel explosive growth in the demand for sand, prompting many to question the sustainability of this valuable global resource (UN Environment Programme 2019).

Figure 4-2: Bluff Collapse in Solana Beach September 13, 2019

Strategies to Prepare for Coastal Erosion and Sea Level Rise

Strategy 1: Infrastructure protection. Incorporate the best available coastal research into long- term, capital improvement projects, such as improvements to public access stairways and the Marine Safety Building.

Strategy 2: Beach replenishment. Implement and expand upon the short- and long-term sediment management programs identified in the Solana Beach & Encinitas Coastal Storm Damage Reduction Project to preserve shorelines and coastal habitat through beach replenishment and nourishment to address impacts of sea-level rise on shorelines. As a part of this process both continue to pursue federal funding and examine other funding mechanisms for beach replenishment, e.g., special taxes or bonds.

Strategy 3: Stakeholder education & outreach: Extend efforts to both coastal and inland communities to maximize opportunities for all stakeholders to participate in and inform coastal planning processes that affect public recreational resources. Attempt to warn the maximum number of people about coastal bluff safety. Inform the City's residents and businesses about projected sea level rise and the implications of storm surges, etc. For example, use visual presentations and installations, including signs and displays in the coastal parks and beaches that show expected sea levels and possible surges.

Strategy 4: Regional coordination. Join with other coastal cities in the region to share information and collaborate on adaptation measures and simultaneously monitor coastal erosion and sea level rise science, e.g., OPC 2018 sea level rise projections for La Jolla and risk aversion guidance and adaptation options.

4.2.5 Flooding

Climate change in the region is predicted to modify the frequency, intensity, and duration of extreme storm events. Extreme rain events may be associated with atmospheric rivers of warm, moist, tropical air masses forming narrow streams of warm, concentrated precipitation often resulting in the deposition of considerable rainfall over a short period of time. Under higher emissions scenarios, the intensity and magnitude of atmospheric rivers are expected to become more severe, resulting in increased regional and localized flooding (Dettinger, et al. 2011) (Gershunov, et al. 2019). Currently, the City experiences localized flooding during heavy rainfall in the area around Stevens Creek due to inadequate drainage.

While flooding in urban areas can occur as a result of the natural topography associated with creeks, rivers or coastal areas, "urban flooding" refers specifically to flooding that occurs in urban areas when rainfall, and not an overflowing body of water, overwhelms the local stormwater drainage capacity of a densely populated area. This happens when rainfall runoff is channeled from impervious surfaces such as roads, parking lots, buildings, and rooftops to storm drains and sewers that cannot handle the volume. In many places, swales or bioswales are replacing the traditional concrete curbs and gutters for managing stormwater. Swales are gradually sloping depressions or trenches, often lined with gravel and/or planted with vegetation, that allow rainwater to infiltrate the ground and replenish ground water. Other types of green infrastructure to minimize urban flooding might include multilevel parking lots instead of sprawling single level ones, narrower streets and green islands which also beautify the community and other possibilities. Alternative materials and designs should also be considered for building parking lots, driveways, sidewalks, and roads to increase infiltration of rainwater.

Currently, the city is taking several steps to reduce urban runoff. Bioswales are required on new residential developments and the amount of impermeable hardscape is limited. In addition, Solana Beach has incorporated green islands in the redevelopment of roadways on Stevens and Coast Highway and proposed them for portions of Lomas Santa Fe Drive.

Strategies to Prepare for Coastal Erosion and Sea Level Rise

Strategy 1: Assess infrastructure risk. Coordinate with relevant agencies such as Cal OES and the Public Works Department to map and identify all critical facilities and infrastructure that may be compromised by increased flood risk including storm and wastewater systems. This should include the Steven's Creek region. The City should plan accordingly for upgrades to infrastructure and coordinate with the City of Del Mar as needed.

Strategy 2: Mitigate flood risk from extreme rain events. Continue efforts for storm water catchment and water reserve system.

Strategy 3: Incentivize green infrastructure. Explore incentives for private residents, businesses, and schools to implement elements such as cisterns, rain barrels, or create rain gardens and swales that would help clean stormwater runoff and direct it to landscaping or capture basins. The City should implement green infrastructure additions as part of City projects.

Strategy 4: Increase permeable/pervious pavement surfaces. Where feasible, the City should consider using pervious pavement options for City projects. The City should also incentivize the use of pervious pavement options for residential and commercial projects.

4.2.6 Increased Energy System Demand

Changes in temperatures, precipitation patterns, extreme events, wildfire and sea-level rise have the potential to decrease the efficiency of thermal power plants and substations, decrease the capacity of transmission lines, render hydropower less reliable, and put energy infrastructure at risk of flooding and wildfire. According to a study of SDG&E's electricity infrastructure, as part of the Fourth Climate Change Assessment (Bruzgul, et al. 2018), thousands of electric substations, transformers, power lines, and other equipment are potentially exposed to damage under scenarios of sea level rise of 0.5 and 2.0 m (1.6 and 6.6 ft.) for both annual and 100-year storm events. The greatest potential of direct physical impacts to assets are damage to 4 substations in the Mission Bay and San Diego Bay areas.

Furthermore, extreme and prolonged high temperatures also threaten local energy supply due to high demand for electricity. A surge in energy use in the City and the San Diego region has the potential to cause brownouts or blackouts. This effect may be exacerbated by a higher proportion of renewable energy such as solar or wind whose generation is variable. In an effort to mitigate some of these effects, in 2013, the California Public Utilities Commission (CPUC) mandated that all investor-owned utilities switch their customers over to Time-Of-Use (TOU) rate plans. Energy pricing in TOU plans vary according to the time of day, day of the week (weekend v. weekday) and season (e.g. summer v. winter). Higher rates are charged during the peak demand hours and lower rates during off-peak (low) demand hours. TOU rate structures provide price signals to energy users to shift energy use from peak hours to off-peak hours.

On December 13, 2017, The City established a Community Choice Aggregation (CCA) framework to procure its own energy consisting of a higher percentage of renewable energy electricity at lower rates than SDG&E. This effort was consistent with the City's Climate Action Plan goals to reduce GHG emissions caused by electrical demand. In the Fall of 2019, the City decided to move beyond a Solana Beach-only CCA to enter into a Joint Powers Agreement (JPA) with other regional cities to create a larger CCA.

Ensuring that utilities and CCA programs have adequate power to meet peak demand periods has been a primary concern of the CPUC since the energy crisis. The processes and methods to ensure Resource Adequacy (RA) by CCA's are still in the process of being determined and negotiated with the CPUC.

Adaptation measures to prepare for extreme heat events listed above, such as reducing urban heat islands and promoting passive cooling, will also help reduce electrical demand.

Additional actions that the City will take to mitigate increased risk to the City's energy supply are listed below.

Strategies to Prepare for Coastal Erosion and Sea Level Rise

Strategy 1: Public education. Educate the public on how to become more energy efficient, reduce demand, and optimize time-of-use. Identify and publicize emergency solutions for vulnerable populations and infrastructure during extended power outages.

Strategy 2: Promote local energy generation and storage. Encourage and incentivize solar- based or other renewable energy sources to supplement the grid and reduce peak demand including the addition of energy storage.

4.2.7 Threats to Public Health and Safety

Climate change has been described as the biggest threat to public health this century (Costello, et al. 2009). In addition to the consequences presented in sections 4.2.1 through 4.2.6, we will face new ecological challenges such as increases in vector- and water-borne diseases and food insecurity (Ebi, et al. 2018). Figure 4-3 (Federal Centers for Disease Control and Prevention) provides a graphic summary of some of these effects.

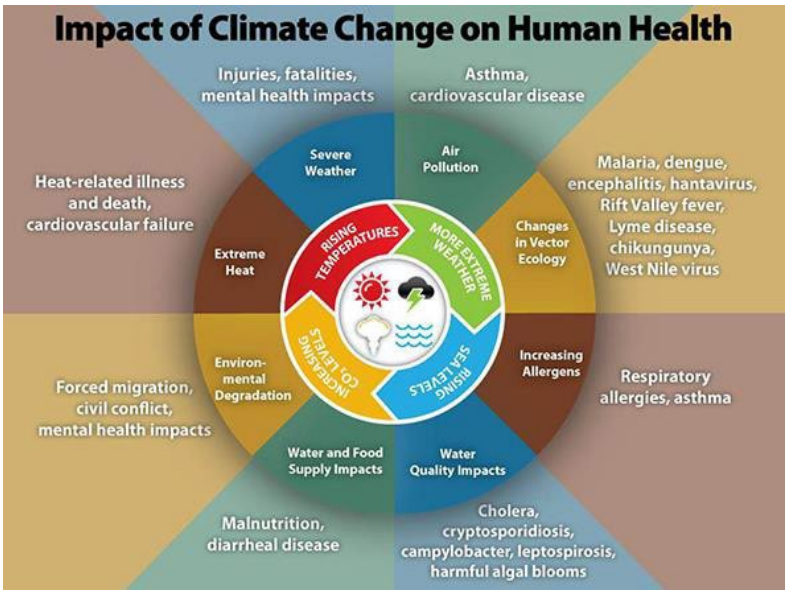


Figure 4-3: Human Health Impacts of Climate Change

Source: Federal Centers for Disease Control and Prevention.

Health impacts. In California, the strongest health impacts from recent heat waves have been found at the coast (Gershunov, et al. 2011) (Guirguis & Gershunov 2014) (Knowlton, et al. 2009). These warming trends will pose challenges for Solana Beach where physiological acclimatization and air conditioning penetration are lower than the state average (Gershunov & Guirguis 2012). The need for more air conditioning can stress supplies of electricity.

Prolonged or intense exposure to high temperatures can impact human health in a number of ways. Heat related illnesses include heat exhaustion, heat cramps, and heat strokes.

Environmental impacts include a reduction in air quality due to increasing ozone levels and particulate matter concentrations, which can cause asthma and shortness of breath. Sensitive populations include the young, elderly and those with pre-existing health conditions. Outdoor workers, such as construction and maintenance workers, are also more susceptible due to extended periods of exposure. The 2006 California heat wave resulted in 147 reported deaths, over 1200 hospitalizations, and over 16,000 emergency room visits (Knowlton, et al. 2009). In addition to effects on overall health, excessive heat has been shown to cause an increase in violent crime and mental illness. Studies have found that those living in microclimates that are hotter and less vegetated have higher risk of morbidity or mortality (Schinasi & De Roos 2018).

Increased risks from wildfires pose both direct and indirect risks to public health. Smoke produced from wildfires can denigrate the air quality throughout the county and is associated with respiratory and cardiovascular disease. The health impacts of the 2015 California wildfires were greatest among adults ≥65 years, indicating that the health effects of climate change impact different population groups differently (Wettstein, et al. 2018).

Climatic change can alter the range, biogeography, and growth of insects, microbes and vector- borne diseases. Changes in aquatic environments may result in increases in harmful algal blooms which in turn lead to increases in foodborne and waterborne illnesses. For California, increased average temperatures and can shift infectious diseases typically found in lower latitudes toward the north. Solana Beach is bounded by two estuaries, San Elijo Lagoon to the north and San Dieguito Lagoon to the south. These bodies of water can provide breeding grounds for mosquitos such as Aedes aegypti and Aedes albopictus (Figure 4-4).

Figure 4-4: Aedes aegypti and Aedes albopictus.

Both these species have the potential to transmit infectious diseases such as chikungunya, dengue, yellow fever and the Zika virus and both have been undergoing massive expansion as a result of climate change, human migration, and accelerating urbanization (Messina, et al. 2019).

Temperatures and pooling water are two critical factors in a mosquito's life cycle and, subsequently, their potential to spread disease. Warmer temperatures accelerate the life cycle of both the mosquito and the viruses they carry. Increased flooding leaves behind pools of water that provide abundant habitat for mosquitos to breed. Rising seawater levels and high tides can also create brackish water habitat in coastal areas in which certain adapted mosquitos can breed. While the relationships are complex, the consensus is that mosquito-borne diseases will increase with climate change (Campbell-Lendrum, et al. 2015). Researchers (Kraemer, et al. 2019) concluded that by 2050, Aedes aegypti and Aedes albopictus will significantly expand their range, posing a threat to 49 percent of the world's population (Yale School of Forestry & Environmental Studies 2019).

In addition to mosquitos, climate change may also cause a range expansion for ticks. Although Lyme disease carried by ticks is rare in San Diego County – found mostly in coastal and rural areas - the CDC has now determined it to be the most commonly reported vector-borne disease in the United States since it was first identified in Connecticut in 1975. As of April 2019, the County has also found several ticks carrying Tularemia, a bacterial disease which can cause serious illness and even death in humans if not treated with antibiotics.

There are a number of programs already in place to deal with mosquito borne diseases. San Diego County maintains an active Vector Control Program (County of San Diego 2020b) to mitigate the impacts of vector-borne diseases including spreading larvicide to limit mosquito numbers in critical areas such as San Elijo Lagoon. The County's Department of Environmental Health also includes an in-house diagnostic laboratory that can provide highly sensitive and rapid disease test results so that informed, data-driven control measures can be quickly established.

Mental Health. While most research and communications on the impacts of climate change have emphasized physical health effects, mental health effects are also far-reaching and complex (Clayton, et al. 2017). These range from minimal stress and distress symptoms to clinical disorders, such as anxiety, depression, post-traumatic stress disorders, substance abuse and suicidal thoughts.

The loss of property, homes and lives that occur during natural disasters elicit an increased sense of helplessness, hopelessness or fatalism. This can be accompanied by a feeling of loss regarding one's personal or occupational identity when treasured objects or personally important places are destroyed or disrupted by climate change. Research on adults seeking emergency disaster assistance after a wildland-urban interface fire, have found that a large percentage showed signs of PTSD and depression (Marshall, et al. 2007) (Eisenman, et al. 2015). Long- term drought and/or sea-level rise, unlike sudden extreme weather events, has a slow onset and long duration, interacting over time with multiple environmental and social stressors to disrupt lives and individual function. Prolonged drought can have visible and long-term impacts on landscapes and individual and community resilience, causing anxiety, depression, and other mental illnesses.

As with physical health, the mental health impacts of climate change affect some communities or individuals more than others. For example, stress from climate impacts can cause children to experience changes in behavior, development, memory, executive function, decision-making, and scholastic achievement. Some patients with mental illness are especially susceptible to heat. Suicide rates vary with weather, rising with high temperatures (Burke, et al. 2018). Dementia is a risk factor for hospitalization and death during heat waves. Patients with severe mental illness, such as schizophrenia, are at risk during hot weather because their medications may interfere with temperature regulation or even directly cause hyperthermia. Individuals who use alcohol to cope with stress and those with preexisting alcohol use disorders are most vulnerable to increased alcohol use following extreme weather events.

Personal relationships and the ways in which people interact in communities and with each other are affected by a changing climate. Studies have linked extreme heat and increasing violence, aggressive motives, and/or aggressive behavior (Plante, et al. 2017) (Hsiang, et al. 2013). Increases from pre-disaster rates have been observed in interpersonal and domestic violence, including intimate partner violence, particularly toward women, in the wake of climate- or weather- related disasters. Signs of intergroup aggression and hostility have also emerged as climate refugees search for alternative homes.

According to a recent study, psychological responses to climate change, such as conflict avoidance, fatalism, fear, helplessness, and resignation are growing. Our ability to adapt and be resilient is important since these responses may hinder the very efforts to properly address the core causes of and solutions for our changing climate (Clayton, et al. 2017)

Existing measures and new strategies to address health related concerns associated with increases in temperature and extreme heat events are addressed in Section 4.2.1. Additional options to mitigate increased risk of vector borne diseases are listed below.

Strategies to Prepare for Threats to Public Health and Safety

Strategy 1: Education for preventative measures. Educate businesses and residents about actions they can take to reduce mosquito habitat and disease transmission (e.g. elimination of stagnant water around residences).

Strategy 2: Education for protective measures. Urge people to remember to protect themselves and their pets when hiking by wearing insect repellent, proper clothing and by using insect control products on their pets that kill fleas and ticks.

Strategy 3: Encourage citizen participation. Mobilize residents to report mosquito breeding sites, increases in mosquito population, and sentinel dead bird species to the VCP.

Strategy 4: Coordinate efforts with other agencies. Work closely with local and state health agencies (e.g. VCP, San Diego County Dept. of Environmental Health, universities, and research centers) to mitigate vector-borne diseases.

Strategy 5: Support mental health well-being of individuals and the community. The City will assess and provide the community with information about available mental health resources and communicate about climate-mental health issues in order to build mental health resilience. In addition, the City will endeavor to maintain practices that foster optimism and provide a sense of meaning by providing connectedness to place, culture and community.

4.2.8 Coastal Habitat

San Diego County is rich in biodiversity and is one of the most biodiverse counties in North America. While Solana Beach is bounded by two estuaries, the City itself is almost entirely built out, with only a few pockets of native and/or naturalized vegetation remaining. A detailed description of ecosystems and species within the City including maps identifying their locations is included in Chapter 3 of the City's Local Coastal Program – Land Use Plan (LCP-LUP) (City of Solana Beach 2011). Much of the information that follows regarding existing conditions comes from that report.

Developed lands in the City account for approximately 1,981 acres, or 90 percent of the City. These lands include paved roadways, parking lots, residences, commercial buildings, plant nurseries, schools, landscaped slopes, maintained yards, golf courses, mowed/maintained parks, and the railroad.

The largest areas of native vegetation communities occur in the northern portion of the City, in and adjacent to the San Elijo Lagoon Ecological Reserve, as well as on canyon slopes within the golf course and adjacent to San Andres Drive. San Elijo Lagoon is approximately 1,000 acres and is vitally important for birds as a stop on the Pacific Flyway, as nesting and foraging areas for endangered species, and as a fish hatchery. The San Dieguito coastal area is also a significant scenic resource for residents and visitors in Solana Beach, Del Mar, and San Diego County.

A 3-acre property at the gateway of Solana Beach and Cardiff-by-the-Sea was purchased by a conservation group in conjunction with the Nature Collective (formerly San Elijo Lagoon Conservancy). Named after a major donor, the Harbaugh Seaside Trails property improvements include the removal of invasive plant species for native plantings that will attract pollinators and link the habitat to San Elijo Lagoon Ecological Reserve.

Environmentally Sensitive Habitat Areas (ESHA) designations were established in the LCP-LUP including lands in the San Elijo Lagoon Ecological Reserve and contiguous areas supporting either functionally intact

native vegetation communities or presence of rare species, as well as relatively large areas of southern maritime chaparral and coastal sage scrub communities near and along San Andres Drive.

Increasing temperature and precipitation extremes due to climate change will negatively impact native ecosystems and vegetation by affecting breeding patterns, moisture availability and other factors important to species generation, maintenance and migration. Development and expanding human land use can exacerbate climate change impacts by destroying remaining habitat and limiting species migration to and availability of future climate refuge. Detailed climate effects on various coastal Southern California Habitats are outlined in vulnerability assessments and adaptation strategies (EcoAdapt 2020) completed by the California Landscape Conversation Partnership (CA LCP) as overseen by a non-profit group called EcoAdapt.

While not included in the ESHA, both the beaches and developed spaces within the City can provide important wildlife habitat. For example, beach wrack is an important part of the marine ecosystem. Beach wrack refers to the piles of seaweed and plant and animal remains that are washed ashore by waves. While this may be unsightly for some visitors, research has found that it is an important nutrient source and provides micro-habitat for a variety of organisms. Regular grooming of sandy beaches and either excavation or deposition of sand can destroy the wrack and degrade the nearshore habitat. These types of activities can also have negative impacts to grunion that deposit their eggs in the sand during high tides.

In addition, while open space in the City is limited, habitat can be created in residential and commercial landscaping in what is not traditionally considered wildlands. There are a number of organizations that promote bird and insect friendly vegetation for landscaping including Xerces (xerces.org) and The National Wildlife Federation (nwf.org). Plant selection, particularly trees, has the added advantage of increasing shade and reducing localized temperatures and can also reduce fire risk.

Strategies to Prepare for Threats to Coastal Habitat

Strategy 1: Landscaping. Encourage the use of native landscaping. Educate the public on the LUP requirements to protect native trees including oak, manzanita, sycamore, cottonwood, willow and toyon trees.

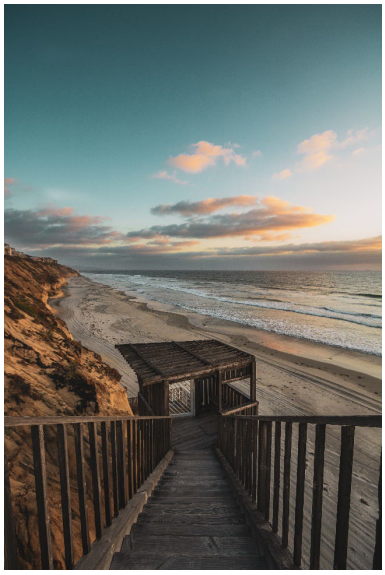
Strategy 2: Protect and restore native habitat and ecosystem functioning. Increase public knowledge, engagement and cooperation to support climate-informed restoration. Support and explore the possibilities of activities such as restoring habitat along roadways, managing invasive and/or problematic species, and restoring native plant communities. Restore the open portions of the Stevens Creek drainage.

Strategy 3: Enable wildlife movement. Improve wildlife connectivity passages and riparian corridors and plant native plant species to attract local pollinators including bees and butterfly species.

4.2.9 Climate Justice

Climate Justice embraces “the concept that no group of people should disproportionately bear the burden of climate impacts or the costs of mitigation and adaptation” (Cooley, et al. 2012) (Roos 2018). It is a term that accentuates the ethical and political issues of climate change in addition to environmental concerns. This is especially true since people who are the most vulnerable to the effects of climate change and have the fewest resources to adapt are also the least responsible for the world’s increases in greenhouse gas emissions. At its core, climate justice is fundamentally an issue of human rights and environmental justice that connects the local to the global. Increasingly, climate justice has evolved into a global civil rights movement, demanding action rather than mere discourse. This is evident from the millions of participants that turned out for youth-lead climate strikes around the globe.

- Factors that contribute to the differential vulnerability of various populations to climate change include:
  - Lack of access to financial resources & good health care
  - Age – children and the elderly are more sensitive
  - Race/Ethnicity
  - Disparities in education and limited English proficiency
  - Existing high rates of health issues such as chronic diseases and mental health conditions
  - Disproportionate impacts from other pollutants (e.g. freeway derived particulate matter)
  - Lack of access to air conditioning and transportation
  - Lack of social capital: political involvement, civic representation, and isolation
  - Citizenship and immigration status.



Source: City of Solana Beach.

Strategies that address climate justice with respect to extreme temperature are included in Section 4.2.1. Additional strategies are listed below.

Climate Justice Strategies

Strategy 1: Identify at-risk populations. Determine which individuals or populations in Solana Beach would be sensitive to, and, therefore, vulnerable to extreme weather conditions resulting from climate change. Coordinate with groups currently engaging these populations.

Strategy 2: Target efforts towards at-risk populations. Ensure that vulnerable individuals have the means to respond in threatening climate-driven situations such as being able to evacuate in case of flooding or fires; and/or have the means to protect their respiratory health if a nearby wildfire degrades air quality.

Strategy 3: Perform more education and outreach. Emphasize the benefits and harm of local actions to vulnerable communities worldwide.

4.3 California's Fourth Climate Change Assessment – Highlights from the San Diego Region

San Diego County will be increasingly affected by climate change and has begun to prepare on multiple fronts for the panoply of climate related impacts to San Diego's residents, development, infrastructure, and ecosystems. In future decades, San Diego County and adjacent regions will be confronted with increasingly warmer average temperatures, more frequent and more intense heat waves, more intense droughts, occasionally increased heavy rainfall events and floods, continuing Santa Ana winds and wildfire threats, among other impacts. These impacts will play out in different ways across the complex terrain and differing climates within San Diego County. Communities along San Diego County's 70 miles of coastline are planning for substantial sea level rise, which will affect beaches, sea cliffs, real estate, infrastructure, and other amenities. The region has many unique characteristics, such as narrow beaches backed by sea cliffs, large percentage of conserved lands, highly populated urban and sub-urban development, small farm dominated agriculture, and large solar power production. These characteristics, among others, all determine vulnerabilities to climate changes and related adaptation measures. Below are some highlights of climate impacts, adaptations, and gaps.

- Temperature is projected to increase substantially, by 5 to 10 °F by the end of the 21st century. Along with average temperature, heat wave frequency will increase, with more intensity and longer duration. Marine layer clouds can help to mitigate the impacts of temperature change in the coastal regions, though these clouds are not well represented in climate models requiring further research.

- Precipitation will remain highly variable but will change in character, with wetter winters, drier springs, and more frequent and severe droughts punctuated by more intense individual precipitation events. Effects of an altered precipitation regime on ecosystems, water demand and supply, water quality and flooding emergencies are incompletely known and will benefit from cross-disciplinary investigation.

- Broadly, wildfire risk will likely increase in the future as climate warms. The risk for large catastrophic wildfires driven by Santa Ana wind events will also likely increase because of drier autumns leading to low antecedent precipitation before the height of the Santa Ana wind season (i.e., December and January).

- Sea level along the San Diego County coast is expected to rise approximately 1 ft by the middle of the 21st century, and 3 ft or potentially much higher by 2100. For the next several decades, high tides combined with elevated shoreline water levels produced by both locally and distantly generated wind-driven waves will drive extreme events. Longer-term sea level will increase rapidly in the second half of the century and will be punctuated by short periods of storm-driven extreme sea levels that will imperil existing infrastructure, structures, and ecosystems with increasing frequency. San Diego is testing adaptation approaches, but sustained and improved observations in combination with physics-based modeling are needed to evaluate these adaptations measures and guide future planning.

- Development in the San Diego County region is concentrated in the western third of the county with approximately 60% of the land remaining undeveloped. Climate change, along with development and fragmentation, will act as significant stressors to San Diego's natural lands, which are some of the most biodiverse in the United States. San Diego Association of Governments' (SANDAG's) regional planning emphasis on smart growth to concentrate urban development near city and transit centers supports conservation while also mitigating greenhouse gas emissions.

- The San Diego County Water Authority, the region's water wholesaler, continues to diversify its supply by developing and negotiating local and nearby imported sources, developing more recycled water and encouraging greater water conservation. There are several coordinated efforts in the region to build resilience to climate and holistic water management adaptations are becoming more prevalent throughout communities. Continued science and regional coordination to evaluate climate change impacts on future water supply, demand and quality are needed in order to inform adaptation to future climate changes.

- San Diego's energy supply is rapidly changing with renewable energy sources, mostly photovoltaic arrays, increasing by more than 30% since 2010, which introduces novel sensitivities to weather variation and evolving vulnerability to climate changes. San Diego Gas and Electric has installed a high-density weather station network that provides a more detailed, real time awareness of weather conditions that could damage the energy system and/or produce unusual supply or demand.

- Recent work in San Diego showed that heat-related health impacts are observed at lower temperatures in the coastal region than in the inland and desert regions. This is in part due to coastal residents being less acclimated to heat and less likely to have air conditioning.

- Climate changes felt by San Diego County will also occur in northern Baja, Mexico. Binational coordination of climate adaptation measures present potential for significant benefit to communities on both sides of the border. However, to be effective the approaches must navigate the complexity posed by different governance and community structures.

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 Update (CAP Update) strategies, measures, and actions 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 Update is on track to achieve the GHG reduction targets; and (3) desired community outcomes are attained.

Source: City of Solana Beach.

5.2 Implementation Strategy

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

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 Update. Additionally, success will depend on the participation of the City's residents, businesses, and regional partners.

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

- **New Ordinances.** Several of the measures in the CAP Update would be implemented through regulations adopted by the City. The City has already adopted Building Electrification Ordinance 528 for new construction; however, at the time of development of the CAP Update the ordinance is not being enforced due to the Ninth Circuit Court of Appeals decision on *California Restaurant Association V. City of Berkeley* (CRA v. City of Berkeley 2023). The City will continue to monitor the progress of this case to identify opportunities to continue enforcement of the Building Electrification Ordinance. Additionally, the CAP Update proposes an energy and water benchmarking program, which would result in a new ordinance after details of program are further defined and thorough public engagement is conducted. New ordinances will ensure that the City requirements are in place to achieve the objectives of the CAP Update.

- **Financing and Incentives.** Identifying mechanisms for funding and allocating resources will help ensure that the CAP Update is successfully implemented.

- **Partnerships.** Interagency coordination and partnerships with other organizations are critical to ensuring implementation of certain measures (e.g., collaborate with the San Diego Association of Governments [SANDAG] on active transportation infrastructure improvements) and with other governments, universities, and non-profits in the region.

- **Education and Outreach**. Education efforts about the objectives of the CAP Update will help build support and involve the community in its implementation.

The City has developed detailed implementation schedules for each measure, based on staff requirements and funding opportunities available for implementing the measures outlined in the CAP Update. 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.

5.2.1 Measure Implementation

As part of the CAP Update, an Implementation Matrix has been developed to provide a detailed path forward for actions the City will take to implement GHG reduction measures and monitor implementation progress. This matrix, included in Appendix B *Implementation Matrix*, identifies the following information for each GHG reduction measures:

- City department responsible for leading implementation (where applicable),
- Implementation timeline,
- Quantitative success tracking metrics, and
- Data needed for tracking success.

The information included in the Monitoring Matrix will help the City to establish the appropriate framework for both implementing GHG reduction measures and measuring the long-term success of the measures in meeting the CAP Update's GHG reduction targets and overall community goals.

5.2.2 Implementation Cost

The City will incur costs to implement some of the measures outlined in the CAP Update. 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. To better understand the costs of implementation, an Implementation Cost Analysis is being developed alongside the CAP Update. This analysis will assess the potential costs of implementation for the City of Solana Beach for most of the CAP Update GHG reduction measures. The Implementation Cost Analysis considers the costs that would be incurred by the City for initial start-up, ongoing administration, enforcement, and potential infrastructure improvement. The full results and details of the Implementation Cost Analysis are provided in Appendix C.

Source: City of Solana Beach.

While the Implementation Cost Analysis provides details on the costs needed for implementation, there are various sources to help fund both City and community member costs for implementation measures of the CAP Update. An overview of some potential funding and financing options is provided in Table 5-1 below. Funding options are included from a variety of sources including the City, regional agencies such as SANDAG, San Diego Gas & Electric (SDG&E), and Clean Energy Alliance (CEA). The City should monitor private and public funding sources for new grant and rebate opportunities on an ongoing basis. Leveraging funding opportunities would facilitate successful implementation of the GHG reduction measures.

Table 5-1 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 (CARB)	• CARB 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.
Transportation-Related Federal and State Funding	• Coordination with SANDAG can help identify funding for measures related to transit, bicycle, or pedestrian improvements.
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 participates in a number of energy efficiency and building electrification incentive and rebate programs. • A variety of rebates are available for existing and new homes. • Single-family homes, commercial development, and affordable housing are eligible.
Energy Upgrade California	• Program is intended for home energy upgrades. • Homeowners are connected to home energy professionals. • Rebates, incentives, and financing are available.
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.

Table 5-1 Potential Funding Sources to Support GHG Reduction Measures	
Funding Source	Description
	• 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.
Clean Energy Alliance Revenue	• Revenue generated by Clean Energy Alliance may be used to fund or incentivize GHG reduction measures.

5.3 Monitoring and Updates

The City will:
- **Coordinate inventory updates every 2 years;**
- **Prepare a CAP update every 5 years starting in 2029.**

The CAP Update lays out a broad-based strategy to reduce GHG emissions and improve the sustainability and resilience of the community. However, the CAP Update 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 may not achieve the proposed reduction targets. This will include conducting periodic GHG emissions inventory updates and analyzing measure performance.

Upon adoption, the CAP Update's measures and actions will begin to be implemented by the City, which will build upon the momentum gained from implementation efforts for the 2017 CAP. To track progress, City staff will coordinate updates to the inventory every two years, consistent with SANDAG's Regional Framework schedule. This will help ensure progress is made towards achieving emissions reduction targets. A 2020 GHG emissions inventory was developed for the City by SANDAG in 2023; however, this inventory may not be the most appropriate for tracking emissions progress due to the Covid-19 pandemic. It is expected that a 2022 GHG emissions inventory will be available in 2025.

Source: City of Solana Beach.

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 Update 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

2024	**CAP Update Adopted** City Council adopts plan and staff begins to implement CAP Update measures.
2025	**Inventory Update** City staff conducts update to inventory every two years starting in 2025.
2026-2029	**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,

Figure 5-1 CAP Monitoring Schedule

City staff, in coordination with the City Council, will evaluate measures every two years beginning in 2026 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 Update.

Additionally, the City will prepare a subsequent CAP update every five years beginning in 2029, following the second CAP report after adoption of the current CAP Update. The CAP will be updated based on the recommended changes and findings in the CAP report.

Source: City of Solana Beach.

5.4 Ongoing Community Engagement and Participation

Source: City of Solana Beach.

As the City continues to implement and monitor progress on the CAP Update, 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 Update 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 Update serves as a resource that supports community-based action.

Chapter 6
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