A Tradition of Stewardship
A Commitment to Service

FINAL DRAFT

Climate Action Plan

Acknowledgements

Board of Supervisors

Planning Commission

Watershed Information & Conservation Council

County of Napa Staff

Ascent Environmental (Consultant)

Napa County Community Members

County staff would like to acknowledge and thank all community members who attended Climate Action Plan public workshops and hearings held in 2015-2017 and provided their comments to help shape this plan.

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Acronyms and Abbreviations

AB	Assembly Bill
BAAQMD	Bay Area Air Quality Management District
BAU	Business-As-Usual
APG	California Adaptation Planning Guide
CARB	California Air Resources Board
DWR	California Department of Water Resources
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CALGreen	California Green Building Standards Code
CNR	California Natural Resources Agency
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CFCs	chlorofluorocarbons
CAP	Climate Action Plan
CNG	compressed natural gas
County	County of Napa
ºC	degrees Celsius
ºF	degrees Fahrenheit
EV	electric vehicle
EIR	Environmental Impact Report
FEMA	Federal Emergency Management Agency
GWP	global warming potential
GHG	greenhouse gas
HFC	hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
MCE	Marin Clean Energy
CH_4	methane
MT	metric ton
MPO	Metropolitan Planning Organization
NVTA	Napa Valley Transportation Authority
NVWT	Napa Valley Wine Train
N_2O	nitrous oxide
O_3	ozone

PG&E	Pacific Gas and Electric
ppm	parts per million
PFCs	perfluorocarbons
PACE	property assessed clean energy
SB	Senate Bill
SLCP	short-lived climate pollutant
SF_6	sulfur hexafluoride
SCS	Sustainable Communities Strategy
TOD	transit-oriented development
VMT	vehicle miles traveled
ZNE	zero net energy

Napa County Climate Action Plan

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Executive Summary

Source: County of Napa

Executive Summary

This Climate Action Plan (CAP) provides a comprehensive roadmap to address the challenges of climate change in unincorporated Napa County. Acting on climate change means both reducing greenhouse gas (GHG) emissions from local sources in the unincorporated County and helping the community to adapt to climate change and improve its resilience over the long term.

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

The scientific consensus is that it is "extremely likely" that global climate change is caused by GHG emissions associated with human activities, and that significant reductions in human-caused GHG emissions are needed by the mid-21st century to prevent the most the catastrophic effects of climate change. To this end, in 2006, the California Global Warmings Solutions Act (Assembly Bill [AB] 32) established the State's first target to reduce GHG emissions, which established a goal of lowering emissions to 1990 levels by 2020. California has been making steady progress and is expected to achieve the 2020 target; however, ongoing reductions in GHG emissions are needed as noted above.

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

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

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

In 2016, Governor Brown signed Senate Bill (SB) 32 into law, which established a new mid-term target of 40 percent below 1990 levels by 2030. This target aligns with those of leading international governments such as the 29-nation European Union which adopted the same target in October 2014. The new 2030 target places California on a trajectory towards meeting its longer-term goal, which is to bring emissions down to 80 percent below 1990 levels by 2050.

Over the last decade, the County of Napa (County) has taken several steps to begin addressing climate change and achieving reductions in GHG emissions, both in the County's operations as well as the broader community. Dating as far back as 2007, the County has been involved in various efforts to quantify GHG emissions sources and formulate reduction strategies on both a county and larger regional level. The County's General Plan and Environmental Impact Report (EIR) called for development and adoption of a CAP. This CAP builds upon the County's past efforts and fulfills the requirements of the County's General Plan and EIR.

Source: County of Napa

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

1. **A baseline GHG emissions inventory** was prepared for 2014.

    - 484,283 metric tons of carbon dioxide equivalent (CO_2e) were emitted by communitywide sources in the unincorporated County in 2014.
    - The largest source of emissions was the Building Energy sector (i.e., residential and commercial/industrial buildings

The Top 5 Emitting Sectors in 2014:

1. Building Energy Use (31%);
2. On-Road Vehicles (26%);
3. Solid Waste (17%);
4. Agriculture (10%); and
5. Off-Road Vehicles (9%).

Source: County of Napa

and other facilities), which accounted for 31 percent of the inventory; while the Transportation sector accounted for approximately 26 percent of the inventory.

2. **GHG emissions forecasts and reduction targets** were identified for 2020, 2030 and 2050, consistent with State targets under AB 32 and SB 32.

   - Without any future actions (i.e., "business-as-usual" conditions), GHG emissions are expected to increase by 2020, 2030 and 2050.
   - GHG emissions reduction targets for the CAP were established consistent with the most recent guidance provided by the California Air Resources Board (CARB):
     - 2 percent below 2014 levels by 2020;
     - 40 percent below 2014 levels by 2030; and
     - 77 percent below 2014 levels by 2050.
   - Legislative actions by State or Federal agencies help to reduce emissions in the future, but are not enough to achieve the targets.
   - Achieving the 2030 and 2050 targets will require local action to help close the gap between legislative-adjusted emissions forecasts and the emissions limits established by the CAP's targets.

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

3. **Local GHG emissions reduction strategies and measures** were identified to help the County achieve the 2020 and 2030 targets.

   - GHG reduction strategies in the CAP are aligned with each of the GHG inventory sectors, and contain a total of 48 specific local GHG reduction measures that will achieve GHG reductions.
   - Some of the GHG reduction measures will result in measurable, quantifiable reductions in emissions. Others are difficult to quantify, but will still contribute to achieving local reductions, either alone or in combination with legislative actions or other local GHG reduction measures.
   - The top 5 measures in the CAP that will the achieve the most local GHG emissions reductions by the year 2030 include:
     - Measure BE-6: Requiring new or replacement residential water heating systems to be electrically-powered or alternatively-fueled (e.g., solar thermal, ground-source heat pump) will reduce emissions annually by 11,575 $MTCO_2e$ by 2030.
     - Measure AG-3: Replacing diesel or gasoline-powered equipment with electric or alternatively-fueled agricultural equipment and pumps will reduce emissions annually by 8,540 $MTCO_2e$ by 2030.

The CAP contains a total of 48 local GHG reduction measures. While many of the emission reductions of the measures can be quantified, others are more difficult to quantify. However, the combination of all measures contributes towards achieving 2020 and 2030 targets.

The total estimated annual GHG emissions reductions from all reduction measures quantified is approximately 57,828 $MTCO_2e$ in 2030.

- Measure OR-2: Replacing diesel or gasoline with alternative fuels in recreational watercraft throughout the County will reduce emissions annually by 7,512 $MTCO_2e$ by 2030.
- Measure LU-1: Establishing targets and enhanced programs that result in the preservation of oak woodlands and coniferous forests to avoid future carbon storage and sequestration losses, along with mandatory replanting to mitigate for tree loss when land use changes occur, will result in the annual reduction of 4,544 $MTCO_2e$ by 2030.
- Measure TR-1: Updating and enforcing the County's Transportation System Management Ordinance will result in an annual reduction of 3,582 $MTCO_2e$ by 2030.

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

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

4. A **climate change vulnerability assessment** was prepared, and climate adaptation measures were developed to improve community sustainability.

▪ The climate change vulnerability assessment (Appendix C) determined that the County is vulnerable to several adverse impact climate change effects, including:
  - Increases in average temperatures and the frequency of heat waves and extreme heat events;
  - Changes to precipitation patterns;
  - Increased risk of wildfire;
  - Increased likelihood of flooding; and
  - Increased risk of coastal flooding from sea-level rise.

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

A vulnerability assessment includes identification of localized climate change exposure and related effects, an assessment of potential areas of vulnerability, a review of the County's current capacity to adapt to climate-related impacts, and consideration of how likely and how quickly impacts will occur. See Appendix C for the full vulnerability assessment.

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

▪ Implementation of the measures in the CAP will require the County to develop and implement new ordinances, programs and projects, or modify existing one. This will require careful consideration of the operational and capital resources

The CAP outlines how County staff will implement measures, and how the CAP will be monitored and updated over time to ensure measures and targets are achieved.

needed, as well as the timing and phasing of implementation. Chapter 5 outlines these assumptions in detail.

The County's CAP monitoring and reporting activities will include:

- Evaluate the performance of CAP measures and prepare a progress report to the Board of Supervisors every two years; and,
- Review and update the GHG emissions inventory every five years.

- Monitoring is an important aspect of the CAP to ensure that the County 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 County will need to review and update the GHG emissions inventory periodically (every five years), track the community's progress on the implementation status of each measure in the CAP, and report back to the Board of Supervisors and the public at least every two years.
- The County will use the CAP to streamline the analysis of project-level GHG emissions pursuant to California Environmental Quality Act (CEQA) Guidelines Section 15183.5. Projects subject to discretionary review will be required to determine consistency with the CAP Consistency Checklist (see Appendix D).
- Local action on climate change cannot be addressed insularly by one agency or community, but requires active and ongoing partnerships between residents, businesses, the County, 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; produce less waste through recycling, conserve water, and compost; and drive 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 County.

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

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Chapter 1

Introduction

(https://upload.wikimedia.org/wikipedia/commons/e/e2/Bay_Trail_in_Napa_County.jpg)
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1.1 Climate Action Plan Overview

There is strong consensus that global climate change is occurring; seasons are shifting, average temperatures are increasing, precipitation levels are changing, and sea levels are rising. These changes will have adverse effects on human health and safety, economic prosperity, provision of basic services, and the availability of natural resources in Napa County.

This Climate Action Plan (CAP) sets a course of action for the County of Napa (County) to address global climate change. The CAP, consistent with and complimentary to Statewide legislation and actions, provides a feasible roadmap for the County to both reduce greenhouse gas (GHG) emissions from many sources in the unincorporated County and address the challenges of a changing climate by helping to adapt and respond to climate change over the long term.

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

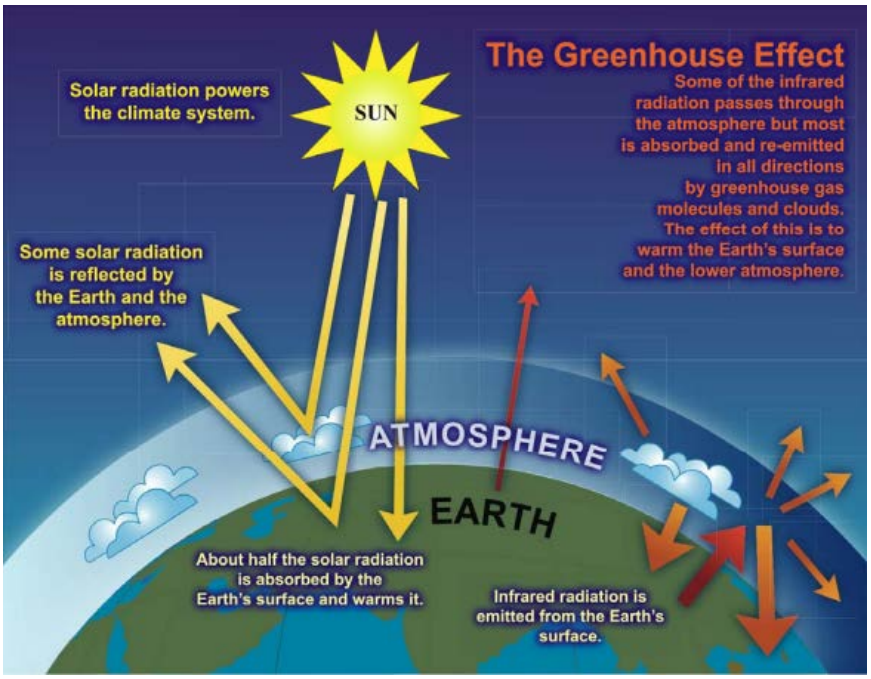
While the CAP uses the best information, research, and techniques available today, technologies and markets are constantly changing. Thus, strategies identified in the CAP may become obsolete considering the development of new technologies that do not yet exist, or as new State and Federal laws are passed.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

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

1.2 Introduction to Climate Change Science

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

Source: County of Napa



Source: IPCC 2007

Figure 1-1: The Greenhouse Effect

However, human activities (e.g., burning of fossil fuels for transportation and energy, and increasing rates of deforestation and development) have contributed to the elevated concentration of these gases in the atmosphere. Human-caused (i.e., anthropogenic) emissions of GHGs above natural ambient concentrations are responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate, known as global climate change, or global warming. There is strong scientific consensus that it is "extremely likely" that most of the changes in the world's climate during the last 50 years are a result of anthropogenic GHG emissions (Intergovernmental Panel on Climate Change [IPCC] 2014:3, 5).

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

Furthermore, short-lived climate pollutants (SLCPs), which are GHGs that remain in the atmosphere for a much shorter period than long-lived climate pollutants (i.e., CO_2 and N_2O), are powerful climate forcers that have an outsized impact on climate change in the near term. Despite their relatively shorter atmospheric lifespan, their relative potency in terms of how they heat the atmosphere (i.e., global warming potential [GWP]) can be tens, hundreds, or even thousands of times greater than that of CO_2. SLCPs include CH_4; F-gases, including hydrofluorocarbons (HFCs), perflurocarbons (PFC), and sulfur hexafluoride (SF_6); and, black carbon.

Global climate change, is causing changes in precipitation patterns, shrinking polar ice caps, rises in sea level, and other impacts to biological resources and humans. Chapter 2 of the CAP summarizes the County's GHG emissions that are contributing to global warming.

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 consequences of climate change phenomena, particularly at specific locations. Chapter 4 of the CAP discusses the predicted climate change effects in the County in more detail, while also outlining specific vulnerabilities the County faces because of these effects.

The CAP represents an important step in acknowledging global climate change effects on the County. Chapters 3, 4 and 5 of the CAP includes strategies, specific measures, and implementation programs and monitoring tools 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 County have already taken several steps to both reduce GHG emissions and adapt to climate change. These efforts, briefly summarized below, provide important policy direction and context for the CAP.

Source: County of Napa

1.3.1 California

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

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

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

On April 20, 2015 Governor Edmund G. Brown Jr. signed Executive Order B-30-15, establishing a new GHG emissions reduction target 40 percent below 1990 levels by 2030. This target aligns with those of leading international governments such as the 29-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 Senate Bill (SB) 32, which codified into statute the mid-term 2030 target established by Executive Order B-30-15. The new 2030 GHG emissions reduction target places

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

Specific to SLCPs, SB 605, which was signed in September 2014, required CARB to develop a plan to reduce emissions of SLCPs. SB 1383, signed in September 2016, requires CARB to approve and begin implementing the plan by January 1, 2018. SB 1383 also sets targets for statewide reductions in SLCP emissions of 40 percent below 2013 levels by 2030 for methane and HFCs and 50 percent below 2013 levels for 2030 for anthropogenic black carbon. CARB adopted the SLCP Reduction Strategy in March 2017 pursuant to SB 605 and SB 1383, laying out options to accelerate SLCP emissions reductions in California through enacting regulations, creating incentives, and other market-supporting activities.

In addition to legislation setting statewide GHG reduction targets, SB 375, signed by the Governor 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. 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.

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

Source: County of Napa

1.3.2 Napa County

Over the last decade, the County has taken several steps to begin addressing climate change, sustainability, and reductions in GHG emissions. Dating as far back as 2007, the County has been involved in various efforts to quantify GHG emissions sources and formulate reduction strategies on both a county and larger regional level. This CAP builds upon these past efforts by creating a GHG inventory for 2014 and forecasting emissions for 2020, 2030 and 2050 to comply with new legislation. Other notable County efforts are highlighted below.

- **GHG Reduction Plan for County Municipal Operations:** In 2007, the Napa County Department of Public Works, together with Kenwood Energy, performed a separate inventory and prepared a reduction plan for the GHG emissions associated with the County's municipal operations. The Emissions

Reduction Plan identified a suite of actions that would result in reducing emissions from government operations by 15 percent by 2020 compared to 2008 levels (Napa County 2007). In 2016, the County updated the 2008 GHG emissions inventory for County operations (Napa County 2016). A 10 percent reduction has been achieved so far.

- **Napa County General Plan (2008):** The County General Plan provides the foundation upon which all future land use and public investment decisions are based. It is a guide for the development of all planning documents, including this CAP, which must be consistent with General Plan Policies. The General Plan includes policies aimed at reducing local contributions to global climate change and encouraging sustainable building practices, sustainable vineyard practices, and ecological stewardship. The General Plan's Environmental Impact Report (EIR) specifically directed the County to develop a CAP as an implementation action and mitigation measure to reduce GHG emissions in the County and address climate change impacts (Mitigation Measure M-4.8.7a).

The CAP is not a part of the General Plan, but must be maintained consistent with the General Plan. This allows the County to update the CAP on an ongoing, as-needed basis, without amending the General Plan. It also ensures that County climate action efforts can be adjusted over time to reflect new legislation and technologies.

1.4 Climate Action Plan Purpose and Objectives

The CAP outlines a course of action for the County to reduce community-wide GHG emissions in the County, as well as prepare for and adapt to climate change.

The GHG reduction targets for the County in the CAP are established in proportion to CARB's Draft 2030 Target Scoping Plan's community-wide GHG reduction targets. Consistent with the Scoping Plan targets and the State's 2014 GHG emissions inventory, the CAP aims to achieve the following local community-wide GHG reduction targets:

- 2 percent below 2014 levels by 2020;
- 40 percent below 2014 levels by 2030; and
- 77 percent below 2014 levels by 2050.

AB 32, SB 32, and Executive Orders B-30-15 and S-3-05 use 1990 levels as a benchmark to identify statewide reduction targets. Because the County's 1990 emissions level were not estimated, proportional targets for the County's CAP were developed for 2014 that are consisted with CARB's Draft 2030 Target Scoping Plan and the State's 2014 GHG emissions inventory.

To achieve these objectives, the CAP identifies the following:

- A summary of baseline GHG emissions and the potential growth of these emissions over time;
- The expected climate change effects on the County, including areas of vulnerability;
- GHG emissions reduction targets and goals to reduce the community's contribution to global warming; and

Source: County of Napa

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

1.5 Co-Benefits

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

While the measures included in the CAP are generally geared towards reducing GHG emissions, many will also result in environmental or economic "co-benefits." Environmental co-benefits include improved air quality, water supplies, biological resources, public health outcomes, and beneficial outcomes for other resources. For example, a significant co-benefit of implementing CAP measures related to reductions in motor vehicle use and associated fuel combustion will result in fewer toxic air contaminants, leading to better air quality and improved health for everyone. Other strategies focus on improving energy and water-use efficiency in new and existing buildings, lowering overall housing and operation costs for residents and businesses. Another reduction measure focuses on improving the sustainability of wineries in the County, which is a large economic driver. By incentivizing wineries in the County to participate in the Napa Green Program, wineries could expand their facilities while also reducing the amount of GHGs their facilities emit.

Co-Benefits identified in the CAP:

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Improved Quality of Life
- Reduced Fossil Fuel Reliance
- Protection of Structures and Assets
- Increased Public Awareness of Climate Change
- Lowered Energy Demand
- Lowered Energy, Water, and Sewer Bills

Furthermore, several reduction measures encourage transit- oriented development and siting of affordable housing in the County, which allow residents to live closer to jobs, schools, and services. The CAP also supports the development of increased interregional transit solutions, as well as the construction of more park and ride facilities. These measures allow people to drive less, save money, and use their time more constructively.

More detailed discussion of reduction measures, along with their co-benefits, can be found in Chapter 3, Greenhouse Gas Emissions Reduction Strategies and Measures. Further details on the co-benefits analysis can be found in Appendix B. Adaptation co-benefits can be found in Chapter 4, Climate Change Vulnerability and Adaptation.

1.6 Community Action and Public Involvement

1.6.1 Community Action

While global change is happening worldwide, local efforts to reduce human-induced GHG emissions and build resilience in the face of adverse climate change effects can make a difference. Local action on climate change cannot be addressed individually by one agency or community, but requires active and ongoing partnerships between residents, businesses, the County, 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 and respond to climate change in the future.

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

Effective and long term climate action and resiliency in the County can only be achieved through efforts that continue to change the way individuals interact with the environment. The CAP serves as a resource and starting point to support long term sustainability efforts.

1.6.2 Summary of Public Involvement

The CAP was prepared with the involvement and engagement of key internal and external stakeholder groups from various public, private, and nonprofit sectors; as well as individual citizens and residents of the County. A total of four outreach meetings occurred at key milestones in the process, engaging the community and interested stakeholders.

The first meeting, which occurred in November 2015, introduced the CAP process, provided a history of County actions to date on climate change, and provided an explanation of methods used in GHG emissions inventories. The second meeting took place in February 2016 and presented the results of both the draft GHG emissions inventory and emissions forecasts for the County. There was also time allotted for public comments and questions. The third meeting, occurring in June 2016, presented the draft emissions reductions targets, measures, and gap analysis. The final meeting, held in February 2017, presented the Draft CAP to the public and the County Watershed Information and Conservation Council. Public comments were accepted from January 26, 2017 through March 10, 2017.

Source: County of Napa

The Planning Commission will hold a public hearing on the Final CAP and will be requested to forward a recommendation for adoption to the Board of Supervisors. The Final CAP proposed for adoption will be considered by the County Board of Supervisors at a public hearing.

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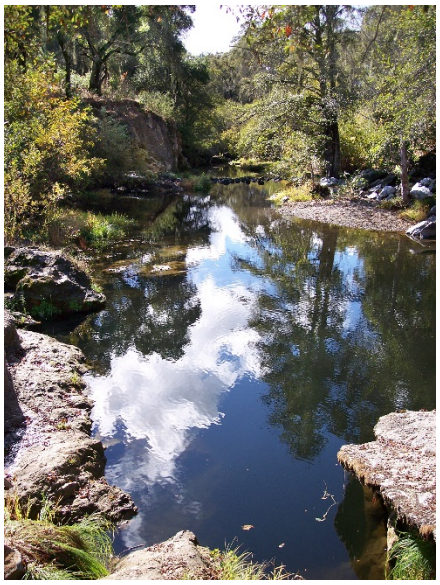
Chapter 2

Greenhouse Gas Emissions Inventory, Forecasts, and Reduction Targets

(https://upload.wikimedia.org/wikipedia/commons/4/48/Rolling_hills_of_the_Napa_valley.jpg)By nigelpepper (Rolling hills of the Napa valley) [CC BY 2.0 (http://creativecommons.org/licenses/by/2.0)], via Wikimedia Commons

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 unincorporated areas of Napa County. It includes a discussion of the primary sources and annual levels of GHG emissions for 2014 (i.e., inventory); describes likely trends if emissions are not reduced for 2020, 2030, and 2050 (i.e., forecasts); and sets a path forward to reduce emissions for 2020, 2030, and 2050 (i.e., targets). Emissions from communitywide activities are discussed in Sections 2.2 through 2.4.



Source: County of Napa

2.1.1 Why Prepare a Greenhouse Gas Emissions Inventory?

Recent increases in global temperatures are highly correlated with elevated GHG emissions resulting from human activities. Per the scientific community, to avoid "dangerous climate change" in the Earth's climate system, GHG emissions will need to be stabilized so that global temperatures do not increase more than 3.6 degrees Fahrenheit (°F) (2 degrees Celsius [°C]) above pre-industrial levels. To achieve this outcome, global carbon dioxide (CO_2) emissions must be stabilized between 300 and 350 parts per million (ppm).

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

The inventory baseline is used to:

- forecast emissions;
- develop reduction targets; and
- develop, evaluate, and implement strategies to achieve the targets.

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

The inventory establishes 2014 as the baseline year from which the County determines GHG reduction targets.

AB 32, SB 32, and Executive Orders B-30-15 and S-3-05 use 1990 levels as a benchmark to identify statewide reduction targets. Because the County's 1990 emissions level was not estimated, proportional targets for the County's CAP were developed for 2014 that are consistent with CARB's Draft 2030 Target Scoping Plan and the State's 2014 GHG emissions inventory.

2.1.2 Overview of GHG Emissions Inventory Characteristics

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

A local community GHG emissions inventory is an estimate of a defined set of gases emitted to the atmosphere from local or regional sources that contribute to climate change. The six primary GHG emissions typically included in a community GHG emissions inventory are carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); and, three types of fluorinated gases (F-gases), including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Two common terms used when discussing climate change are "carbon footprint" and "GHG emission inventories." While related, these concepts are not synonymous. The community emissions inventory prepared for this CAP is limited to emissions that are generated from local and regional activities within the unincorporated County or the surrounding region (i.e., San Francisco Bay Area), from a defined set of sources (e.g., transportation, electricity use, waste). These include emissions that can be readily estimated, monitored and reduced by County measures that support the efforts of residents and businesses, and are within local jurisdictional control.

Source: County of Napa

The inventory does not comprehensively address everyone's "carbon footprint" or attempt to quantify life-cycle emissions on a global scale that could be generated from all economic activities associated with the County (e.g., purchasing imported goods, global goods exports, or air travel to and from the County). Unlike a GHG emissions inventory, a carbon footprint is not limited to a defined geography or to a set of activities and sources that the County can influence. A carbon footprint is based on a life-cycle analysis of GHG emissions that result from numerous activities of residences, businesses or organizations, such as the energy required to grow and ship food; the energy required for various forms of travel or goods movement far beyond the County's borders (e.g., trains, planes, ships); or the embodied energy to manufacture, market, and dispose of the products we use.

Local community GHG emissions inventories are focused on emissions that occur within the physical boundaries of the local community or its surrounding region. Attempting to account for the global, life-cycle carbon footprint of the community in the context of a GHG emissions inventory could result in double counting emissions that are within the inventories of other jurisdictions in California or elsewhere. Thus, the preparation of the 2014 GHG emissions inventory for the County's CAP does not include the calculation of the community's global "carbon footprint."

This CAP includes strategies and measures that will help achieve the County's objectives to reduce GHG emissions as documented in the GHG emissions inventory. Many of the measures could also help residents, businesses, and organizations reduce their carbon footprint;

however, achieving the targets in the context of the community's broader carbon footprint is beyond the scope of this CAP.

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

On a community-wide level, individuals and businesses can play an important role in combating climate change. By changing habits, residents and businesses can work towards reducing their carbon footprint

2.2 Inventory

The first step in the County's climate action planning process is to understand the sources and amounts of GHG emissions generated from activities within the County.

The County's 2014 inventory of GHG emissions is broken down into the following nine sectors, shown in decreasing order by level of contribution:

The County's 2014 GHG Emissions Inventory has Nine Sectors:

1. Building Energy Use
2. On-Road Vehicles
3. Solid Waste
4. Agriculture
5. Off-Road Vehicles
6. High GWP Gases
7. Wastewater
8. Land Use Change
9. Imported Water Conveyance

- **Building Energy Use:** Building Energy sector emissions include CO_2, CH_4, and N_2O emissions generated as the result of electricity and natural gas consumption in residential, commercial, and industrial buildings and stationary equipment, including water pumps for private wells.

- **On-Road Vehicles:** On-road transportation emissions include CO_2, CH_4 and N_2O emissions associated with gasoline, diesel and other fossil fuel consumption from motor vehicles on local and regional roadways.

Black carbon emissions associated with diesel exhaust will continue to be reduced through state actions.

- **Solid Waste:** Solid Waste sector emissions include waste-in-place CH_4 emissions generated from the decomposition of previously-landfilled waste in existing landfills operating in the County, as well as CH_4 emissions from the decomposition of waste generated by residences and businesses in the County in at landfills in various locations.

- **Agriculture:** Agriculture sector emissions include CO_2, CH_4 and N_2O generated during fuel combustion in farm equipment operations; CH_4 and N_2O emissions from livestock; and, N_2O from fertilizer use.

- **Off-Road Vehicles:** Off-road vehicles and equipment generate CO_2, CH_4 and N_2O emissions associated with combustion of gasoline, diesel and other fossil fuels.

Source: County of Napa

- **High global warming potential (GWP) gases**: High GWP gas emissions are generated as the result of the use or leakage of refrigerants, electrical insulators in transmission lines, fumigants, and other materials. Emissions in this sector include F-gases such as HFCs, PFCs, and SF_6.

- **Wastewater:** Wastewater treatment results in CO_2 emissions associated with the electricity consumed during treatment, as well as fugitive CH_4 emissions resulting from the treatment process for domestic sewage and industrial wastewater. Fugitive CH_4 accounts for most of the emissions in this sector.

- **Land Use Change:** Lost carbon sequestration and storage potential from conversion of natural lands such as oak woodlands, forests, and shrublands to developed uses, such as agriculture or urban development.

- **Imported Water Conveyance:** Water-related emissions include CO_2 associated with energy and fuel used to convey imported water into the unincorporated County for domestic, irrigation, and industrial purposes.

An important aspect of GHGs is the unit of measurement used to inventory and estimate emissions. CO_2 is the most prevalent and recognized GHG; however, there are five other primary GHGs that must be addressed to meet State-mandated reduction targets, including: CH_4, N_2O, SF_6, HFC, and 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) Fourth Assessment, CH_4 and N_2O are approximately 25 and 298 times more potent, respectively, than CO_2 in their ability to trap heat in the atmosphere (IPCC 2007). The County's 2014 GHG emissions inventory uses the IPCC's Fourth Assessment Report values to maintain consistency with the latest statewide inventory prepared by the California Air Resources Board (CARB). Converting all six classes of GHG emissions into "carbon dioxide equivalents (CO_2e)" using GWP values allows us to consider all the gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to global warming using a standard unit of measurement. A metric ton of CO_2e ($MTCO_2e$) is the standard unit of measurement of the amount of GHG emissions produced and released into the atmosphere.

Some GHG emissions can also be referred to as "short-lived climate pollutants" (SLCPs) because they remain in the atmosphere for a much shorter period than long-lived climate pollutants and have much higher global warming potential (GWP) values than longer-lived climate pollutants. SLCPs include CH_4, F-gases, and black carbon.

The GHG emissions inventory prepared for this CAP includes the most common and prevalent SLCPs (i.e., CH_4 and F-gases); however, black carbon emissions are not quantified in the inventory. Pursuant to Senate Bill (SB) 605 and 1383, CARB adopted the SLCP Reduction Strategy in March 2017, which outlines how the State will reduce emissions of SLCPs. CARB notes in the SLCP Reduction Strategy that there are considerable difficulties in developing accurate black carbon estimates at the statewide level because they depend on a variety of factors with very high rates of variability uncertainty (CARB 2017b). Thus, because of this uncertainty and known difficulties in developing reliable methods for black carbon inventories, black carbon emissions are not included in the 2014 emissions inventory. Nevertheless, the State is leading the way in reducing black carbon emissions. The SLCP Strategy states that while mobile sources (primarily from diesel exhaust) and wildfire are the primary statewide sources of black carbon, black carbon emissions from mobile sources have been reduced by 90 percent since the 1960s and the State's air quality policies will virtually eliminate black carbon emissions from on-road diesel engines within 10 years. Additionally, wildfires are now the largest statewide source of black carbon, and the state will continue to explore the actions needed to decrease emissions (CARB 2017b).

See Section 1.3 Regulatory Background for a more detailed summary of the legislation pertinent to SLCPs.

Transportation sector GHG reduction measures contained in this CAP are aimed at reducing fossil fuel combustion, increasing the use of alternative fuel and zero-emissions vehicles, and reducing vehicle miles traveled (VMT). These measures will help to further reduce fine particulate matter ($PM_{2.5}$) from diesel fuel combustion and other sources, which will complement the State's efforts under the SLCP strategy and result in co-benefits of reducing black carbon emissions in the County. Less black carbon would also be emitted into the atmosphere in the County through wildfire-related climate adaptation measures contained in this plan. For a complete list of measures related to on-road transportation and wildfire, see Chapters 3 and 4.

On a local level, certain measures related to on-road transportation and wildfire, will have a co-benefit of reducing black carbon emissions.

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

2.2.1 Napa County's 2014 GHG Emissions

In 2014, communitywide activities in the County accounted for 484,283 $MTCO_2e$. Most emissions were due to building energy use and on-road vehicle activity. Thirty-one percent of these emissions were due to energy used in buildings for heating, cooling, and powering devices, equipment, and other energy loads. Emissions from gasoline and diesel consumption related to vehicles and trucks on local and regional roads accounted for another 26 percent of the County's emissions in 2014.

The Top Five Emitting Sectors in 2014:

1. Building Energy Use (31%)
2. On-Road Vehicle (26%)
3. Solid Waste (17%)
4. Agriculture (10%)
5. Off-Road Vehicles (9%)

The County's 2014 emissions are equal to the emissions of a car driving 1.4 billion miles, or driving to the moon and back 2,851 times.

To put the County's emissions into perspective, 484,283 $MTCO_2e$ is equivalent to combusting 54.5 billion gallons of gasoline, combusting 258,388 tons of coal, or a year's worth of carbon sequestration from 458,424 acres of U.S. forests. Assuming an average car gets about 25 miles to the gallon, the County's 2014 emissions is same as a single car driving 1.4 billion miles, or driving to the moon and back 2,851 times (U.S. Environmental Protection Agency 2016).

Additional detail related to the specific emission sectors, data sources, assumptions, and methodology can be found in Appendix A. Figure 2-1 and Table 2-1 below show the breakdown of Napa County's GHG emissions 2014.

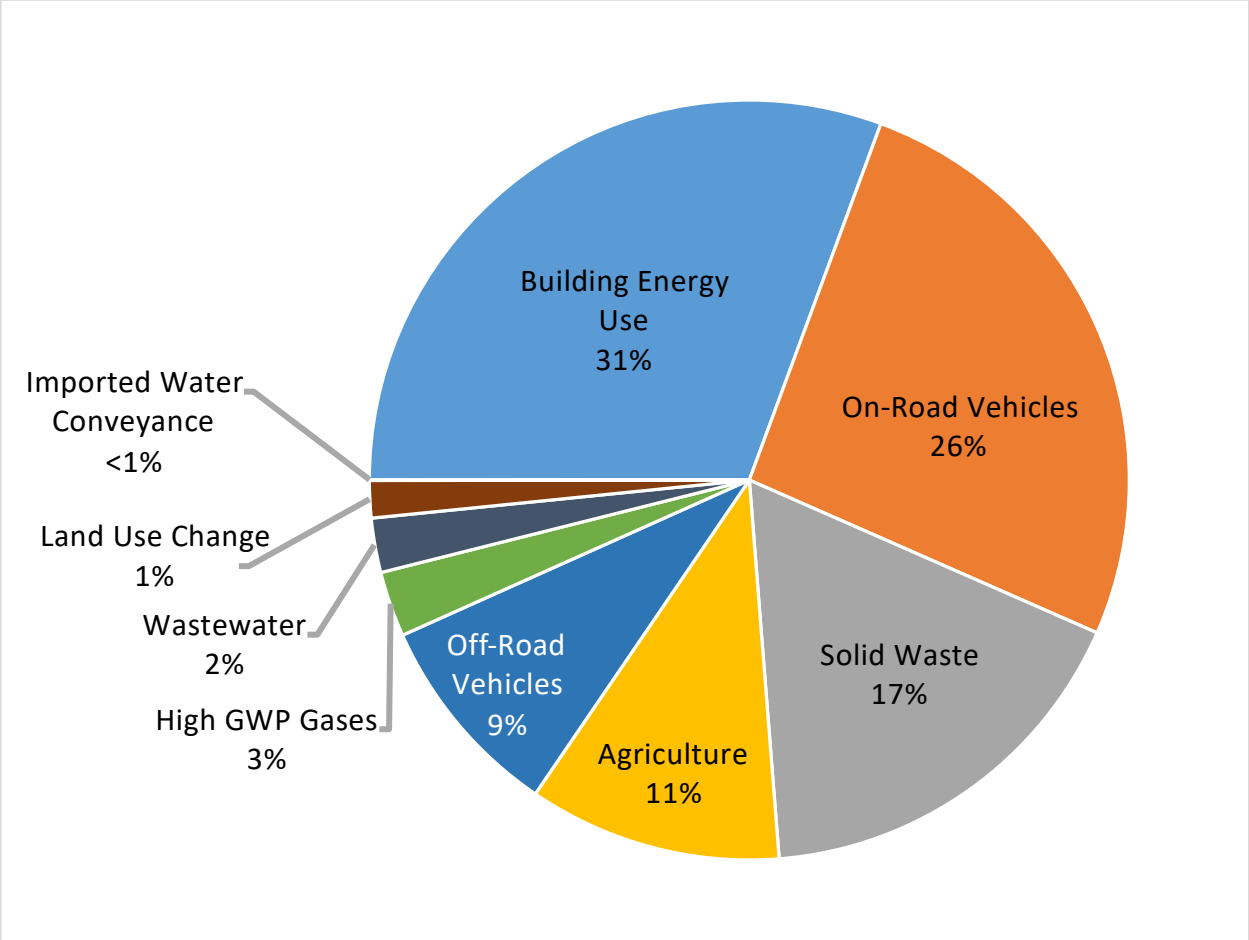


Figure 2-1: Napa County 2014 GHG Emissions

Table 2-1 2014 Unincorporated Napa County Greenhouse Gas Inventory

Emissions Sector	$MTCO_2e$	Percent
Building Energy Use	148,338	31
On-Road Vehicles	125,711	26
Solid Waste	83,086	17
Agriculture	52,198	11
Off-Road Vehicles	42,508	9
High GWP Gases	13,481	3
Wastewater	11,189	2
Land Use Change	7,684	1
Imported Water Conveyance	88	<1
Total	484,283	100

Source: Ascent Environmental 2016

2.3 Forecasts

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

The 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 County projections. Finally, the BAU forecast does not account for GHG emissions reductions associated with implementation of the CAP or legislative actions.

The BAU GHG emissions forecasts in the CAP assume a continued increase in population, housing units, employment and vehicle activity. Projections are based on MTC and the Napa County General Plan.

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

2.3.1 Demographic Trends

GHG emission forecasts were estimated for 2020, 2030, and 2050 using County-specific demographic and vehicle activity projections through 2040 from the Metropolitan Transportation Commission (MTC). Based on MTC's projections, the County's unincorporated

From 2014 levels, population in the County is expected to increase by:

- 7 percent by 2020,
- 19 percent by 2030, and
- 44 percent by 2050.

population is expected to increase by 7 percent by 2020, 19 percent by 2030, and 44 percent by 2050 from 2014 levels. Growth in employment is expected at a lower rate than population, with jobs growing by 3 percent by 2020, 8 percent by 2030, and 17 percent by 2050. This is likely due to the continued agricultural character and associated employment characteristics in the unincorporated area.

The number of households in the unincorporated area is also anticipated to grow by 5 percent by 2020, 12 percent by 2030, and 28 percent by 2050 from 2014, a significantly lower rate than population. Housing growth is anticipated to be concentrated in the cities and towns to accommodate future population increases, highlighting planning efforts to reduce sprawl and achieve denser development.

The forecasts also consider anticipated changes in land use based on Napa County's General Plan. These land use change forecasts not only affect housing and population, but they also indicate losses in natural vegetation, such as oak woodlands and forests, that sequester CO_2 from the atmosphere.

2.3.2 Legislative Reductions

Source: County of Napa

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

- improved vehicle fuel efficiency standards;
- a Federal ban on certain high-GWP gases;
- adopted improvements to the State's Building Energy Efficiency Standards;
- adopted statewide targets to reach 33 percent renewable mix in statewide electricity generation by 2020 and 50 percent by 2050;
- a statewide target to double energy efficiency in existing buildings by 2030 (i.e., Senate Bill [SB] 350);
- a 75 percent statewide waste diversion goal by 2020;
- planned landfill gas capture projects pursuant to State regulations; and
- participation in MCE.

The legislative reductions described above do not assume that the stringency of GHG emissions reductions will increase beyond 2030. A detailed description and analysis of how specific legislative reductions are included in the County's BAU GHG emissions forecast can be

found in Appendix A. Table 2-2 and Figure 2-2 below show the breakdown of the County's forecasted BAU GHG emissions, including a comparison to total annual emissions that will occur without any legislative reductions.

Table 2-2 Unincorporated Napa County BAU GHG Emissions Forecasts: With and Without Reductions ($MTCO_2e$/yr)

Sector and Subsector	2014	2020	2030	2050
Building Energy	148,337	131,643	59,150	67,184
Transportation	125,711	112,854	84,846	85,735
Solid Waste	83,086	62,345	56,711	48,854
Agriculture	52,198	52,521	53,589	57,446
Off-Road Vehicles and Equipment	42,508	45,164	49,592	58,474
High-GWP Gases	13,481	11,828	13,169	15,867
Water and Wastewater	11,277	11,858	12,959	14,335
Land Use Change	7,684	35,608	18,239	21,669
Total BAU with Legislative Reductions	484,283	463,821	348,253	369,563
Percent change from 2014 (%)	*0%*	-4%	-28%	-24%
Total BAU without Legislative Reductions	484,283	523,645	522,248	557,379
Percent change from 2014 (%)	*0%*	*8%*	*8%*	*15%*
Reductions due to Current Legislative Actions	0	59,824	173,995	187,816

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 equivalents
Source: Ascent Environmental 2016

2.3.3 BAU GHG Forecasts with Legislative Reductions

The legislative actions listed above will help to lower GHG emissions in the unincorporated County, as shown in Table 2-2. Despite a 44 percent increase in population between 2014 and 2050, and without the strategies and measures included in this CAP (see Chapter 3), it is estimated that GHG emissions will decrease by 4 percent from 2014 levels to 463,821 $MTCO_2e$/year by 2020. By 2030 and 2050, emissions will decrease by 28 and 24 percent below 2014 levels, respectively. The overall decrease in emissions is primarily due to substantial increases in renewable electricity generation, improved energy efficiency in existing buildings, and more efficient vehicles. As shown in the legislative-adjusted forecasts in Table 2-2, transportation will replace building energy as the largest emissions sector in the future, accounting for 23 percent of emissions through 2050. On the other hand, emissions from building energy accounted

Taking legislative reductions into account, emissions are projected to decrease in the BAU forecast. However, these reductions in emissions are not, in and of themselves, enough to meet State mandates.

for 31 percent of the County's emissions in 2014, but will account for less than 18 percent of emissions by 2050 in the legislative-adjusted forecasts.

2.4 Reduction Targets

Source: County of Napa

This CAP primarily focuses on reducing emissions by 2020 and 2030, consistent with State mandates. While setting goals beyond 2030 is important to provide long-term objectives, it is difficult to establish targets beyond a 15-year time frame for which defensible reduction assumptions can be made. This is primarily due to uncertainty around future technological advances and future changes in State and Federal law beyond 2030.

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

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

CARB developed the *First Update to the Climate Change Scoping Plan (Scoping Plan Update)* pursuant to AB 32. It indicated that reducing the State's emissions to 80 percent below 1990 levels by 2050 would be consistent with the IPCC's analysis of the global emissions trajectory needed to stabilize atmospheric concentrations at 350 ppm or less, to reduce the likelihood of catastrophic global climate change (CARB 2014).

The County's reduction targets are consistent with CARB's Draft 2017 Scoping Plan's recommended community-wide targets, as well as the State's 2014 GHG emissions inventory.

To determine an equivalent reduction target at the local level, CARB's Draft 2017 Scoping Plan Update recommends community-wide GHG reduction goals for local climate action plans that will help the State achieve its 2030 and 2050 targets (CARB 2017a). These goals consist of reducing emissions to 6 $MTCO_2e$ per capita and 2 $MTCO_2e$ per capita by 2030 and 2050, respectively. Considering the overall statewide emissions in 2014 and the estimated statewide population for 2014 through 2050, CARB's recommended per-capita goals are equivalent to reducing 2014 emissions by 40 percent by 2030 and 77 percent by 2050 (CARB 2016, DOF 2014). Thus, consistent with CARB's recommended community-wide targets and recent updates to the State's 2014 GHG emissions inventory, the following adjusted reduction targets should be achieved in the County:

To meet reduction targets, the County will need to reduce emissions to:

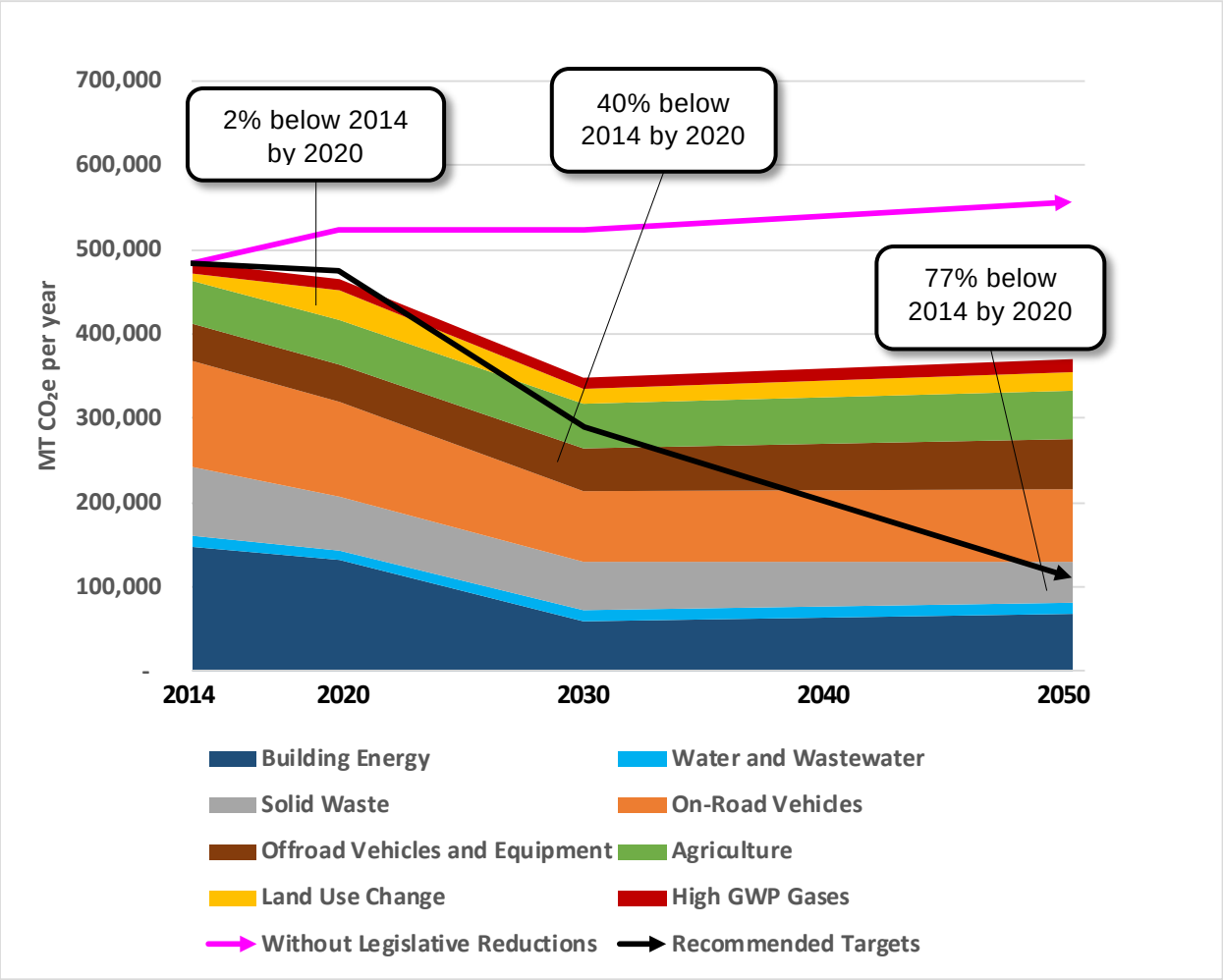
- 474,598 $MTCO_2e$/year in 2020
- 290,570 $MTCO_2e$/year in 2030
- 111,385 $MTCO_2e$/year in 2050

- 2 percent below 2014 levels by 2020,
- 40 percent below 2014 levels by 2030, and
- 77 percent below 2014 levels by 2050.

Attaining a 2 percent reduction in GHG emissions will require that annual emissions be reduced to approximately 474,598 $MTCO_2e$/year in 2020, which is about 9,686 $MTCO_2e$/year lower than 2014 levels.

Forecasts in Table 2-2 show that the County will meet and exceed this reduction target by over 10,000 $MTCO_2e$ through existing legislative reductions.

To achieve long-term GHG reductions, the County will need to reduce emissions to 290,570 $MTCO_2e$/year by 2030, or about 193,713 $MTCO_2e$ (40 percent) below 2014 GHG emissions levels. To achieve a 77 percent reduction in GHG emissions from 2014 levels by 2050, the County will need to reduce its emissions to about 111,385 $MTCO_2e$ per year in 2050, which is about 372,898 $MTCO_2e$ lower than 2014 levels. A detailed technical analysis of the County's emissions reduction target and goals can be found in Appendix B. Figure 2-2 below shows the GHG reduction targets alongside the breakdown of the County's emissions over time discounting any actions and measures proposed in this CAP.



Source: Ascent Environmental 2016

Figure 2-2: Napa County BAU GHG Emissions Forecasts and Targets without CAP Measures

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Napa County Climate Action Plan

A Tradition of Stewardship
A Commitment to Service

Chapter 3

Greenhouse Gas Reduction Strategies and Measures

Source: County of Napa

3.1 Introduction

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

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

Strategies are organized under seven GHG emissions sector-based strategies and one multi-sector strategy. Measures identify specific locally based-actions to reduce GHG emissions.

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

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

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

3.2 Summary of Greenhouse Gas Reduction Strategies

As described in Chapter 2, the County has established a 2020 GHG emissions reduction target (2 percent below 2014 levels), and 2030 and 2050 targets (40 percent and 77 percent below 2014 levels, respectively) to reduce annual emissions levels, consistent with State laws and guidelines. If communitywide emissions in the county were to continue growing under business-as-usual (BAU) practices and activities, the County's GHG emissions will meet and exceed the 2020 reduction target by just over 10,000 metric tons of carbon dioxide equivalent ($MTCO_2e$), but would fall short of the 2030 and 2050 targets by 57,683 and 258,178 $MTCO_2e$ per year, respectively. With the measures included in the CAP, the County's GHG emissions will exceed 2020 and 2030 targets by 57,102 and 264 $MTCO_2e$ per year, but would still need to reduce emissions by 157,460 $MTCO_2e$ per year to meet the 2050 target.

The County aims to reduce annual GHG emissions to:

- 2 percent below 2014 levels by 2020,
- 40 percent below 2014 levels by 2030, and
- 77 percent below 2014 levels by 2050.

Over time, the County will also monitor, review, and update the CAP with new reduction measures to ensure continued effectiveness and progress towards meeting the 2050 emissions reduction target.

The quantifiable measures in the CAP currently fall short of meeting the County's 2050 reduction goal; however, demonstration of achievement of the 2050 goal in a local government CAP is considerably challenging due to the extended time horizon and the County's limited jurisdiction over numerous sources of emissions. In the coming decades, new innovations and technologies will likely become available that will enable further GHG reductions. New or more reliable methods may also become available to quantify measures that are currently unquantifiable. Finally, new Federal and State laws may further reduce emissions in sectors currently addressed primarily by local County measures. As climate change science and policy continues to advance, the County will be able to apply new reductions toward meeting the long-term 2050 GHG emissions reduction target in future CAP updates.

Table 3-1 below shows the annual GHG reductions attributable to the measures included in this Plan. Table 3-2 shows how the anticipated reductions will help the County meet its GHG reduction targets. See Appendix B for detailed calculations and an explanation of how the measures in the CAP work towards achieving the 2020 2030, and 2050 targets.

Table 3-1 Annual GHG Reductions by Sector due to Proposed Reduction Strategies and Measures ($MTCO_2e$/year)

Strategy	2020	2030	2050
Building Energy	13,361	16,999	20,412
On-Road Transportation	5,599	4,198	4,083
Solid Waste	1,807	3,731	4,433
Off-Road Vehicles and Equipment	1,687	7,867	23,014
Agriculture	3,512	10,752	22,288
Land Use Change	18,576	8,657	20,751
Wastewater[1]	1,783	5,743	5,737
Total Reductions	46,325	57,947	100,718

Notes: Columns may not add to totals due to rounding.
[1] Reduction attributed only to Action MS-2, a multi-sector strategy.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2016

Table 3-2 Effect of Plan Measures on County Emissions and Targets ($MTCO_2e$/year)			
Emissions Source	2020	2030	2050
Legislative-Adjusted BAU Napa County Emissions	463,821	348,253	369,563
Reductions from CAP Measures	46,325	57,947	100,718
Napa County Emissions with CAP	417,496	290,306	268,845
Napa County GHG Reduction Targets (Percent below 2014)	-2%	-40%	-77%
Maximum Emissions allowed with Targets	474,598	290,570	111,385
Additional GHG Reductions Needed to meet Targets	-57,102	-264[a]	157,460

Notes: Columns may not add to totals due to rounding.
[a] Negative values represent that the reductions meet and exceed the targets.
BAU = Business-As-Usual
CAP = Climate Action Plan
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2016

3.3 Strategies and Measures to Reduce Greenhouse Gases

To help close the gap between the County's future BAU emissions and State targets, the CAP proposes 48 GHG-reducing measures which are organized under eight GHG emissions sector-based strategies and one multi-sector strategy.

There are 48 GHG-reducing measures, organized under eight GHG emissions sector-based strategies.

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

- the feasibility of the measure to be implemented by the County;
- the need for greater reductions in the sectors with the most emissions, especially in building energy and transportation (See Figure 2-1 in Chapter 2);
- existing policies, actions, or programs that can be expanded or proposed policies yet to be adopted;
- feedback from community and other stakeholders; and
- technological innovations.

While many of the emission reductions of the measures can be quantified, others are more difficult to quantify. However, the combination of all measures contributes towards achieving 2020 and 2030 targets.

The discussion below describes each strategy, measure, and associated GHG emissions reductions, to the extent that they are quantifiable. Some of the measures are not quantifiable due to data limitation or lack of available method to quantify emissions reductions; however, these qualitative measures are still important to include in the CAP.

Additional detail and calculations can be found in Appendix B. Chapter 5 further describes how measures will be implemented.

Source: County of Napa

3.3.1 Building Energy

The energy used in buildings is a significant contributor to GHG emissions in the county, accounting for more than 30 percent of total emissions (10 percent from residential and 21 percent commercial/industrial) in 2014. Although legislative reductions related to State actions will help to reduce building energy emissions by 60 percent from 2014 levels by 2030, and 55 percent by 2050, additional reductions can help the County meet State GHG reduction targets.

Legislative reductions contribute greatly to emission reductions in the Building Energy sector. Measures under the Building Energy will reduce emissions by an additional:

- 14 percent in 2030, and
- 13 percent in 2050.

The Building Energy strategy offers the greatest opportunity to achieve emissions reductions across the eight strategies. Measures under the Building Energy strategy will reduce building energy emissions by an additional 14 percent, resulting in a 72 percent reduction from 2014 levels by 2030, and a 68 percent reduction by 2050 when combined with legislative reductions. The building energy measures included in the CAP aim to further reduce emissions by improving energy efficiency earlier than or beyond State requirements, streamlining access to renewable energy, and increasing the supply of renewable energy for homes and businesses within the county. The success of these measures relies on coordination with local utilities and organizations, participation from the community, and administration of new or revised local policies and programs.

All Building Energy measures also serve as adaptation measures by reducing overall energy demand and increasing the ability of the community and local economy to weather future change. For a complete list of adaptation measures, see Chapter 4.

The Building Energy strategy includes 11 measures, seven of which were quantified. Four measures under this strategy could not be quantified due to the uncertainty of the energy reductions that could occur, but are addressed qualitatively. Two major measures include a water heater replacement program and a formal adoption of standards to achieve the State's zero net energy (ZNE) goals. Combined, these two measures will reduce emissions by 17,137 $MTCO_2e$ per year by 2050.

Table 3-3 summarizes the annual reductions anticipated from building energy measures. Each measure is described in further detail below.

Table 3-3 Summary of Building Energy Measures

Measure Number	Measure Description	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
BE-1	Work with PG&E, PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings	NA	NA	NA
BE-2	Require energy audits for major additions to or alterations of existing buildings	NA	NA	NA
BE-3	Require compliance with CALGreen Tier 1 green building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	28	23	24
BE-4	Require compliance with CALGreen Tier 1 standards for all new construction, and phase in ZNE requirements for new construction beginning in 2020	1,361	2,037	4,587
BE-5	Increase participation in MCE's Deep Green (100% renewable) option	4,005	1,384	1,338
BE-6	Require new or replacement residential and commercial[1] water heating systems to be electrically powered and/or alternatively fueled systems	6,096	11,575	12,550
BE-7	Expand current renewable energy and green energy incentives and update local ordinances	1,479	1,806	1,703
BE-8	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	NA	NA	NA
BE-9	Select MCE's Deep Green Option for all County-Owned Facilities	382	170	205
BE-10	Support Waste-to-Energy Programs at Unincorporated Landfills	10	5	5
BE-11	Encourage Solar Panel Installations on Warehouse Roof Space	NA	NA	NA
TOTAL		13,361	16,999	20,412

Notes: Columns may not add to totals due to rounding.
[1] Emissions reductions quantified under BE-6 only apply to residential water heating systems.
BAU = Business-As-Usual
CALGreen = California Green Building Standards Code
CAP = Climate Action Plan
GHG = greenhouse gas emissions
MCE = Marin Clean Energy
$MTCO_2e$ = metric tons of carbon dioxide equivalent
NA = Not Available
PACE = property assessed clean energy
ZNE = zero net energy
Source: Ascent Environmental 2016

Measure BE-1 Work with PG&E, PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings

The County will provide information on County-, State- and utility-based energy efficiency programs and funding opportunities (e.g., Pacific Gas and Electric's [PG&E's] Energy Watch Program, Sustainable Napa County, property assessed clean energy [PACE] financing). Information sharing can be done through providing informational brochures at County offices, updating the County website, and other methods.

Co-Benefits (BE-1 and BE-2)

- Improved Air Quality
- Reduced Fossil Fuel Reliance

Measure BE-2 Require energy audits for major additions to or alterations of existing buildings

The County will amend the County Code to require energy audits when a building permit application is submitted for a substantial addition to or alteration to an existing building. Audits could be triggered by an alteration or addition greater than or equal to 50 percent of a lot's total building square footage. According to permit records, the County issued or finalized an average of 300 permits per year for additions, alterations, and replacements for inhabited residential and commercial land uses between 2010 and 2015.

This measure could be combined with BE-1 to inform permit applicants of available incentives and financing available to cover efficiency upgrades pursuant to audit recommendations.

Measure BE-3 Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings.

The County will amend County Code to require compliance with California Green Building Standards Code (CALGreen) Tier 1 standards (Title 24, Part 11), as well as Tier 1 building energy efficiency standards (Title 24, Part 6), for alterations and additions over 1,000 square feet, in addition to requiring energy audits (see Measure BE-2). The County may also consider incentivizing compliance with CALGreen Tier 2 standards for eligible buildings, such as through expedited permitting or reduced permit fees. CALGreen Tier 1 also requires all appliances to be EnergyStar rated.

Co-Benefits (BE-3 and BE-4)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure BE-4 Require compliance with CALGreen Tier 1 standards for all new construction, and phase in ZNE standards for new construction beginning in 2020.

The County will amend the County Code to require compliance with CALGreen Tier 1 green building standards (Title 24, Part 11), as well as Tier 1 building energy efficiency standards (Title 24, Part 6), for all new construction. These "reach code" standards include green building measures that can reduce GHG emissions beyond mandatory CALGreen requirements in several categories, including Energy Efficiency, Planning and Design, Water Efficiency and Conservation, Materials Conservation and Resource Efficiency, and Indoor Air Quality. Compliance with these green building measures can lead to increased use of green and recycled materials, turf area limits, reduction of construction waste through recycling, and other important features that achieve important sustainability and public health co-benefits.

Under Tier 1 standards, new construction will be required to exceed minimum building energy efficiency standards by 15 percent or more. The County may also consider additional incentives for new construction projects meeting or exceeding Tier 2 standards which will have energy efficiencies of 30 percent above current standards.

The State is considering, but has not formally adopted, a mandatory ZNE[1] standard for all new residential construction starting in 2020 and new commercial construction starting in 2030. Under this measure, the County will also revise the County's building code to phase in and formally adopt the State's proposed ZNE standard in 2020. The State has demonstrated that ZNE can be achieved through a combination of high-performance energy efficient design and maximizing on-site renewable energy production (e.g., solar and storage).

Source: County of Napa

To phase in the ZNE requirements, the County will amend the local building code to require compliance with ZNE standards for all residential and commercial construction starting in 2020 and 2030, respectively.

Under this measure, CALGreen Tier 1 measures for green building categories other than energy efficiency (Planning and Design, Water Efficiency, Material Conservation and Resource Efficiency, and Indoor Air Quality) will continue to be required after ZNE requirements have been phased in.

Also, with respect to Water Efficiency and Conservation standards under CALGreen Tier 1, the County will develop a program to provide incentives through the permitting process, including:

- incentivize installation of commercial and residential rainwater capture systems;
- incentivize installation of commercial and residential graywater capture and reuse systems for discharge to irrigation applications; and
- require ultra-low flow fixtures and toilets in new construction.

Measure BE-5 Increase participation in MCE's Deep Green (100 percent renewable) option

The County will develop and provide incentives for residents and businesses to adopt MCE's Deep Green Option, which provides 100 percent renewable electricity. The County will consider subsidizing the extra cost of opting into Deep Green (e.g., $0.01 per kilowatt hour) for low-income households, and will develop incentives for wineries, hotels, and other businesses that opt into Deep Green. The County will also work with MCE to promote awareness of the Deep Green Option.

Co-Benefits (BE-5 and BE-6)
- Improved Air Quality
- Reduced Fossil Fuel Reliance

*Measure BE-6 Require new or replacement residential and commercial water heating systems to be electrically powered and/or **alternatively fueled** systems*

As part of a new ordinance or revisions to existing County Code, the County will act to require all new or replacement residential and commercial water heaters to be either electrically-powered or

[1] A ZNE building is one that produces as much renewable energy on-site as it consumes in one year.

alternatively fueled systems, such as solar thermal or geothermal heat pump systems. Replacement of natural gas-fueled water heaters with electric or alternatively fueled heating allows for more opportunities to reduce emissions by displacing on-site fossil fuel combustion with electricity that is at least 50 percent renewable under MCE, on-site renewable energy, or a combination thereof.

This measure will be enforced through the County's current permitting process and will initially apply to residential properties first. New or replacement residential natural gas water heaters would typically no longer be permitted under this ordinance unless they meet stringent annual fuel efficiency ratings (i.e., 95 or higher). Examples of eligible replacement types could include solar thermal water heaters, tankless on-demand and storage-type electric water heaters, geothermal heat pumps, and electric heat pump systems. Electric water heaters could be paired with a solar water heating system to provide backup hot water. Heat pump systems could also include air or ground-source heat pump systems. The County will later phase in requirements for new or replacement commercial water heaters to develop an effective program that can accommodate the variations in size, cost, and capacity of commercial-grade water heaters.

As part of this measure, the County will also consider offering financial incentives if the conversion to electric would require substantial work beyond the unit replacement cost. Financial incentives would also help to offset the incremental cost of electric or solar thermal systems compared to natural gas water heaters for eligible homeowners and commercial owners. The County could also expedite or reduce permitting fees associated with electric or solar water heating installations; however, no incentives would be provided for natural gas systems. This could be achieved in coordination with implementation of Measures BE-1 and BE-7.

Co-Benefits (BE-7)

- Improved Air Quality
- Reduced Fossil Fuel Reliance

Measure BE-7 Expand current renewable energy and green energy incentives and update local ordinances

The County will continue to provide expedited permitting incentives for installing solar panels, electric vehicle charging stations, and wind turbines. The County will also consider expanding incentives to other green technologies (e.g., solar water heating systems, geothermal ground source heat pump, micro-turbines, and battery storage). Any modifications to ordinances under this measure will ensure that ground-based solar panels will not change residential acreage limits on agricultural land uses.

The County will also work with Google, National Renewable Energy Laboratory, or other information providers to help communicate the customized cost-benefits associated with solar opportunities for each resident and business. The County will set a goal of approving 20,000 kW worth of solar permits by 2030, periodically review progress of permit applications, and adjust incentives and outreach efforts accordingly.

Measure BE-8 Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings

The County will establish a program that allows new development to offset construction or operational GHG emissions by setting up a funding mechanism into which developments pay and, indirectly, finance residential energy efficiency retrofits in local existing income-qualified homes or buildings. The County will need to determine how the offset funds will be used to fund retrofits. Emissions benefits may be quantifiable once program details are established. The County could consider pairing funds from the retrofit program with other funding sources or financing mechanisms to allow for even greater energy efficiency improvements in existing buildings (see Measure BE-1).

Co-Benefits (BE-8)
- Improved Air Quality
- Improved Water Supply and Quality
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure BE-9 Select MCE's Deep Green option for all County facilities

The County will select MCE's Deep Green option for all County-owned facilities within the County's operational control.

Co-Benefits (BE-9)
- Improved Air Quality
- Reduced Fossil Fuel Reliance

Measure BE-10 Support waste-to-energy programs at unincorporated landfills

The County will encourage landfills located in the county to pursue waste-to-energy programs that convert waste-based fuel to usable energy that can offset a facility's non-renewable energy usage.

Co-Benefits (BE-10)
- Improved Air Quality
- Improved Water Supply and Quality
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure BE-11 Encourage solar panel installations on warehouse roof spaces

The County will work with MCE and commercial & industrial warehouse owners to encourage solar panel installations on warehouse roof spaces. The County would develop a program to incentivize these installations by expediting permitting (see Measure BE-7) or reducing permit fees associated with installations on existing facilities. The County could also work with interested stakeholders in developing a program to encourage solar panel installations for Feed-in-Tariff arrangements.

Co-Benefits (BE-11)
- Reduced Fossil Fuel Reliance
- Lowered Energy Demand

Lowered Energy, Water, and Sewer Bills

3.3.2 On-Road Transportation

Legislative reductions contribute greatly to emission reductions in the On-Road Transportation sector. When combined with legislative reductions, on-road transportation measures will reduce annual GHG emissions by:

- 36 percent by 2030, and
- 35 percent by 2050.

Like building energy, on-transportation is also a significant contributor to the County's GHG emissions. Emissions from on-road transportation sources accounted for 26 percent of the County's total emissions in 2014. Legislative reductions outside of the County's jurisdiction will reduce 2014 transportation emissions by 33 percent by 2030 and 32 percent by 2050 despite population growth, mainly due to improvements in State and Federal vehicle fuel efficiency standards. These legislative reductions apply to the fuel efficiency of vehicle operations, while measures that affect the frequency or distance of vehicle travel are within local or regional control and can be addressed in a local CAP.

Source: County of Napa

The Plan's on-road transportation measures will reduce 2014 emissions from this sector by 36 percent by 2030 and a 35 percent by 2050 when combined with legislative reductions. The transportation-related measures proposed under this strategy aim to further reduce emissions by reducing vehicle trips through consolidation of vehicle trips and non-motorized solutions, encouraging the use of electric and alternative fuel vehicles, and reducing vehicle miles traveled (VMT) through smarter land use planning. Emissions reductions from these measures rely on successful coordination with and participation from local and regional transportation and planning agencies, incorporated cities in the county, residents, and businesses. These measures will also help to reduce criteria pollutants such as fine particulate matter ($PM_{2.5}$) from diesel fuel combustion and other sources, which will result in the additional co-benefit of reducing black carbon emissions.

This strategy includes 14 measures, five of which can be quantified. Nine measures were qualitatively addressed and could not be quantified due to the uncertainty related to participation rates and variability of external factors. One major measure included in this strategy is an update to the County's transportation system management ordinance that will establish a policy mechanism that addresses commute trips and VMT. Measures under this strategy will also encourage and support the development of active transportation projects in the County.

Table 3-4 summarizes the annual reductions anticipated from on-road transportation measures. Each measure is described in further detail below.

Table 3-4 Summary of On-Road Transportation Measures				
Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
TR-1	Update Transportation System Management Ordinance (for employers)	4,818	3,582	3,547
TR-2	Parking reduction ordinance revisions	78	58	57
TR-3	Increase affordable housing, especially workforce housing, in Napa County	31	23	23
TR-4	Support efforts to allow commuter service to operate on the Napa Wine Train right-of-way	389	289	286
TR-5	Support efforts of transit agencies to increase availability and accessibility of transit information	NA	NA	NA
TR-6	Support alternatives to private vehicle travel for visitors	NA	NA	NA
TR-7	Support Napa County's incorporated cities in developing transit oriented development unique to the needs of the Napa Region	NA	NA	NA
TR-8	Support interregional transit solutions	NA	NA	NA
TR-9	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers	NA	NA	NA
TR-10	Promote existing ride-matching services for people living and working in the unincorporated county	NA	NA	NA
TR-11	Increase the supply of electric vehicle charging stations	NA	NA	NA
TR-12	Promote telecommuting at office based businesses	NA	NA	NA
TR-13	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to use CNG.	284	247	169
TR-14	Encourage and support the development of active transportation projects	NA	NA	NA
TOTAL		5,599	4,198	4,083

Notes: Columns may not add to totals due to rounding.
CNG = compressed natural gas
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NVTA = Napa Valley Transportation Authority
PG&E = Pacific Gas and Electric
NA = Not Available
Source: Ascent Environmental 2016

Measure TR-1 Update Transportation System Management Ordinance (for employers)

The County will revise, adopt, and enforce the existing Transportation System Management ordinance. The updated ordinance will include measures to reduce commute trips to workplaces within the county as well as a program to oversee implementation of these measures at businesses. The County may consider a point-based system that allows employers with more than 20 employees to choose the best trip reduction measures that work for them. The County may recommend a list of trip reduction measures, such as preferential parking for carpools/vanpools or providing shuttle service. The ordinance could also establish a measurable target (e.g., percent

Co-Benefits (TR-1)

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Public Health
- Reduced Fossil Fuel Reliance

increased vanpool ridership and number of transit pass sales). See example trip reduction ordinances from EPA and Code 17.94.060 (Transportation Control Measure) for the City of Rocklin (EPA 2011). The ordinance will be integrated with current Bay Area Air Quality Management District (BAAQMD) and Metropolitan Transportation Commission (MTC) programs and regulations.

Measure TR-2 Parking reduction ordinance revisions

The County will consider reductions in visitor and employee parking requirements and requiring minimum carpool/vanpool/tour bus or shuttle parking spaces, consistent with CALGreen Tier 1 measures (see CALGreen Tier 1 requirements for applicable project in Measures BE-3 and BE-4 above). The County will also consider allowing EV-only parking in lieu of parking reductions. Reductions in standard parking requirements will be made to the standards in Napa County Code 18.66.280.

Co-Benefits (TR-2, T-3, and TR-4)

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure TR-3 Increase affordable housing, especially workforce housing, in Napa County

The County will promote development of affordable housing and transit-oriented development (TOD) in priority development areas in the County as allowable under the County's jurisdiction. Also, the County will encourage the development of housing closer to jobs and services. The Napa Valley Transportation Authority's (NVTA) Countywide Transportation Plan (Vision 2040) predicts growth in low-wage employment throughout the County. Given the many low-wage jobs already located in the county, VMT from commuting will increase without sufficient affordable housing in the County.

Source: County of Napa

Measure TR-4 Support efforts to allow commuter service to operate on the Napa Wine Train right-of-way

The County will support efforts to allow commuter rail service to operate on the Napa Valley Wine Train (NVWT) right-of-way. The NVTA has already explored the possibility of having such a service, but no action has yet been taken to implement such a service. Enhancing connection services, such as shuttles, between stations and nearby employment destinations, in both incorporated and unincorporated areas, will improve the effectiveness of this measure.

According to the 2014 Napa County Travel Behavior Study Survey, 66 percent of workers in the County live in Napa County cities and could be serviced by the commuter rail service on the NVWT line (NCTPA 2014:109). Twelve percent of workers in the county work in the unincorporated area. This measure will reduce more trips associated with VMT to and from incorporated cities and the unincorporated county.

Measure TR-5 Support efforts of transit agencies to increase availability and accessibility of transit information

The County will support efforts to improve overall availability and accessibility of transit information. NVTA is currently working with Google to provide up-to-date transit information online.

Measure TR-6 Support alternatives to private vehicle travel for visitors

The County will improve access to available travel alternatives for visitors. The ways the County will support travel alternatives include:

- subsidizing shuttles for visitors;
- offering winery travel trip route plans that reduce trips and VMT;
- providing information of public and private multi-modal options (e.g., bike tour, van tour, motorcycle tour);
- participating in an industry-wide transportation demand management program (such as a "hop-on hop-off" shuttle programs);
- exploring driverless technology solutions, as they become available;
- requiring dedicated parking space for eligible car-sharing vehicles at major destinations;
- providing cost comparisons to tourists to show monetary and safety benefits of driving vs. using a shuttle service; and
- offering additional subsidies for commercial fleets that are more than 50 percent alternatively fueled.

Co-Benefits (TR-5, TR-6, and TR-7)

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure TR-7 Support Napa County's incorporated cities in developing transit oriented development unique to the needs of the Napa Region

The County will work with the City of Napa and other incorporated cities in exploring the possibility of making the recently-built Soscol Gateway Transit Center, other planned transit hubs, and surrounding areas more visitor-friendly and not just serve commuters. Transit facilities can be marketed as attractions in and of themselves. The County will also support and encourage development of restaurants, hotels, and other attractions within walking distance of the transit center throughout the County, as its jurisdiction allows. One example of such a development is a "grand station" district concept with easy and walkable access to major downtown destinations (e.g., downtown Napa, Riverfront green). This will encourage transit and other non-automobile ridership for visitors traveling to and from the county. This measure should be enacted in tandem with vanpool, shuttle, and increasing transit service in the county (e.g., stops along Vine's Route 10). In addition to funding, the County could install wayfinding signage to promote uses of these developments.

Measure TR-8 Support interregional transit solutions

The County will support and work with NVTA, Association of Bay Area Governments (ABAG), MTC, and Bay Area tourism bureaus to develop transit solutions for interregional passenger travel between San Francisco/East Bay and Napa County, including the unincorporated areas. In addition to expanding connections with ferries, Bay Area Rapid Transit, and Amtrak, the County will consider supporting improvements to existing transit/rail connections to Sonoma and Solano Counties to increase ridership. This could help offset employee commuter trips to and from the county. The County

Co-Benefits (TR-8, TR-9, TR-10 and TR-11)

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Public Health
- Reduced Fossil Fuel Reliance

will also work with NVTA to implement or support applicable measures for interregional travel already included in NVTA's Short Range Transit Plan and Vision 2040.

Measure TR-9 Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers

The County will work with the incorporated cities, neighboring jurisdictions, and NVTA to install additional park and ride facilities near major unincorporated residential centers, where feasible. Currently, there are only a handful of park and ride facilities in the County, all of which are located in three incorporated cities: Yountville, the City of Napa, and American Canyon. The additional park and ride facilities will help consolidate and reduce vehicle trips through carpooling, vanpooling, and transit.

Measure TR-10 Promote existing ride-matching services for people living and working in the unincorporated county

The County will support NVTA and the Solano Transportation Authority to promote awareness of the ride-matching services provided through the Solano Napa Commuter Information website and other organizations. The County will work with local businesses, especially winery, vineyards, and hospitality, to provide information to employers and their employees on ridesharing or shuttle options to transport seasonal workers to and from home. The County will consider offering monetary and non-monetary incentives.

Source: County of Napa

Measure TR-11 Increase the supply of electric vehicle charging stations

The County will promote or incentivize installation of electric vehicle (EV) charging stations at wineries, industrial centers, hotels, major visitor attractions, and multifamily complexes. Charging stations will also be required at park-and-ride facilities. Stations should have clear and obvious signage, require some form of payment to allow for availability, be near amenities, easily accessible, and enforced. The County will also ensure consistency with plans already made under Vision 2040.

Additionally, as noted in Measures BE-3 and BE-4, new construction projects or major additions or alterations to existing buildings will be required to implement CALGreen Tier 1 measures. Tier 1 measures under the Planning and Design section of the code require a minimum number of on-site, dedicated EV parking spaces and pre-wiring dedicated spaces for EV charging stations. This will also contribute to increasing the supply of EV charging.

Measure TR-12 Promote telecommuting at office-based businesses

To reduce commute vehicle miles traveled, the County will work with local office-based businesses to encourage telecommuting. Telecommuting should not impede on normal business practices and, thus, may not be suitable for businesses that require physical employee attendance, such as at retail storefronts and warehouses.

Measure TR-13 Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to use compressed natural gas

The County will encourage solid waste services to convert diesel and gasoline solid waste collection vehicles to compressed natural gas (CNG) or other alternative fuels, thereby reducing fleet-wide emissions.

Co-Benefits (TR-12 and TR-13)
- Improved Air Quality
- Reduction in Black Carbon Emissions

Measure TR-14 Encourage and support the development of active transportation projects

The County will encourage and support the development of active transportation projects that encourage pedestrian and bicycle use (e.g., the multi-use Napa Valley Vine Trail).

Co-Benefits (TR-14)
- Improved Air Quality
- Reduction in Black Carbon Emissions

3.3.3 Solid Waste

The solid waste sector accounted for 17 percent of the County's emissions in 2014. Solid waste is one of the primary sources of methane (CH_4) emissions, which are classified SLCPs. Legislative reductions outside of the County's jurisdiction will reduce 2014 solid waste emissions by 32 percent by 2030 and 41 percent by 2050 despite population growth, mainly due to the State's 75 percent waste diversion goal and a planned landfill gas collection project at Potrero Hills landfill, which accepted 98 percent of the County's waste in 2014.

The CAP's solid waste measures, in combination with legislative reductions, will reduce 2014 emissions in this sector by 36 percent by 2030 and 47 percent by 2050. The two solid waste measures included in the CAP aim to further reduce emissions by encouraging expansion of current composting programs in the County and exceeding the State's waste diversion target. Landfills located within the County already have landfill gas capture operations in place.

When combined with legislative reductions, solid-waste measures will reduce annual GHG emissions by:
- 36 percent by 2030; and
- 47 percent by 2050.

Solid Waste emissions reductions depend on participation from landfills; expansion of County waste reduction, recycling, and composting programs; and participation from County residents and businesses to reduce waste and increase recycling.

Table 3-5 summarizes the annual reductions anticipated from solid waste measures, with more detailed descriptions of the measures following.

Table 3-5 Summary of Solid Waste Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
SW-1	Encourage expansion of composting program for both residential and commercial land uses	629	1,106	1,270
SW-2	Meet an 80 percent Waste Diversion Goal by 2020 and a 90 percent Waste Diversion Goal by 2030	1,179	2,625	3,163
TOTAL		1,807	3,731	4,433

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
PG&E = Pacific Gas and Electric
Source: Ascent Environmental 2016

Co-Benefits (SW-1)
- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats

Measure SW-1 Encourage expansion of composting programs for both residential and commercial land uses

The County will encourage expansion of current composting programs that serve the county to exceed requirements under AB 1826. Under AB 1826, no more than 50 percent of the amount of commercial organic waste landfilled in 2014 can be landfilled starting in 2020. Under this measure, the County will target a composting rate of 85 percent of all food waste and 100 percent of yard waste generated by the County by 2030.

Co-Benefits (SW-2)
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health

Measure SW-2 Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Waste Diversion Goal by 2030

The County will establish a target to meet an 80 percent waste diversion goal by 2020 and a 90 percent waste diversion goal by 2030. This will exceed the State's 2020 75 percent waste diversion target by 5 percent. Key steps include:

- completing an updated waste characterization study to analyze the distribution of waste types in the County's generated waste and identify major waste reduction opportunities. The last waste characterization profile available for the county was available for 1999,
- supporting and expanding existing composting and recycling programs and incentives for residences and businesses, and
- supporting and incentivizing private waste collection and landfills in reducing landfilled waste.

According to Napa Recycling, recycling rates are already at 70 percent in the City of Napa and the southern county. These actions apply to waste management areas under the County's control. Waste in Zone 3 (most areas north of Yountville) is managed by a Joint Powers Authority, the Upper Valley Waste Management Agency (UVA). The County can encourage UVA to adopt these goals, but cannot itself mandate them.

3.3.4 Agriculture

Source: County of Napa

As a leading center for viticulture, the County greatly values the contribution of the agricultural sector to the County's economy and livelihood. Accordingly, the high level of agricultural activity also presents a significant emissions reduction opportunity. Emissions from the agriculture sector, including emissions from livestock, fertilizer use, and equipment, accounted for 11 percent of the County's total emissions in 2014. No applicable legislative actions were assumed to reduce GHG emissions from agriculture; thus, agricultural emissions are anticipated to increase by about 3 percent by 2030 and 10 percent by 2050 from 2014 levels, proportional to the forecasted growth in agricultural acres.

The CAP's measures that address agricultural emissions would prevent emissions increases from this sector and reduce 2014 emissions from this sector by about 18 percent by 2030 and 31 percent by 2050. The agriculture-related measures proposed under this strategy aim to reduce emissions from agricultural equipment and residue burning. Emissions from agricultural equipment accounted for over 60 percent of agricultural emissions in 2014. Actions to reduce emissions from other agricultural operations were not included due to limitation in the County's jurisdiction over activities such as CH_4 generated from cattle (enteric fermentation) and fertilizer use necessary for cultivation.

Agriculture-related measures will reduce annual GHG emissions by:
- 18 percent by 2030
- 31 percent by 2050

This strategy includes four measures that are quantified. The measure with the most future reductions in this strategy supports the usage of electric or alternatively-fueled equipment in lieu of gasoline- or diesel- powered equipment.

Table 3-6 summarizes the annual reductions anticipated from measures affecting the agriculture sector. Each measure is described below Table 3-6.

Table 3-6 Summary of Agriculture Measures				
Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
AG-1	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	NA	NA	NA
AG-2	Support the conversion of all stationary diesel or gas-powered irrigation pumps to electric pumps	1,696	1,792	2,009
AG-3	Support use of electric or alternatively- fueled agricultural equipment	1,617	8,540	19,149
AG-4	Support the use of Tier 4 final diesel equipment for off-road agricultural equipment	0	64	48
AG-5	Support reduced application of inorganic nitrogen fertilizer	199	420	1,130
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	NA	NA	NA
TOTAL		3,512	10,752	22,288

Notes: Columns may not add to totals due to rounding.
BAAQMD = Bay Area Air Quality Management District
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
RCD = Resource Conservation District
Source: Ascent Environmental 2016

Co-Benefits (AG-1)
- Improved Air Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health

Measure AG-1 Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris

The County does not have regulatory control over open burning. The County will support BAAQMD in encouraging farmers and County public services to find alternatives to open burning of agricultural, forest, and other removed biomass. Potential alternatives could include converting agricultural and forest waste to compost, mulch, or biochar for reapplication on cropland (see Measure AG-6 below); or, converting to biomass to energy at waste-to-energy facilities. The County may also be willing to contribute funds to support a wood waste to energy plant, should a viable project be proposed by another party. There may be instances where open burning is still the most effective tool to prevent the spread of pests and disease, and for this reason the County will support ongoing use of open burning where appropriate and in compliance with BAAQMD regulations.

Measure AG-2 Support the conversion of all stationary diesel or gas-powered irrigation pumps to electric pumps

The County will work with PG&E, MCE, or other utilities to provide incentives to convert stationary diesel or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar. Electric pumps are up to 2.5 times more efficient than diesel pumps. This measure will apply to all crop types and assumes that all pumps will be converted to electric by 2020 and that any new pumps associated with growth in agriculture will be electric.

Measure AG-3 Support use of electric or alternatively-fueled agricultural equipment

Farm equipment other than irrigation pumps accounted for 60 percent of agricultural emissions in 2014 and is anticipated to increase through 2050. Under this measure, the County will support the use of electric or alternatively-fueled equipment in place of gasoline or diesel equipment. The County will work with BAAQMD or the California Air Resources Board (CARB) to promote or provide financial or regulatory incentives to encourage the switch to electric or alternatively-fueled equipment. Currently-available electric equipment includes vineyard tractors, mulchers, and chainsaws; however, the range and types of such equipment will likely increase as low- or zero-emission technology advances in the future.

Co-Benefits (AG-2, AG-3, and AG-4)

- Improved Air Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure AG-4 Support the use of Tier 4 final diesel equipment for off-road agricultural equipment

The County will work with Napa Green and other entities to encourage vintners and other grower to use Tier 4 final diesel equipment[2]. Equipment manufacturers claim that Tier 4 final equipment may increase fuel efficiency by up to 5 percent from Tier 4 interim and Tier 3 level equipment (Caterpillar 2016, Empire Renewable Energy 2011).

Measure AG-5 Support reduced application of inorganic nitrogen fertilizer

The County will work with farmers to either reduce or replace the use of nitrogen-based fertilizers. Reductions can be achieved through better fertilizer management, and examples of recommended replacements include compost production from local waste management or manure from local ranches and dairies. This measure targets a fertilizer reduction rate of 5 percent by 2020, 10 percent by 2030, and 30 percent by 2050 from 2014 levels of inorganic nitrogen applied in the County. To track the progress of this measure, the County will work with the farming cooperatives or industry associations, such as the Napa Valley Grapegrowers or Napa Valley Vintners, to determine the amount of inorganic and organic nitrogen fertilizers applied per year. Measure AG-6 below will also contribute to achieving these reductions.

Co-Benefits (AG-5)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health

Measure AG-6 Encourage and support the use of carbon farming and other sustainable agricultural practices in the County

The County will work with the Napa County Resource Conservation District (RCD), farmers, and other stakeholders to encourage and support the use of carbon farming and other sustainable agricultural practices in the County. The County can encourage and promote, through partnerships and education and outreach, the use of best management practices (BMPs) in farming operations to reduce

Co-Benefits (AG-6)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Increased Public Awareness of Climate Change

[2] In 1994, EPA established tiered rulings for diesel equipment to meet certain emission standards to be phased in over a period of time. The most recent ruling was for Tier 4 equipment, signed in 2004, which would reduce emissions of particulate matter and nitrogen oxides by over 90 percent from Tier 1 equipment.

emissions and sequester carbon. These BMPs include, but are not limited to, low carbon farming, low impact farming including minimizing tractor passes, low- or no-till farming, cover cropping strategies, low nitrogen usage, low water usage, composting, and use of fuel efficient equipment.

The County will set a goal to engage 10 percent of Napa County's working lands in carbon farming by 2030. To support the increased use of carbon farming practices, the County could use Napa County RCD's Huichica Creek Sustainable Demonstration Vineyard Carbon Farm Plan and its implementation as a pilot project for potential replication. Additionally, the County could also work with Napa County RCD and farmers to identify regional, state, and federal incentive programs, along with other funding sources and financing.

Sustainable farming practices are also supported and encouraged under Multi-Sector Strategy measures outlined later in this chapter.

Source: County of Napa

3.3.5 Off-Road Vehicles and Equipment

Emissions from the off-road sector accounted for nine percent of the County's total emissions in 2014, and off-road emissions are anticipated to increase by about 17 percent by 2030 and 38 percent to 2050 from 2014 levels, proportional to the forecasted growth in population and jobs.

The CAP includes two measures that will reduce 2014 emissions from this sector by about 2 percent by 2030 and 17 percent by 2050. The proposed measures under this strategy are focused on improving equipment efficiency and the use of alternative fuels in marine vessels.

Off-road measures will reduce annual GHG emissions by:
- 2 percent by 2030, and
- 17 percent by 2050.

Table 3-7 summarizes the reductions from this strategy. Descriptions of the off-road measures follow Table 3-7.

Table 3-7 Summary of Off-Road Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
OR-1	Require Tier 4 equipment for all construction activity and mining operations as a condition for approval by 2030	0	354	386
OR-2	Increase the use of alternative fuels for recreational watercraft	1,687	7,512	22,629
TOTAL		1,687	7,867	23,014

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2016

Measure OR-1 Require Tier 4 equipment for all construction activity and mining operations as a condition for approval by 2030

The County will revise current building ordinances to require the use of Tier 4 final equipment as a condition of approval for all construction projects occurring in the county by 2030. Equipment manufacturers claim that Tier 4 final equipment may increase fuel efficiency by up to 5 percent from Tier 4 interim equipment. Because higher Tier equipment have more stringent standards, efficiency gains compared to lower Tier equipment may be greater.

Co-Benefits (OR-1)

- Improved Air Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure OR-2 Increase the use of alternative fuels in recreational watercraft

The County will encourage both visitors and residents to use alternative fuels in recreational boats and other recreational watercraft. The County will work with watercraft rental companies, marinas, and parks districts that operate on waterways within the County to explore ways to offset diesel or gasoline with biodiesel, ethanol, or other alternative fuels. This could include increasing the availability of alternative fuels at marinas or other fueling locations, and working with incorporated cities in the county that have jurisdiction over similar entities within city limits, as recreational watercraft docking within city limits may operate on waterways in the county.

Co-Benefits (OR-2)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Reduced Fossil Fuel Reliance

The biofuel performance targets for this measure (expressed as a percentage of total watercraft fuel consumption) are 5 percent by 2020, 20 percent by 2030, and 50 percent by 2050.

3.3.6 Water and Wastewater

Although water and wastewater-related GHG emissions only accounted for two percent of the County's emissions in 2014, water conservation is needed to address serious periodic drought issues affecting Napa County and the State, in general. As discussed further in Chapter 4, drought conditions could increase in frequency and severity because of climate change over the long term.

Water and wastewater-related measures included in this Plan will reduce both the strain on water supplies and GHG emissions from pumping and treatment activities. Although electricity emission factors will decrease over time due to current legislative actions, water and wastewater-related GHG emissions would still increase by 15 percent by 2030 and 27 percent by 2050 from 2014 levels. This is due primarily to the anticipated population growth in the county overshadowing the reductions due to greater renewable energy production. The State's water conservation plans, despite addressing the on-going drought, do not address reductions in non-urban water use by 2020 or future years.

Water and wastewater-related GHG emissions will increase over time because projected population growth overshadows anticipated reductions in emissions from renewable energy production.

The measures proposed under this strategy will reduce emissions primarily through water conservation in new and existing facilities. Most measures involve revising the County's current ordinances that relate to water conservation. Emissions reductions from these measures rely on successful coordination with and participation from Napa County residents and businesses.

All water and wastewater measures also serve as adaptation measures by preserving water quality and encouraging water conservation. For a complete list of adaptation measures related to water, see Chapter 4.

This strategy includes four measures, all of which are qualitatively addressed. These could not be quantified due to the uncertainty related to participation rates and the types of new facilities that will be constructed. Table 3-8 summarizes the measures included in this strategy. Each measure is described in further detail below.

Measure MS-2 under the Multi-Sector Strategy described later in this chapter also addresses reductions of wastewater emissions from wineries.

Table 3-8 Summary of Water and Wastewater Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
WA-1	Amend or revise water conservation regulations for landscape design to include residential landscaping, and consider cash-for grass rebates or other incentives to replace turf with drougt-tolerant landscaping	NA	NA	NA
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	NA	NA	NA
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	NA	NA	NA
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	NA	NA	NA
TOTAL		NA	NA	NA

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
Source: Ascent Environmental 2016

Note that Measure MS-2, under the multi-sector strategy, includes and quantifies emissions reductions in wastewater treatment activity at wineries. However, emissions reductions from that measure are not specifically attributed to the measures under the water and wastewater strategy. Nevertheless, emission reductions from MS-2 will reduce water and wastewater-related emissions by 36 percent in 2030 and 24 percent in 2050 from 2014 levels.

Measure WA-1 Amend or revise water conservation regulations for landscape design to include residential landscaping, and consider cash-for-grass rebates or other incentives to replace turf with drought-tolerant landscaping

The County will consider expanding its existing water conservation ordinance (Chapter 18.118) to include homeowner- provided landscaping projects. Section 18.118.020 exempts home-owner provided landscaping on a residential property. This measure will limit documentation requirements for homeowners. Other potential amendments can include minimum drought tolerant plant species and cash-for-grass turf rebates.

Co-Benefits (WA-1 and WA-2)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Reduced Fossil Fuel Reliance

Measure WA-2 Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering

The County will adopt a new water conservation ordinance for commercial and residential land uses that focuses on limiting on-site outdoor and indoor water use. Requirements include:

- limiting outdoor watering to 2 days per week and having written violations for the first offense and increasing fines for each offence thereafter, waiving a second offense fee after an offender attends a 2-hour water conservation seminar;
- staggering allowable watering days on an address-number basis (e.g., even address numbers can only water on Tuesday and Saturday);
- banning most lawn and landscape watering on consecutive days and irrigation within 48 hours of measurable rainfall, similar to the City of Napa's water conservation ordinance;
- banning outdoor car washing on certain days of the week; and
- providing educational material for residents and businesses on water conservation tips.

Measure WA-3 Expedite and/or reduce permit fees associated with water conservation installations in existing facilities

The County will expedite, reduce, or exempt permits and permit fees associated with water conservation installations in existing facilities. These installations can include graywater plumbing and large rainwater catchment systems.

Co-Benefits (WA-3)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Reduced Fossil Fuel Reliance

Measure WA-4 Require water audits for large new commercial or industrial projects and significant expansions of existing facilities

The County will require water audits for large new commercial or industrial projects and significant expansions of existing facilities to identify opportunities for water conservation. The County will establish a program to follow up with the water audits and explore water conservation that are appropriate to each facility.

Co-Benefits (WA-4)

- Improved Water Supply and Quality

3.3.7 Land Use Change

Source: County of Napa

Changes in land use can result in the reduction or loss of stored carbon and carbon sequestration potential. This occurs when trees and other vegetation on natural undeveloped lands (e.g., riparian woodland, grassland, coniferous forest, oak woodland, shrubland) are converted to agriculture (e.g., vineyards) or urban development. The net losses in carbon storage and sequestration are GHG emissions in the CAP, and emissions from this sector accounted for two percent of the County's total emissions in 2014.

The County anticipates that conversion of natural lands will increase in the future due to conversion of undeveloped lands to new or expanded vineyards or other crops, as well as increased residential and commercial development. The County's General Plan projected that over 8,000 acres of riparian woodland, oak woodland, coniferous forests, and other natural lands will be converted to vineyards between 2005 and 2030 (Hade, pers. comm., 2015). Due to these development forecasts, land use change-related emissions will increase by nearly 137 percent by 2030 and 180 percent by 2050 compared to the baseline annual losses in 2014. These emissions are based on the annual carbon sequestration lost from the cumulative reduction in natural lands since 2014 and the annual losses in stored carbon from year-to-year reductions in natural lands. Apart from the County's land use forecasts under its general plan, no legislative actions are currently assumed to address future changes in land use or emissions related to land use change.

Land use change will result in net GHG emissions over time due to the loss of stored carbon and sequestration potential. However, land use measures will help to reduce this net increase in annual GHG emissions by:

- 25 percent in 2030, and
- 88 percent in 2050.

The measures included in this Plan will reduce GHG emissions from the land use change sector by promoting conservation of existing natural lands, tree replanting efforts, and preserving stored carbon through repurposing removed wood. These measures will not show substantial reductions in the near term due to the slow growth rates of trees over time and the larger effect in emissions from sudden loss of natural land cover. However, the CAP measures will increase 2014 emissions from this sector by a lesser amount (25 percent) in 2030 and reduce 2014 emissions by 88 percent by 2050. Emissions reductions from these measures rely on successful administration of new programs, enforcement of County ordinances, and coordination with and participation from land use development in the County.

Measure LU-2 also serves as an adaptation measure by conserving natural habitats to prevent future flooding (see Chapter 4).

This strategy includes three measures, all of which are quantified. The first measure, LU-1, prioritizes preservation of existing trees on lands that will be converted to urban development or agricultural use. In addition, the measure targets planting 2,500 trees per year. Such efforts will have a compounding effect on the amount of carbon dioxide (CO_2) removed from the atmosphere resulting in a reduction of over 10,000 $MTCO_2e$ per year by 2050 from replanting alone.

Table 3-9 summarizes the annual GHG emissions reductions anticipated from measures affecting the land use change sector. Each measure is described below Table 3-9.

Table 3-9 Summary of Land Use Change Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	7,077	4,544	15,360
LU-2	Refine protection guidelines for existing riparian lands	660	660	660
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	10,839	3,453	4,731
TOTAL		18,576	8,657	20,751

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2016

Measure LU-1 Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting

The County will establish a mitigation program that prioritizes preservation of existing on-site trees for land use development projects, including vineyard conversions. Trees that cannot be preserved will be required to be replaced at a 2:1 ratio, consistent with General Plan Policy CON-24. This program will primarily focus on, but will not be limited to, oak and coniferous trees. The program will target a minimum preservation rate of 30 percent of existing on-site trees. For any tree replacements, the County will encourage project applicants to prioritize replanting on the project site followed by offering off-site planting opportunities.

Co-Benefits (LU-1)
- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health

Considering County resources, staffing, and physical space limitations on available lands, it is assumed that an average of 2,500 replacement trees will be planted per year beginning in 2017. This target could be achieved by a combination of existing or enhanced volunteer replanting efforts (e.g., 5,000 Oaks Initiative) and compliance with the County's 2:1 tree replacement policy.

The County will work with arborists and local conservation organizations (e.g., Napa Land Trust) to design and implement this mitigation program, along with other policies and programs that will protect or enhance the health of existing oak woodlands. Key coordination activities include determining ecologically-sound locations for tree plantings, or expanding the use of conservation easements or other efforts to protect existing oak woodlands.

Measure LU-2 Refine protection guidelines for existing riparian lands

The County will continue to enforce the County's Conservation Regulations (County Code, section 18.108.010 B.4) that protect riparian lands and prevents conversion of riparian lands to urban development, agricultural land use, or other land use types. If

Co-Benefits (LU-2)
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health

appropriate, the County will develop guidelines or refine existing regulations to ensure that no net losses of riparian lands will occur. The County will work with arborists and local organizations to implement policies or programs that enhance existing riparian lands, especially those deemed unhealthy or at risk.

Measure LU-3 Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests

Co-Benefits (LU-3)

- Improved Air Quality
- Improved Public Health

The County will develop a program to require repurposing of usable lumber from trees removed due to land use conversion and burying or chipping of non-usable lumber. Repurposed wood may be used in construction or sold to local woodworking businesses or collectives with proceeds funding the administration of this measure. A minimum of 80 percent of the total removed weight of trees shall be repurposed, buried, chipped, or otherwise prevented from burning.

Land use forecasts and associated GHG emissions forecasts from vegetation losses conservatively assume that all vegetation removed due to land conversions will be burned, releasing all stored carbon as CO_2 into the atmosphere. The goal of this program is to prevent burning of removed biomass, thus avoiding future CO_2 emissions.

3.3.8 Multi-Sector Strategy

Source: County of Napa.

In addition to identifying reduction opportunities associated with individual measures in the affected sectors, a multi-sector GHG reduction strategy looks at implementing program and policies that will reduce GHG emissions across sectors. This strategy includes four measures, one of which was quantified. These measures address the overall function of activity in the County and establish a carbon offset program. One of the measures targets Napa Green certification of 100 percent of eligible wineries, vineyards, and eligible businesses in the county by 2030. This measure will reduce approximately 5,743 $MTCO_2e$ per year by 2030 and 5,737 $MTCO_2e$ per year by 2050.

Table 3-10 summarizes the annual reductions anticipated from measures affecting the all sectors. Each measure is described below Table 3-10.

Table 3-10 Summary of Multi-Sector Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
MS-1	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	NA	NA	NA
MS-2	Support efforts to increase Napa Green Certified wineries and vineyards in the County, with a goal of 100 percent certified by 2030.	1,783	5,743	5,737
MS-3	Promote the sale of locally grown foods and/or products	NA	NA	NA
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	NA	NA	NA
TOTAL		1,783	5,743	5,737

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
Source: Ascent Environmental 2016

Measure MS-1 Work with other local jurisdictions within the County to develop a unified Climate Action Plan

Reducing GHG emissions in the entire County will require the efforts of all local jurisdictions in the County. The measures in the CAP are primarily focused on the unincorporated county. Under this measure, the County will coordinate with the incorporated cities in the County to pursue development of a unified, countywide climate action policy framework. This could result in a countywide CAP that applies to both the County and incorporated cities, or similar efforts to encourage incorporated communities to adopt their own CAPs consistent with the County's CAP.

A comprehensive, unified CAP will improve the effectiveness of intraregional GHG reduction efforts, such as providing affordable housing in city centers and offering regional transit or rideshare solutions to wineries, vineyards, and other employment centers throughout the county.

Co-Benefits (MS-1 and MS-2)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure MS-2 Support efforts to increase Napa Green Certified wineries and vineyards in the County, with a goal of achieving 100 percent certified by 2030

The Napa Green certification program aims to reduce solid waste generation, water use, and wastewater generation, promoting sustainable agricultural practices. Green practices at vineyards include using electrified or alternatively-fueled agricultural equipment, converting diesel-powered irrigation pumps to electric, night-shift harvesting, and using biochar as soil amendments.

The County will support efforts to increase the number of Napa Green Certified wineries and vineyards in the County by including designated facilities as a favorable factor in its locational criteria when considering applications for new or expanded facilities. The County will also work with Napa Green to incentivize the replacement of CH_4-emitting open air wastewater treatment ponds in certified wineries and vineyards with low-emissions treatment systems. These actions depend on the ongoing support of the Napa Valley Vintners and increased staffing in the County to support the certification program.

The County will also consider highlighting Napa Green Certified wineries on appropriate websites (e.g., visitnapavalley.com). Currently, approximately 56 wineries in Napa are Napa Green Certified, representing approximately 40 percent of current annual wine production by volume in the County. This measure targets a participation rate of 60 percent by 2020 and 100 percent by 2030, as a function of annual production by volume.

Measure MS-3 Promote the sale and consumption of locally-grown foods and/or products

Co-Benefits (MS-3)
- Improved Air Quality
- Improved Water Supply and Quality
- Improved Public Health

Developing and supporting a market for locally-grown foods or other consumer products helps to decrease transportation emissions from delivery, promotes local sustainable growing practices, and contributes to a stronger local economy. Under this measure, the County will promote the sale and use of locally grown food and/or products in the County. The County will work with local grocery stores, farmer's markets, and restaurants to identify opportunities to reduce the supply of imported foods and to encourage local farmers to grow foods that are typically imported. Imported crops are typically off-season crops or tropical fruits for which there is little or no domestic production. The County will encourage farmers to use greenhouses or other methods to supply off-season crops during the winter.

While primarily focused on food, this measure could also be expanded to other products. For example, locally-sourced wood products developed because of Measure LU-3 implementation will help to reduce demand for wood products from more distant locations.

Measure MS-4 Establish a local carbon offset program in partnership with Sustainable Napa County

Co-Benefits (MS-4)
- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health Reduced Fossil Fuel Reliance

In coordination with Sustainable Napa County, the County will establish a local carbon offset program that allows events, persons, businesses, or institutions in Napa County to purchase credits to offset GHG emissions they generate. The funds from the sale of carbon offsets will be used to construct, develop, or operate projects that provide short or long term GHG reductions, depending on the emissions being offset. This program could be used to help implement other measures in this CAP, such as retrofitting existing buildings under measures BE-1, BE-2, BE-3, or BE-8; or, converting agricultural equipment to alternative fuels under measures AG-2 or AG-3.

3.3.9 High GWP Gases

High-GWP gases accounted for 13,481 $MTCO_2e$, or approximately three percent of total emissions in 2014. High GWP gas emissions are generated as the result of the use or leakage of refrigerants, electrical insulators in transmission lines, fumigants, and other materials. Emissions in this sector includes various types of F-gas emissions such as hydrofluorocarbons (HFC), perfluorocarbons (PFCs) and sulfur hexafluroside (SF_6), which are also classified as SLCPs.

State and Federal regulations are reducing High-GWP gases as the result of regulations. The County will take action to complement legislative actions already in place. This strategy includes two measures that aim to reduce the use of high-GWP refrigerant systems.

Table 3-11 summarizes measures from this strategy, with descriptions following the table.

Table 3-11 Summary of High GWP Gases Measure

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	NA	NA	NA
HG-2	Incentivize the use of low-GWP refrigerants	NA	NA	NA
TOTAL		NA	NA	NA

Notes:
CARB = California Air Resources Board
GWP = global warming potential
GHG = greenhouse gas emissions
HVAC = heating, ventilation, and air conditioning
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
RMP = Refrigerant Management Program
Source: Ascent Environmental 2016

Measure HG-1 Encourage registration of facilities in CARB's Refrigerant Management Program and incentivize installation of low-GWP refrigerant systems

CARB's Refrigerant Management Program (RMP) requires facilities with refrigeration systems using over 50 pounds of high GWP refrigerant to register with the program. To reduce emissions of these refrigerants, facilities registered in the program are required to enact several BMPs including conducting periodic leak checks and detecting leaks in a timely manner. The County will encourage

Co-Benefits (HG-1)
- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health

registration into the program and explore ways to financially incentivize the future installation of low-GWP refrigerant systems.

Co-Benefits (HG-2)

- Improved Air Quality
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health

Measure HG-2 Incentivize the use of low-GWP refrigerants

The County will consider incentivizing the use of low-GWP refrigerants in refrigeration systems or HVAC systems by expediting the permitting process or reducing permitting for new or replacement projects. The County could also pair funds with other funding sources and financing mechanisms to increase installation rates.

Because of adoption and enforcement of CALGreen Tier 1 standards under Measures BE-3 and BE-4, eligible HVAC and refrigeration equipment would not be permitted to contain hydrochlorofluorocarbons (HCFCs). Installation of HVAC systems could comply with either of the following: install HVAC and refrigeration that do not contain hydrofluorocarbons (HFCs) or do not contain HFCs with a GWP greater than 150; or install HVAC and refrigeration equipment that limit the use of HFC refrigerant through the use of a secondary heat transfer fluid with a GWP no greater than one.

Napa County Climate Action Plan

A Tradition of Stewardship
A Commitment to Service

Chapter 4

Climate Change Vulnerability and Adaptation

https://upload.wikimedia.org/wikipedia/commons/8/89/Fall_in_Napa_Valley.jpg
By Brocken Inaglory (Own work) [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or GFDL (http://www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons

4.1 Introduction

Climate change is a global phenomenon that over the long term will have a wide variety of impacts on human health and safety, economic continuity, water supply, ecosystem function, and the provision of basic services (California Natural Resources Agency [CNRA] 2012a:3). Locally, climate change is already affecting and will continue to affect the physical environment throughout California, the Bay Area, and Napa County. Because impacts of climate change vary by location and other social and economic characteristics, it is important to identify the projected severity these impacts could have in Napa County.

The California Adaptation Planning Guide (APG) provides climate adaptation planning guidance to cities, counties, and local governments. The APG, developed by the California Office of Emergency Services and CNRA, introduces the basis for climate change adaptation planning, including a nine-step process that details ways communities can reduce climate-related risks and impacts and prepare for climate change.

The nine steps in the adaptation planning process are outlined below in Figure 4-1. The first five steps of the process represent the vulnerability assessment phase, which is a method for determining the potential impacts of climate change on community assets and populations. The severity of these impacts and the community's ability to respond determine how these impacts affect a community's health, economy, ecosystems, and socio-cultural stability. Section 4.2 of this chapter summarizes the results of the vulnerability assessment prepared for the County of Napa (County). The entire vulnerability assessment can be found in Appendix C.

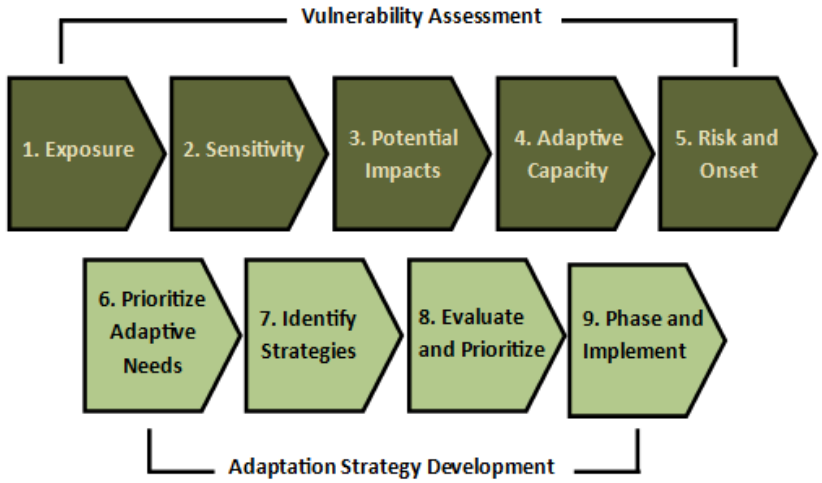

Figure 4-1: The Nine Steps in the Adaptation Planning Process

The second phase of the process is adaptation strategy development, in which effective climate adaptation strategies and measures are identified and prioritized that apply to County assets, systems or populations that may be vulnerable to climate change. These strategies and measures will help increase the County's ability to prepare for, respond to, and adapt to climate change. Climate adaptation strategies and measures for the County are included in Section 4.3 of this chapter.

4.2 Summary of Climate Change Effects and Vulnerability Assessment

This section summarizes the results of the vulnerability assessment prepared for the County, which includes identification of localized climate change exposure and related effects, an assessment of areas of vulnerability, a review of the County's current capacity to adapt to climate-related impacts, and consideration of how likely and how quickly impacts will occur. The completed vulnerability assessment, which follows the first five steps of APG's adaptation planning development, can be found in Appendix C.

4.2.1 Climate Change Effects

Where possible, climate change effects in the County are characterized for two periods of time: midcentury (around 2050) and the end of the century (around 2100). Historical data is used to identify the degree of change by these two future periods in time.

The first step in assessing vulnerability is to identify what climate change effects the County will experience in the future. To begin assessing climate change impacts over time, Cal-Adapt, a climate change scenario planning tool was used. Cal-Adapt downscales global climate simulation model data to local and regional resolution under both high and low global GHG emissions scenarios. Results from both emissions scenarios are considered in this summary and distinguished where possible.

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

Increased Temperatures

Annual average temperatures are projected to increase between 3.3 º F and 5.7 º F by the end of the century.

Annual temperatures in the County are projected to climb steadily. The County's historical average temperature, based on data from 1960-1990, is 58.3 degrees Fahrenheit (˚F). Under the low-emissions scenario, annual average temperature is projected to increase to 61.6 ˚F by 2090, an increase of 3.3 ˚F. The annual average temperature under the high-emissions scenario is projected to increase 5.7 ˚F to 64.0 ˚F by the end of the century.

The County's average annual low temperature, based on historical data from 1960-1990, is 44.4 ˚F. Under the low-emissions scenario, annual low temperature is projected to increase to 48.6 ˚F by 2090, an increase of approximately 4.2 ˚F. The annual average low temperature under the high-emissions scenario is projected to increase to 50.7 ˚F in 2090 (i.e., an increase of approximately 6.3 ˚F). Historically, annual high temperatures average 70.5 ˚F. Annual average high temperatures are projected to increase under the low-emissions scenario by approximately 2.9 ˚F to 73.4 ˚F. Under the high-emissions scenario, annual average high temperature is projected to increase to 76.4 ˚F, an increase of approximately 5.9 ˚F.

Source: County of Napa

Increased Frequency of Extreme Heat Events and Heat Waves

In Napa County, an "extreme heat day" is defined as a day with a high temperature of at least 92 ˚F (Cal Adapt 2016). Historically, the County has experienced an average of four extreme heat days a year. Because of climate change, the number of extreme heat days is projected to increase substantially by 2099. The projected annual average number of extreme heat days is expected to increase approximately 23-26 days per year in 2050, and 54-64 days per year towards the end of the 21st century.

Heat waves, which can be defined as five or more consecutive extreme heat days, have been historically infrequent in the County, with no more than two heat waves occurring in a year. However, with climate change, a significant rise in the frequency in heat waves is projected under both emissions scenarios. Under the low emissions scenario, projections show an increase of heat wave events with around three per year at the middle of the century and up to seven per year in 2090. The high emissions scenario also shows an increase in annual heat wave events, with up to five heat wave events occurring annual by midcentury and as high as 16 heat wave events occurring annually by the end of the century. Along with an increased frequency of heat events, heat waves are also projected to occur both earlier and later in the season, which historically started in late May/early June and ended in mid-September.

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

Changes to Precipitation Patterns

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

Reduced precipitation could lead to higher risks of drought, while increased precipitation could cause flooding and soil erosion (CNRA 2014: 25).

While the County is not located in an area where snow typically accumulates, major water districts and utilities in the County receive a significant amount of water from the State Water Project, which depends on spring and early-summer snowmelt in the Sierra Nevada

for water supply. Additionally, agricultural water users in the unincorporated areas of the County are the primary user of groundwater (Napa County 2005:2). Increased average temperatures and changes in the timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies, and thus the County could face increasing challenges of providing adequate water supplies due to increased uncertainty in the amount and timing of water availability to meet future demand. If demand exceeds supply, water users could face shortages in normal or dry years.

Increased Wildfire Risk

Recent mitigation efforts, including adoption of the 2010 Uniform Fire Code, the Firewise Program, and the Chipping Program, have helped reduce Napa County's wildfire risk, but it is still quite vulnerable and at high-risk for wildfires (Napa County 2013: 77).

According to Napa County's Operational Area Hazard Mitigation Plan, the County has a history of wildfires, with more than 200,000 acres of the County's 482,000 acres burned in the last thirty years, most of which have occurred in the unincorporated areas (Napa County 2013: 12). Currently, the major wildland fire hazard risks for residential development are in the County's hilly areas characterized by steep slopes, poor fire suppression delivery access, inadequate water supply and highly-flammable vegetation (Napa County 2013: 75).

Increased temperatures and changes in precipitation patterns associated with climate change are expected to increase the risk of wildfire in the County. Under the low-emissions scenario, fire risk is 11 percent more likely to occur in 2020, compared with a baseline year of 2010, 15 percent more likely to occur in 2050, and 12 percent more likely to occur in 2085. Under the high-emissions scenario, fire risk is 14 percent more likely to occur in 2020, compared to the 2010 baseline year, 13 percent more likely in 2050, and 22 percent more likely to occur in 2085. Given that the County is currently at risk for wildfire, these increases of between 10 and 20 percent under both emissions scenarios is significant and could result in additional threats and increased vulnerability.

Increased Likelihood of Flooding

Climate change is likely to lead to changes in the frequency, intensity, and duration of extreme events, such as sustained periods of heavy precipitation and increased rainfall intensity during precipitation events. These projected changes could lead to increased flood magnitude and frequency (IPCC 2001: 14).

The County is dry during the late spring, summer, and early fall and receives most of its rain during the winter months (Napa County 2013:11).

According to Napa County's Operational Area Hazard Mitigation Plan, the County is already considerably vulnerable to flooding. Flooding has caused the most disaster declarations and the most damage and loss of life historically in the County, with floods usually occurring during the season of highest precipitation or during heavy rainfall after prolonged dry periods (Napa County 2013:11). Almost all of the land adjacent to the Napa River is subject to flooding that has a one percent probability of occurring in any given year, or a 100-year flood event (Napa County 2013:58). While it is uncertain exactly how and to what extent climate change will affect flooding events in the County, it

is reasonable to assume that any increase in flooding could have serious ramifications as the area is already considerably vulnerable. Additional information on increased risk of flooding, which could be exacerbated by sea-level rise in the southern portion of the County, is included below.

Sea-Level Rise

Another outcome of global climate change is sea-level rise. The southwestern portion of the County includes the mouth of the Napa River, which forms a tidal estuary that drains into San Pablo Bay. Less than one percent of the County's population is considered at risk and vulnerable to sea-level rise (CEC 2012:14 and U.S. Census 2014). Some critical infrastructure (i.e., roads, hospitals, schools, emergency facilities, and properties) are at increased risk of coastal flooding in the County. For example, the American Canyon Power Plant and the Napa Sanitation District Water Treatment Plant could become vulnerable to a 100-year flood event with 1.4 meters (m) of sea-level rise (CEC 2012:23).

Currently 140,000 people, or 2 percent of the Bay Area's population, live in areas currently at risk of being inundated in a 100-year flood event. A 1.4 m rise in sea level will put an additional 130,000 people at risk, increasing the total number of people at risk to 270,000 (CEC 2012).

Because several physical structures (i.e., levees) are currently in place to protect against a 100-year flood event, approximately 36 acres in the County are currently at risk for flooding. Taking a 1.5 m rise in sea level into account, along with other storm factors, it is projected that an additional 13,000 acres could be inundated by a 100-year flood event. The majority of area that is at risk is currently undeveloped or used for agricultural purposes. Specific areas along the Napa River that could become vulnerable include Buchli, Cuttings Wharf, Thompson, and Imola, along with areas further north along the Napa River, including some industrial uses, wineries, and parts of Downtown Napa (i.e., up to 3rd Street and portions east of State-Route 29). The Milton Road/Edgerly Island area could be lost in its entirety if the privately-owned levy system were to fail. Additional portions of Thompson, Middleton, and American Canyon also have some flood-prone low lying areas that would become more vulnerable to flooding due to sea-level rise. While the Napa County Airport itself is not at immediate risk for inundation from coastal flooding due to 1.5 m of sea-level rise, adjacent areas to the west are at increased risk of flooding due to sea-level rise.

4.2.2 Vulnerability

This section summarizes the main areas of vulnerability, in terms of structures, functions, and population to climate change exposures and impacts in the County. Vulnerability to climate change also considers the County's adaptive capacity, or the ability to currently address climate change exposures, along with how likely and how quickly impacts will occur. More detailed discussion of climate-related vulnerabilities, as they relate to the climate change exposures, can be found in Appendix C.

Agriculture and Wine Industries

The County's wine industry accounts for $10.1 billion of $51.8 billion in economic impact from winemaking and related industries in California (Mayton 2015).

Climate change could significantly impact the agricultural and wine industries, which are large drivers of the County's economy. Specifically, the wine industry in Napa, which produces an average of 4 percent of California's wine grape harvest, currently has 475 wineries, producing more than 49.7 million cases of wines totaling over $4.5 billion dollars in sales (Napa Valley Vintners 2017 and Napa County 2013: 28).

Increases in temperature and changes in precipitation and soil moisture could impact the growing of wine grapes by causing late or irregular blooming and affecting yields (Lee et al. 2013:1).

Source: County of Napa

The increased likelihood of extreme floods could also lead to the destruction of crops, erosion of topsoil, and deposits of debris and sediment on crop lands. Conversely, as average temperatures increase with climate change, agricultural demand for water could intensify under extreme heat conditions, under which water evaporates faster and plants need more water to move through their circulatory systems to stay cool (CNRA 2014:21). More specifically, attempts to maintain wine grape productivity and quality in the face of warming may be associated with increased water use for irrigation, a change to different varietals of grapes, and to cool grapes through misting or sprinkling (Lee et al. 2013). As noted earlier, increased average temperatures and changes in timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies in the future, which could in turn affect water supplies for agricultural uses.

The wine industry and thousands of acres of vines could also be affected by wildfire. For vineyards that are near fire-prone areas, smoke from wildfire could potentially cause problems, particularly for red grapes, where the grape skin is still used in the winemaking process. Studies have shown that wildfire smoke can potentially infuse with the grape skin and create abnormal flavors (Mayton 2015a). Furthermore, wildfires could threaten vineyards, particularly at the start of harvest season. Oftentimes when wildfires occur, evacuation orders are established by Cal Fire, which could leave certain vineyards inaccessible for a period of time. Without access, grapes could remain on the vine too long and over ripen, leaving them unsuitable for winemaking (Mayton 2015b).

Sensitive Populations

With approximately 17 percent of the County's population over the age of 65 and 33 percent of Hispanic or Latino origin, projected climate change exposures have the potential to leave sensitive populations in the County especially vulnerable to increased risk (Census 2014).

Higher frequency of extreme heat conditions can cause serious public health impacts, increasing the risk of conditions directly related to heat such as heat stroke and dehydration (CNRA 2012a: 3). Older adults, particularly seniors, are more likely to experience respiratory and/or cardiovascular health complications than younger individuals. Approximately 24,000 of the County's population are elderly, which are more likely to live alone with limited mobility, all of which can exacerbate health risks associated with extreme heat (Census 2014).

The County has a large Hispanic population, many of which are low-income agricultural workers that speak primarily Spanish. The majority of the County's large agricultural job base is of Hispanic origin. Heat stress can seriously affect those working outside, by reducing overall productivity and in extreme exposures could lead to illness, disability, or death (CNRA 2014:24). Wildfire could also negatively impact those who pick the grapes, due to the potential degradation of transportation infrastructure. Because a large number of agricultural workers cannot afford to live in the County (due to high housing costs and the lack of affordable housing), their access and mobility could be impaired.

The Hispanic population has increased from 23.7 percent in 2000 to 33.7 percent in 2014 (Census 2014).

As sea levels rise, the area and the number of people at risk due to flooding will also rise. Factors that increase vulnerability to the adverse impacts of flood events associated with sea-level rise include access to preparedness information, transportation, healthcare, and insurance. Key demographics associated with these vulnerabilities include income, race, linguistic isolation (i.e., non-English speaking), and residential tenure (CEC 2012:8). Language ability is an important factor in assessing vulnerability as emergency response crews may be unable to communicate with non-English speakers (CEC 2012: 9). The portion of the County's Hispanic population that is low-income and that speak primarily Spanish are especially vulnerable and would be impacted by a flood event associated with sea-level rise.

Renters are also more vulnerable, as they are less likely to reinforce buildings and buy insurance because the decision to make major home improvements typically lies with the property owner. Additionally, disaster recovery services have often targeted homeowners, to the disadvantage of renters (CEC 2012:9).

Wildfire Threat is Likely to Increase

The County is already considered to be an area that is at high-risk for wildfires, which is only expected to increase by the end of the century (Napa County 2013:77). This increase could cause additional threats to the County and has the potential to affect emergency services, roads, water supplies to residents, housing access, and quality of life.

Source: County of Napa

A changing climate is expected to subject forests to increased stress due to drought, disease, invasive species, and insect pests. These stressors are likely to make forests more vulnerable to catastrophic

fire (Westerling 2008:231). While periodic fires are natural processes and carry out an important ecological function, catastrophic fire events that cannot be contained or managed can cause serious threats to homes and infrastructure, especially for properties located at the wildland-urban interface (i.e., where residential development mingles with wildland areas) (California Dept. of Forestry and Fire Protection 2009). Ecological functions are further impacted as the risk of fire increases. When it does rain in burned areas, more soil washes off the hills and into roads, ditches, and streams.

Source: County of Napa

Flooding and Sea-Level Rise Could Make New Areas in the County Vulnerable

The County as a whole is not very vulnerable to sea-level rise, with less than one percent of the County's total population considered at risk (CEC 2012:14 and Census 2014). Considering a 100-year flood event, a 1.5 m rise in sea-level and other hydrodynamical factors, most of the land at increased risk for flooding is undeveloped. A small portion of critical infrastructure, such as roads, railways, hospitals, emergency facilities, and properties in the southwestern portion of the County and in areas along the Napa River, including parts of Downtown Napa, could become vulnerable. American Canyon Power Plant and the Napa Sanitation District Water Treatment Plant could also become vulnerable (CEC 2012:23).

Current Actions and Adaptive Capacity

The County has already begun to address many of the challenges associated with climate change through existing local policies, plans, programs, resources, and institutions.

On a planning level, the County addresses current and future impacts related to existing natural hazards, as evidenced by the creation of the County's Operational Area Hazard Mitigation Plan in 2013, which identifies current hazard risks and mitigation strategies for flooding, earthquakes, and fires. Furthermore, the County's 2008 General Plan includes policies aimed at reducing local contributions to global climate change and encourages sustainable building practices, efficient use of resources (i.e., water, land, and energy), sustainable vineyard practices, and ecological stewardship. It also covers vulnerable populations, including policies aimed at achieving more equitable outcomes for the growing low-income populations in the County, as well as its aging population that require better access to public services and housing.

The County is already addressing climate change through existing policies, plans, and programs. Based on current efforts, the CAP assesses the County's adaptive capacity, or its ability to adapt and respond to projected changes.

In addition to planning efforts, the County has embarked on a number of climate adaptation-related efforts, which are summarized below. The County's adaptive capacity, or the ability to adapt and reduce vulnerability to climate change, is also assessed. Adaptive capacity can be rated high, medium, or low. High adaptive capacity indicates that sufficient measures are already in place to address projected

changes, while a low rating indicates a community is unprepared (CNRA 2012:26).

Efforts Related to Increased Temperature and Extreme Heat Frequency

The Napa County Health and Human Services Agency, Public Health Division, maintains an Excessive Heat Emergency Response Plan, which is designed to address current and projected changes in increased temperature, including extreme heat events and heat waves (Napa County 2009). The plan clearly outlines procedures and steps the County can take, including which other agencies to enlist for support, to effectively help the community in the event of excessive heat emergencies. While the plan can account for projected increases in temperature, it is reactive in nature and does not include potential solutions that could be put in place before extreme heat events occur. Therefore, the adaptive capacity ranking for increased temperature is considered medium.

Source: County of Napa

Efforts Related to Water Supply and Precipitation Patterns

The County has several water conservation programs, including rebates for appliances and free-water saving devices for residents, that are helping to combat drought and other water supply issues, but the County is still currently vulnerable to water supply issues due to drought and other factors. The County will face challenges in providing sufficient water supplies in the future due to climate change effects, coupled with an increasing population (i.e., mostly in the incorporated areas) and increasing water demand. While the County has already taken steps towards achieving long-term groundwater sustainability, there is still a possibility that water supply availability may change in the future and will need to be further addressed. Therefore, the adaptive capacity ranking for changes to precipitation patterns and water supply is medium.

The County has water conservation regulations for landscape design, with the intent to conserve water through promotion of the most efficient use of water in landscape design, while respecting the economic, environmental, aesthetic, and lifestyle choices of individuals and property owners (Napa County Municipal Code Title 18, Chapter 18.118).

Efforts Related to Flooding

While levees and structures have been built to protect the County from a 100-year flood event, and the Napa River Flood Control Project will provide a higher level of flood protection, the County is currently not prepared to address effects associated with future sea-level rise and other hydrodynamic factors that would increase the risk of flood0ing. Climate change is projected to expose 13,000 additional acres to 100-year flood risk. While a majority of these areas are undeveloped, some developed areas are at risk and should be accounted for in future plans. Therefore, the adaptive capacity for risks associated with flooding is considered medium.

The Napa River Flood Control Project will restore more than 900 acres of high-value tidal wetlands of the San Francisco Bay Estuary while protecting 2,700 homes, 350 businesses, and over 50 public properties from 100-year flood levels, a savings of $26 million annually in flood damage costs (Napa County 2016).

Efforts Related to Wildfire Prevention

The County is an area that is currently at high-risk for wildfires. Currently, the County has several programs to help prevent wildfires. The County participates in the National Fire Protection Association's (NFPA) Firewise Communities Program and also has several Fire Safe Councils that are active in minimizing the potential for wildfire damage. The County is also only one of four Counties to have road standards that meet the Board of Forestry's stringent requirements. While programs and policies in place show a current capacity to address risks, the County is still vulnerable. Climate change is projected to increase this current risk by anywhere from 10 to 20 percent and the County will need to continue to adapt to this projected increase. Therefore, the adaptive capacity for risks associated with wildfire is considered medium.

Other Climate-Adaptation Related Efforts

The County enforces the Green Building Standards Code to establish and encourage sustainable building construction practices having a positive environmental impact (Napa County Municipal Code Title 15, Chapter 15.14).

The County has practices and organizations in place that help address future issues of sustainability and climate adaptation. With organizations, such as Sustainable Napa County, that educate the public and foster collaboration for longer term environmental sustainability, the County through partnerships is finding ways to change behaviors and practices now. The County also supports the Napa Green Certification program, which aims to reduce solid waste generation, water use, and wastewater generation, promoting sustainable agricultural practices. Furthermore, by adopting the Green Building Standards Code, the County is setting a precedent for reduced energy use, building with more sustainable materials, and employing better water conservation tactics. The County also recently joined MCE, which allows users to purchase more renewable energy options. These efforts, however, would need to be expanded and applied on a much larger scale throughout the County to address future changes attributed to climate change. Therefore, the adaptive capacity for other climate-adaptation related efforts is medium.

Risk and Onset

The timeframe in which the impact is most likely to occur are defined as follows:

- Near-term: 2020-2040
- Mid-term: 2040-2070
- Long-term: 2070-2100

The County is committed to continuing efforts to address and reduce existing climate-related risks and future impacts on a program level. With several ordinances and programs that cover a range of climate exposures and related impacts, the County is well equipped to handle current issues of extreme heat events and water supply issues, but could still likely face increasing challenges as projected changes occur.

In terms of how likely and quickly impacts will occur, temperature related impacts are the most likely near-term climate change exposure facing the County and should be addressed and prioritized in future adaptation planning efforts. While sea-level rise has a high certainty rating and is already occurring, its onset is not expected to occur until closer to the end of the century in terms of changes in areas already vulnerable to flooding or causing permanent inundation in tidally-influenced areas of the County. Addressing increases in

flooding and wildfire risk have mid-term onsets and should be prioritized accordingly.

4.3 Adaptation Strategies and Measures

This section defines the strategies and measures that the County will pursue to further its climate adaptation efforts. These strategies build upon current efforts to be more sustainable, adaptive, and progressive. The County's 2008 General Plan contains several policies aimed at achieving sustainable development, reducing vehicle emissions, using resources more efficiently, and improving vineyard practices. The strategies and measures within this section define the specific steps necessary to prepare for the future effects of a changing climate. Other County plans, programs, efforts, and policies support this vision and contribute to addressing climate change issues.

See Section 4.2 Current Actions and Next Steps for more details regarding current County efforts to address climate change.

Adaptation measures are grouped into five strategies. These strategies address the climate change impacts and vulnerabilities identified in the vulnerability assessment (i.e., temperature, wildfire, precipitation, flooding, and sea-level rise). Within each strategy are a series of measures that define the programs, policies and regulations the County will implement to remain responsive to the challenges created by climate change. Consideration for how likely and how soon impacts are expected to occur are included, with specific attention given to those exposures that pose the most serious and near-term threats to the County. This includes identifying responsible County departments and an implementation timeframe for each measure. More detailed discussion on implementation and monitoring of the CAP can be found in Chapter 5. Strategies also have the potential to provide other important benefits to the community, or co-benefits. These benefits are identified within each strategy, where applicable. And finally, GHG reduction measures previously identified in Chapter 3 that also contribute to adaptation are discussed, where appropriate.

Strategies identify the primary ways to adapt to climate change impacts. Measures identify specific steps that the County will take to implement strategies.

Below are the five strategies included in this section:

- Prepare for Increases in Average Temperatures and Extreme Heat Events,
- Prepare for Increased Risk of Wildfire,
- Prepare for Variable Water Supplies and Preserve Water Quality,
- Prepare for Increased Likelihood of Flooding, and
- Prepare for Sea-Level Rise.

The five adaptation strategies address the climate change impacts and vulnerabilities identified in Section 4.2:

- temperature,
- wildfire,
- precipitation,
- flooding, and
- sea-level rise.

Source: County of Napa

All GHG Building Energy measures serve as adaptation measures by reducing overall energy demand. For a complete list of measures related to building energy, see Chapter 3.

4.3.1 Prepare for Increases in Average Temperatures and Extreme Heat Events

Temperature-related impacts because of climate change are likely to affect the County in several ways. Increased average temperatures, along with more frequent extreme heat events, are likely to exacerbate already high temperatures, in what are known in developed areas as urban heat islands. Built-up areas, which tend to have a prominence of asphalt and less vegetation, create, intensify and retain heat. To help curb the effects of urban heat islands in developed areas, the County will incorporate "green" infrastructure into new development and developing areas. Examples of green infrastructure include planting trees, climate-appropriate landscaping, rain gardens, and rooftop gardens. The County will also incorporate cool pavement and rooftop technology in new and existing developments, while also including more shade trees in parking lots.

With increased average temperatures and more frequent extreme heat events, energy demand is likely to increase. A number of GHG-reduction measures (see Chapter 3) also serve as climate adaptation measures. For example, improving energy efficiency and reducing energy demand in buildings today will help to mitigate future increases in energy demand as average temperatures rise and more extreme heat events occur. GHG-reduction measures include working on increasing energy efficiency in new and existing buildings, by incentivizing energy efficiency improvements (GHG Measures BE-1 and BE-7), requiring compliance with CALGreen Tier 1 Standards (GHG Measures BE-3 and BE-4), and increasing participation in MCE's Deep Green option for renewable energy (GHG Measures BE-5 and BE-9).

Understanding that health-related risks increase along with average temperatures, the County will continue to work with other departments to ensure that the proper outreach programs and plans are in place to deal with heat-related illnesses and that the agricultural sector is equipped to withstand a changing climate.

Measures related to temperature are described below and summarized in Table 4-1 below.

Measure Temp-1 Map Critical Infrastructure Locations Vulnerable to Extreme Heat Events

Map locations of communication, energy, service, and transportation infrastructure that are vulnerable to extreme heat events.

Measure Temp-2 Develop Outreach Programs for Outdoor Workers

Work with labor organizations, the agriculture and wine community, and County and State health and safety agencies to publicize

programs and standards for preventing heat-related illness in employees who work outdoors.

Measure Temp-3 Educate Residents on Heat-Related Illness Prevention

Develop education outreach materials to publicize methods for preventing heat-related illness during heat waves.

Measure Temp-4 Encourage the installation of Cool Roof Technologies and Rooftop Gardens

Encourage and explore ways to incentivize the installation of cool roof technologies and, where appropriate, rooftop gardens in residences and commercial buildings.

Co-Benefits:

- Lowered Energy Demand
- Lowered Energy Bills
- Lowered Building and Operating Costs
- Reduced Fossil Fuel Reliance
- Improved Air Quality
- Improved Public Health
- Improved Quality of Life
- Increased Public Awareness of Climate Change

Measure Temp-5 Incorporation of Cool Pavement Technology

Explore options to incorporate cool pavement technology into both the regular maintenance of existing and construction of new roads, sidewalks, parking areas, and bike lanes.

Measure Temp-6 Improve Parking Lot Shading and Landscaping

Explore options to improve parking lot shading requirements in new construction and to promote planting of additional trees and landscaping in existing parking lots.

Measure Temp-7 Update the County's Excessive Heat Emergency Response Plan

Coordinate with the Napa County Health and Human Services Agency, Public Health Division, to maintain and update the County's Excessive Heat Emergency Response Plan to better prepare for increased extreme heat days and more frequent and intense heat waves.

Measure Temp-8 Support and Monitor Research on the Effects of a Warmer Climate on the Agriculture and Wine Industries

Support and monitor ongoing research on the potential effects of a warmer climate on the agriculture and wine industry by existing organizations and groups, including but not limited to, Napa Valley Vintners and the California Climate and Agriculture Network.

Measure Temp-9 Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Temperatures

Work with grape growers to understand the tolerance of current wine grape crop mixes to withstand increased temperatures, and explore options to shift the types of grape varietals to suit changing environments.

Measure Temp-10 Develop Outreach Programs for Winemakers

Develop outreach programs to inform and assist winemakers in changing practices to adapt to the effects of climate change (e.g., increasing average temperatures, variation in water supplies, etc.). Techniques

could include, but are not limited to, providing artificial shade and limiting light exposure on grapevines during extreme heat events.

Creating a more resilient energy system will increase reliability and help ensure uninterrupted access to critical resources like power and water. GHG Building Energy measures also help to increase energy resilience by reducing the County's overall energy demand and diversifying regional sources of renewable power generation.

Measure Temp-11 Develop and Implement Strategies to Increase Energy Resiliency

Work with MCE and PG&E to develop and implement strategies to increase energy resiliency in the face of extreme events (e.g., extreme heat events, damages due to wildfire, flooding, and sea-level rise). Strategies could include, but are not limited to, battery storage and back-up systems, creating grid flexibility through increased renewable energy development, and identifying design weaknesses in energy infrastructure.

Table 4-1 Summary of Temperature Related Measures

Measure	Title	Responsibility	Timeframe
Temp-1	Map Critical Infrastructure Locations Vulnerable to Extreme Heat Events	Planning and Public Works	Near-Term
Temp-2	Develop Outreach Programs for Outdoor Workers	Planning & Public Health Division	Near-Term
Temp-3	Educate Residents on Heat-Related Illness Prevention	Planning & Public Health Division	Near-Term
Temp-4	Encourage the installation of Cool Roof Technologies and Rooftop Gardens	Planning	Near-Term
Temp-5	Incorporation of Cool Pavement Technology	Planning	Mid-Term
Temp-6	Improve Parking Lot Shading and Landscaping	Planning	Near-Term
Temp-7	Update the County's Excessive Heat Emergency Response Plan	Planning & Public Health Division	Mid-Term
Temp-8	Support Research on the Effects of a Warmer Climate on the Agriculture and Wine Industries	Planning & the Agriculture Commissioner's Office	Near-Term
Temp-9	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Temperatures	Planning & the Agriculture Commissioner's Office	Mid-Term
Temp-10	Develop Outreach Programs for Winemakers	Planning & the Agriculture Commissioner's Office	Mid-Term
Temp-11	Develop and Implement Strategies to Increase Energy Resiliency	Planning and Public Works	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
Source: Ascent Environmental 2016

4.3.2 Prepare for Increased Risk of Wildfire

With the County already at high risk for wildfire, it is imperative that the County prepare for increased wildfire risk as a result of climate change. The Napa County Fire Department currently has mutual aid agreements with American Canyon, the City of Napa, St. Helena, and Calistoga, forming the Napa County Firefighters Association (Association). The County will continue to collaborate with the Association and other pertinent agencies to coordinate strategies to ensure a cohesive County-wide approach to wildfire risk management.

Additionally, GHG Measure AG-1, which supports BAAQMD efforts to reduce open burning of removed agricultural biomass and flood debris, will help to reduce the risk of fire to spread and become hazardous threats. Wildfire is also the largest source of black carbon in California, harmfully impacting both public health and the climate (CARB 2017). An added co-benefit of reducing fire hazard risks and building resiliency through wildfire-related adaptation measures, is that less black carbon will be emitted into the atmosphere.

GHG Measure AG-1 will help to reduce the risk of fire spreading (see Chapter 3).

All wildfire-related measures are described below. Summaries of the measures are included in Table 4-2 below.

Measure Fire-1 Map and Identify Locations That Are Newly at Risk, or at Higher Risk for Fire Hazards

Work with CAL FIRE and the Napa County Fire Department to map and identify locations in the County that are newly at risk, or at higher risk, for fire hazards because of climate change and its impacts.

Measure Fire-2 Map Critical Infrastructure Locations Vulnerable to Wildfires

Map locations of communication, energy, service, and transportation infrastructure that are vulnerable to wildfires.

Measure Fire-3 Collaborate Dissemination of Information with the Napa County Firefighters Association

Collaborate with the Napa County Firefighters Association to disseminate information regarding the nexus between climate change and increased wildfire risk to identify opportunities for County-wide coordination efforts.

The Napa County Firefighters Association is a joint agency comprised of fire departments in Napa County, American Canyon, City of Napa, St. Helena, and Calistoga (Napa County 2016).

Measure Fire-4 Coordinate Emergency Preparedness Systems

Coordinate with the Napa County Firefighters Association and the Office of Emergency Services to identify strategies to ensure capacity and resilience of escape routes compromised by wildfire, including emergency evacuation and supply transportation routes.

Co-Benefits:

- Protection of Structures and Assets
- Improved Air Quality
- Reduction in Black Carbon Emissions
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Improved Quality of Life
- Increased Public Awareness of Climate Change

Measure Fire-5 Collaborate on Programs to Reduce Fire Hazards

Collaborate with the Napa County Fire Department to continue to reduce fire hazards, including but not limited to, enforcing defensible space guidelines, restoring fire-resilient conditions by thinning, removing live or dead vegetation, and retaining healthy native trees.

Table 4-2 Summary of Wildfire Risk Measures			
Measure	Title	Responsibility	Timeframe
Fire-1	Map and Identify Locations That Are Newly at Risk, or at Higher Risk for Fire Hazards	Planning, Napa Couny Fire Department, & CAL FIRE	Near-Term
Fire-2	Map Critical Infrastructure Locations Vulnerable to Wildfires	Planning, Public Works, & Caltrans	Mid-Term
Fire-3	Collaborate Dissemination of Information with the Napa County Firefighters Association	Planning & Napa County Firefighters Association	Mid-Term
Fire-4	Coordinate Emergency Preparedness Systems	Planning, Napa County Firefighters Association, & Office of Emergency Services	Mid-Term
Fire-5	Collaborate on Programs to Reduce Fire Hazards	Planning & Napa County Fire Department	Near-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
Source: Ascent Environmental 2016

4.3.3 Prepare for Variable Water Supplies and Preserve Water Quality

Climate change effects will result in variable water supplies and an increased need to preserve water quality in Napa County. To prepare for these conditions, the County will continue to evaluate the vulnerabilities of its water supply systems and networks, while also identifying innovative options to meet future water demand.

All GHG Water measures serve as adaptation measures by preserving water quality and encouraging water conservation. For a complete list of measures related to water, see Chapter 3.

Several GHG reductions measures also serve as adaptation strategies. GHG Measure LU-2, refines protection guidelines for existing riparian lands, further preserving areas and water quality. Additional water related GHG measures cover a range of water conservation tactics, including regulations for landscape design (GHG Measure WA-1), adopting ordinances that limit outdoor watering for commercial and residential land uses (GHG Measure WA-2), and requiring audits for new large-scaled projects and existing facilities (GHG Measure WA-4). GHG Measure WA-3, expedites and reduces permit fees associated with water conservation installations, including rainwater catchment systems, which are also encouraged in Adaptation Measure Water-3 below.

Additionally, the County will pursue future grant opportunities to continue efforts related to provide enough water supplies in the future, and support local efforts from Napa Green Land to increase water efficiency in agricultural lands in the County.

All measures related to water supply and quality are described below and summarized in Table 4-3 below.

Measure Water-1 Evaluate Vulnerabilities of Water Supply Systems and Networks

Evaluate the vulnerability of the water supply systems and networks to climate change related impacts and develop strategies to increase the resilience of these systems.

Co-Benefits:

- Lowered Water and Sewer Bills Improved Water Supply and Quality
- Increased Public Awareness of Climate Change

Measure Water-2 Consider Innovative Options to Meet Future Demand

Consider innovative options to meet future water demand (e.g., on-site graywater systems; institute water conservation strategies; and use of recycled water).

Measure Water-3 Promote Use of Rainwater Catchment and Storage Systems

Promote the use of catchment systems, such as rain barrels, rain gardens, cisterns, and other mechanisms to capture and store rainwater.

Measure Water-4 Support Napa Green Land Efforts

Support efforts of Napa Green Land to increase certification of agriculture and farm land to prevent soil erosion, reduce harmful inputs and runoff, restore wildlife habitats, and support healthy rivers, streams, and riparian vegetation to maintain water quality and conserve water resources.

Source: County of Napa

Measure Water-5 Collaborate with Agencies to Identify Future Water Supplies and Explore Alternative Supply Sources

Collaborate with the Napa County Flood Control and Water Conservation District and Public Works, to identify water supply options for the future. Explore opportunities to expand the use of on-site graywater systems, recycled water systems, or other alternative supply sources to meet non-potable water demands, and where possible, to offset groundwater and/or potable use.

Measure Water-6 Pursue Grant Funding Opportunities for Water Resource Planning Projects

Pursue grant funding opportunities related to on-site graywater reuse systems, water recycling projects, and/or other water resource planning projects.

Table 4-3 Summary of Water Supply and Quality Measures			
Measure	Title	Responsibility	Timeframe
Water-1	Evaluate Vulnerabilities of Water Supply Systems and Networks	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Near-Term
Water-2	Consider Innovative Options to Meet Future Demand	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term
Water-3	Promote Use of Rainwater Catchment Systems	Planning & Public Works	Mid-Term
Water-4	Support Napa Green Land Efforts	Planning	Near-Term
Water-5	Collaborate with Agencies to Identify Future Water Supplies and Explore Alternative Supply Sources	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term
Water-6	Pursue Grant Funding Opportunities for Water Resource Planning Projects	Planning & Public Works	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
Source: Ascent Environmental 2016

4.3.4 Prepare for Increased Likelihood of Flooding

Through a variety of measures, the County will prepare for the increased likelihood of flooding. The County will work with local agencies and organizations to reduce the effects of flooding by improving and mapping critical infrastructure. On a larger County-wide level, the County is committed to partner with incorporated cities to address flooding collectively, paying attention to areas at increased flooding risk along the Napa River.

The County will also use several measures to restore the natural environment to combat flooding. Identifying streamside areas that could be restored will not only buffer buildings, roads, and crops from floods, but will also improve natural landscapes and air quality.

GHG Measure LU-2 will help conserve natural habitats to prevent future flooding (see Chapter 3).

Additionally, GHG reduction Measure LU-2 which refines protections guidelines for existing riparian lands, also serves as an adaptation strategy.

Measures related to flooding are described below and summarized in Table 4-4 below.

Measure Flood-1 Update the County's Operational Area Hazard Mitigation Plan to Address Flooding and Climate Change

Ensure that future updates to the County's Operational Area Hazard Mitigation Plan incorporate strategies to address the increased likelihood of flooding because of climate change.

Measure Flood-2 Partner with Incorporated Cities and Local Organizations to Address Flooding

Partner with incorporated cities in the County and local organizations, such as the North Bay Climate Adaptation Initiative, to ensure coordinated efforts are taken to reduce threats to structures, populations, and functions because of flooding, particularly along the Napa River.

Measure Flood-3 Identify Streamside Restoration Areas

Identify streamside areas in the County that could be restored by stabilizing stream banks and planting appropriate vegetation to buffer buildings, roads, and crops from floods.

Co-Benefits:

- Protection of Structures and Assets
- Protection of Natural Ecosystems and Habitats
- Improved Air Quality
- Improved Public Health
- Improved Quality of Life

Measure Flood-4 Replant Bare or Disturbed Areas

Replant bare or disturbed areas to reduce runoff, improve water uptake, and reduce erosion and sedimentation in streams.

Measure Flood-5 Coordinate Emergency Evacuation and Supply Transportation Routes

Coordinate emergency evacuation and supply transportation routes with the County's Office of Emergency Services to ensure capacity and resilience of escape routes compromised by flooding.

Measure Flood-6 Improve Sewage and Solid-Waste Management Infrastructure

Improve sewage and solid-waste management infrastructure, to the extent such infrastructure is within the jurisdiction of the County, to reduce vulnerabilities to climate change (i.e., storm surge, flooding, and inundation).

Source: County of Napa

Measure Flood-7 Improve Capacity of Storm Water Infrastructure

Evaluate and improve capacity of storm water infrastructure for high intensity rainfall events.

Measure Flood-8 Increase Use of Pervious Pavements and Landscaping in Developed Areas

Increase the use of pervious pavements and landscaped areas to allow for better infiltration and reduced stormwater overflow in developed areas.

Measure Flood-9 Map Critical Infrastructure Locations Vulnerable to Flooding

Map locations of communication, energy, service, and transportation infrastructure that are vulnerable to floods and storm surges.

Measure Flood-10 Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Flooding

Work with the agriculture sector to understand the tolerance of current wine grape varieties to withstand increased flooding, and explore

options to shift the types of grape varietals to suit changing conditions.

Measure Flood-11 Design Programs to Address Vector- and Waterborne Diseases

Design programs to monitor and prepare for the appearance of vector- and waterborne diseases following floods and storms.

Table 4-4 Summary of Flood Risk Measures

Measure	Title	Responsibility	Timeframe
Flood-1	Update the County's Operational Area Hazard Mitigation Plan to Address Flooding and Climate Change	Planning & Office of Emergency Services	Near-Term
Flood-2	Partner with Incorporated Cities and Local Organizations to Address Flooding	Planning & Incorporated Cities[1]	Mid-Term
Flood-3	Identify Streamside Restoration Areas	Planning & Public Works	Near-Term
Flood-4	Replant Bare or Disturbed Areas	Planning	Mid-Term
Flood-5	Coordinate Emergency Evacuation and Supply Transportation Routes	Planning & Office of Emergency Services	Mid-Term
Flood-6	Improve Sewage and Solid-Waste Management Infrastructure	Planning & Public Works	Mid-Term
Flood-7	Improve Capacity of Storm Water Infrastructure	Planning & Public Works	Mid-Term
Flood-8	Increase Use of Pervious Surfaces and Landscaping in Developed Areas	Planning	Mid-Term
Flood-9	Map Critical Infrastructure Locations Vulnerable to Flooding	Planning	Near-Term
Flood-10	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Flooding	Planning & the Agriculture Commissioner's Office	Mid-Term
Flood-11	Design Programs to Address Vector- and Waterborne Diseases	Planning and Public Health Division	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
[1] Includes American Canyon, Calistoga, City of Napa, St. Helena and Yountville.
Source: Ascent Environmental 2016

4.3.5 Prepare for Sea-Level Rise

Source: County of Napa

The County will coordinate with several agencies, including the Federal Emergency Management Agency (FEMA) Region IX, DWR, Napa County Public Works, and Napa County's Office of Emergency Services to prepare for the projected effects of sea-level rise. Measures include identifying specific areas in the County that will be affected by sea-level rise and establishing measures to protect functions, structures and populations. In addition to supporting ongoing research and analysis of sea-level rise and its effects on the County, the County will incorporate sea-level rise effects into its future planning efforts. The County will also through an outreach strategy, educate and inform residents of potentially affected areas of the need to plan for sea-level rise.

Measures related to sea-level rise are described below and summarized in Table 4-5 below.

Measure SLR-1 Identify Areas Affected by Sea-Level Rise

Conduct a detailed sea-level rise assessment to identify and inventory areas that will be affected by sea-level rise and establish measures to protect functions, structures, and populations.

Measure SLR-2 Update the County's Operational Area Hazard Mitigation Plan to Incorporate Sea-Level Rise

Ensure that future updates to the County's Operational Area Hazard Mitigation Plan incorporate sea-level rise assessment and risk management processes.

Measure SLR-3 Floodplain Mapping Coordination

Coordinate with FEMA and DWR to ensure that floodplain mapping for potentially affected areas are regularly updated to reflect changes in Base Flood Elevations that account for sea-level rise.

Measure SLR-4 Support and Monitor Ongoing Analysis of Sea-Level Rise Data

Support and monitor ongoing collection and analysis of sea-level rise, storm surge, and tidal data by existing institutions, including, but not limited to FEMA, the Bay Conservation Development Commission, the Bay Area Regional Collaborative, and the National Oceanic and Atmospheric Administration.

Co-Benefits:

- Protection of Structures and Assets
- Improved Public Health
- Improved Quality of Life
- Increased Public Awareness of Climate Change

Measure SLR-5 Create a Comprehensive Outreach Strategy

Create a comprehensive outreach strategy that informs residents in potentially affected areas of County efforts to protect and increase community resiliency to sea-level rise.

Measure SLR-6 Incorporate Sea-Level Rise Effects into Capital Improvement Plans

Update capital improvement plans for critical infrastructure to address the effects of future sea-level rise and associated hazards in potentially affected areas.

Measure SLR-7 Assess Sea-Level Rise Impacts on Agriculture

Conduct a more detailed assessment of the impacts sea-level rise, severe storms, and increased risk of coastal flooding on the County's agriculture sector.

Table 4-5 Summary of Sea-Level Rise Measures

Measure	Title	Responsibility	Timeframe
SLR-1	Identify Areas Affected by Sea-Level Rise	Planning	Mid-Term
SLR-2	Update Napa County's Operational Area Hazard Mitigation Plan to Incorporate Sea-Level Rise	Planning & Office of Emergency Services	Near-Term
SLR-3	Floodplain Mapping Coordination	Planning, FEMA & DWR	Near-Term
SLR-4	Support Ongoing Analysis of Sea-Level Rise Data	Planning	Near-Term
SLR-5	Create a Comprehensive Outreach Strategy	Planning	Mid-Term
SLR-6	Incorporate Sea-Level Rise Effects into Capital Improvement Plans	Planning & Public Works	Mid-Term
SLR-7	Assess Sea-Level Rise Impacts on Agriculture	Planning	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
Source: Ascent Environmental 2016

Napa County Climate Action Plan

A Tradition of Stewardship
A Commitment to Service

Chapter 5

Implementation and Monitoring

Source: County of Napa

5.1 Introduction

Source: County of Napa

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

5.2 Implementation Strategy

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

Ensuring that the measures translate to on-the-ground results and reductions in GHG emissions is critical to the success of the CAP. Table 5-1, which lists each strategy and measure in this CAP, summarizes the first steps towards implementing the CAP. More specifically, the table identifies the time frame for which each measure will be implemented. It also identifies County departments that will be responsible for implementing assigned actions upon adoption of the CAP. Some measures will require interdepartmental or inter-agency cooperation and appropriate partnerships will need to be established accordingly. The table also outlines other considerations, and whether a measure is mandatory or voluntary.

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

- **Code Updates.** Several of the measures in the CAP are implemented through new or amended regulations as part of County Code updates. The County, for example, will need to incorporate CALGreen Tier 1 "reach codes" into the County's building codes, along with requiring that new or replacement residential water heating systems be electrically-powered and/or alternatively-fueled systems.
- **Financing and Incentives.** Identifying mechanisms for funding and allocating resources, such as expanding current green energy incentives will help ensure that the CAP is successfully implemented.
- **Program Research and Development.** Several measures are programmatic in nature and will require additional research and development for proper implementation to occur (i.e., developing programs to address vector- and waterborne diseases). These programs may require future partnerships and financing mechanisms to be in place down the road, but most immediately, County staff will need to integrate program research and development into the context of existing workloads and programs whenever possible.

Source: County of Napa

- **Partnerships.** Inter-agency coordination and partnerships with other organizations is critical to ensuring implementation of certain measures (i.e., developing a region-wide CAP, increasing Napa Green Certified wineries, or supporting efforts to allow commuter service to operate on the Napa Wine Train right-of-way).
- **Education and Outreach**. Education efforts about the objectives of the CAP will create support for the CAP and involve the community in its implementation.

Proper implementation and tracking of the CAP allows County staff, the Board of Supervisors, and the public to monitor the effectiveness of each measure as well as the overall CAP.

The County will develop more detailed implementation schedules for each measure, based on staff requirements and funding opportunities available for implementing the measures outlined in the CAP. Key staff in each department will facilitate and oversee action implementation. Priority will be given to projects based on cost effectiveness, GHG reduction potential, available funding, and the ease and length of time for implementation.

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

5.2.1 Role of New Development

The CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the CAP.

Implementation of the CAP will require that new development projects attain higher levels of energy efficiency and incorporate more sustainable design standards. However, new developments that are consistent with applicable GHG reduction measures in a CAP are eligible for California Environmental Quality Act (CEQA) streamlining, per the provisions of CEQA Guidelines Section 15183.5. Under these provisions, if a project can show consistency with applicable GHG reduction measures in a CAP, the level of analysis for the project required under CEQA with respect to GHG emissions can be reduced considerably (i.e., detailed analysis of project-level GHG emissions and potential climate change impacts is not needed). Furthermore, a project's incremental contribution to cumulative GHG emissions may be determined not to be cumulatively considerable. This CAP meets the criteria identified in Section 15183.5 and is therefore considered a "qualified" CAP.

To help new development applicants plan and design projects consistent with the CAP, and to assist County staff in determining the consistency of proposed projects with the CAP during development review, the County has prepared a CAP Consistency Checklist (See Appendix D). The Checklist incorporates the GHG reduction measures that could be feasibly applied to future projects subject to

discretionary review. This may include certain measures that are listed as "voluntary" in Table 5-1 below. Some measures (e.g, AG-2 and MS-2) are listed as voluntary because they would not apply broadly to all existing land uses and existing development in the County; however, they would become mandatory for future discretionary projects seeking consistency with the CAP.

The Checklist may also be updated to incorporate new GHG reduction techniques or to comply with later amendments to the CAP or local, State, or federal law. By incorporating applicable GHG reduction measures in the checklist into project designs or conditions of approval, the County will ensure that new development is consistent with applicable GHG reduction measures in the CAP and thus will contribute its "fair share" in achieving the identified GHG reduction targets.

Source: County of Napa

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
GHG Reduction Measures							
Agriculture							
AG-1	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	Planning & BAAQMD	Near-Term	Medium	Voluntary	Partnerships	Requires County collaboration & administrative capacity
AG-2	Support the conversion of all stationary diesel or gas-powered irrigation pumps to electric pumps	Planning & BAAQMD	Near-Term	Medium	Voluntary[1]	Financing & Incentives	Requires County administrative capacity, & funding
AG-3	Support use of electric or alternatively-fueled agricultural equipment	Planning & BAAQMD	Near-Term	Low	Voluntary[1]	Partnerships	Requires County collaboration & administrative capacity
AG-4	Support the use of Tier 4 final diesel equipment for off-road agricultural equipment	Planning & Agricultural Community	Mid-Term	Medium	Voluntary[1]	Partnerships	Requires County collaboration & administrative capacity
AG-5	Support reduced application of inorganic nitrogen fertilizer	Planning & Agricultural Community	Near-Term	Low	Voluntary	Partnerships, Education & Outreach	Requires County collaboration & administrative capacity
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	Planning, Napa County RCD, & Agricultural Community	Mid-Term	Medium	Voluntary[1]	Partnerships, Program Research & Development, Education & Outreach	Requires County collaboration, funding, & administrative capacity
Building Energy							
BE-1	Work with PG&E, PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings	Planning, Public Works, & PG&E	Ongoing, Near-Term	Medium	Voluntary	Partnerships	Requires County collaboration, funding, & administrative capacity
BE-2	Require energy audits for major additions to or alterations of existing buildings	Building	Near-Term	Medium	Mandatory	Code Updates	Requires County administrative capacity
BE-3	Require compliance with CALGreen Tier 1 green building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	Building & Public Works	Near-Term	Low	Mandatory	Code Updates	Requires updating current building code ordinances

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
BE-4	Require compliance with CALGreen Tier 1 standards for all new construction, and phase in ZNE requirements for new construction beginning in 2020	Building & Public Works	Near-Term	Low	Mandatory	Code Updates	Requires updating current building code ordinances
BE-5	Increase participation in MCE's Deep Green (100 percent renewable) option	Planning, Public Works, MCE, & Potential Funding Sources	Near-Term	Medium	Voluntary	Financing & Incentives	Yearly costs to County & requires County adminisrative capacity
BE-6	Require new or replacement residential and commercial water heating systems to be electrically powered and/or alternatively fueled systems	Building	Near-Term	Medium	Mandatory	Code Updates	Requires updating current building code ordinances
BE-7	Expand current renewable energy and green energy incentives and update local ordinances	Planning, Google, and National Renewable Energy Laboratory	Mid-Term	Varies	Mandatory	Code Updates, Partnerships	Yearly costs to County & requires County adminisrative capacity
BE-8	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	Planning	Mid-Term	Medium	Voluntary	Program Research & Development	Requires County administrative capacity
BE-9	Select MCE's Deep Green option for all county-owned facilities	Public Works	Near-Term	Low	Mandatory	Financing & Incentives	Yearly costs to County
BE-10	Support waste-to-energy programs at unincorporated landfills	Planning, Public Works, & Landfills	Mid-Term	High	Voluntary	Partnerships	Requires County collaboration
BE-11	Encourage solar panel installations on warehouse roof spaces	Planning, Public Works, & MCE	Mid-Term	Medium	Voluntary	Partnerships	Requires County collaboration
Land Use							
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	Planning, Project Applicants, & Volunteers	Near-Term	Low	Mandatory	Code Updates	Requires updating code, funding, & County administrative capacity
LU-2	Refine protection guidelines for existing riparian lands	Planning	Near-Term	Low	Mandatory	Code Updates	Requires updating code & County administrative Capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	Planning & Eligible Businesses/ Organizations	Near-Term	Low	Mandatory	Partnerships	Requires County collaboration & administrative capacity
Multi-Sector							
MS-1	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	Planning & Other Cities	Mid-Term	Medium	Voluntary	Partnerships	Requires County collaboration & administrative capacity
MS-2	Support efforts to increase Napa Green Certified wineries and vineyards in the County, with a goal of 100 percent certified by 2030	Planning, Napa Green, & Businesses	Near-Term	Medium	Voluntary	Program Research & Development	Requires County administrative capacity
MS-3	Promote the sale of locally grown foods and/or products	Planning & the Agriculture Commissioner' s Office	Mid-Term	Low	Voluntary	Partnerships	Requires County collaboration & administrative capacity
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	Planning & Sustainable Napa County	Mid-Term	High	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
Off-Road Vehicles and Equipment							
OR-1	Require Tier 4 equipment for all construction activity and mining operations as a condition of approval by 2030	Planning & Project Applicants	Mid-Term	Medium	Mandatory	Code Updates	Requires ordinance amending County code & County administrative capacity
OR-2	Increase the use of alternative fuels for recreational watercraft	Planning, Dock Operators, Local Businesses, & Cities	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration & administrative capacity
Solid Waste							
SW-1	Encourage expansion of composting program for both residential and commercial land uses	Planning & Waste Management Companies	Near-Term	Medium	Voluntary[1]	Program Research & Development	Requires County administrative capacity
SW-2	Meet an 80 percent Waste Diversion Goal by 2020 and a 90 percent Waste Diversion Goal by 2030	Planning	Near-Term	Medium	Mandatory	Program Research & Development	Requires County collaboration & administrative capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
On-Road Transportation							
TR-1	Update Transportation System Management Ordinance (for employers)	Planning, BAAQMD, & MTC	Near-Term	Medium	Mandatory	Code Updates	Requires updating ordinance, County collaboration, funding, & County administrative capacity
TR-2	Parking reduction ordinance revisions	Planning	Near-Term	Medium	Mandatory	Code Updates	Requires updating existing ordinance
TR-3	Increase affordable housing, especially workforce housing, in Napa County	Planning, Cities, & NVTA	Mid-Term	Medium	Mandatory	Program Research & Development	Requires County collaboration, funding, & administrative capacity
TR-4	Support efforts to allow commuter service to operate on the Napa Wine Train right-of-way	Planning, NVTA, & Napa Wine Train	Mid-Term	Medium	Mandatory	Partnerships	Requires County collaboration, funding, & administrative capacity
TR-5	Support efforts of transit agencies to increase availability and accessibility of transit information	Planning, NVTA, & Regional Transit Agencies	Near-Term	Low	Voluntary	Partnerships	Requires County collaboration & administrative capacity
TR-6	Support alternatives to private vehicle travel for visitors	Planning, NVTA, & Visit Napa Valley	Mid-Term	Low	Voluntary	Partnerships	Requires County collaboration, funding, & administrative capacity
TR-7	Support Napa County's incorporated cities in developing transit oriented development unique to the needs of the Napa Region	Planning & Cities	Mid-Term	Varies	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
TR-8	Support interregional transit solutions	Planning, Cities, NVTA, MTC, & Regional Transit Agencies	By 2030	Varies	Voluntary	Partnerships	Requires County collaboration, funding, & administrative capacity
TR-9	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers	Planning & NVTA	By 2030	Medium	Voluntary	Partnerships	Requires County collaboration & administrative capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
TR-10	Promote existing ride-matching services for people living and working in the unincorporated County	Planning, Cities, & NVTA	By 2030	Varies	Voluntary	Partnerships, Education & Outreach	Requires County collaboration & administrative capacity
TR-11	Increase the supply of electric vehicle charging stations	Planning & Local Businesses	By 2030	Medium	Voluntary[1]	Financing & Incentives	Requires County collaboration, funding, & administrative capacity
TR-12	Promote telecommuting at office-based businesses	Planning	By 2030	Low	Voluntary	Program Research & Development	Requires County administrative capacity
TR-13	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to use CNG	Planning & Solid Waste Collection Services	By 2030	High	Voluntary	Partnerships	Requires County collaboration
Tr-14	Encourage and support the development of active transportation projects	Planning, Napa Valley Vine Trail Coalition, NVTA, & Caltrans	Mid-Term	Varies	Voluntary	Partnerships	Requires County collaboration, funding
Water and Wastewater							
WA-1	Amend or revise water conservation regulations for landscape design to include residential landscaping, and consider cash-for grass rebates or other incentives to replace turf with drougt-tolerant landscaping	Planning	Near-Term	Low	Voluntary	Code Updates	Requires updating existing ordinance
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	Planning	Near-Term	Low	Voluntary	Code Updates	Requires updating existing ordinance
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	Planning	Near-Term	Low	Voluntary	Program Research & Development	Requires County administrative capacity
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	Planning	Mid-Term	Medium	Mandatory	Program Research & Development	Requires County administrative capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
High GWP Gases							
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	Planning & Building	Mid-Term	Medium	Voluntary	Partnerships, Education & Outreach	Requires County collaboration, funding, & administrative capacity
HG-2	Incentivize the use of low-GWP refrigerants	Planning & Building	Mid-Term	Medium	Voluntary	Partnerships, Education & Outreach	Requires County collaboration, funding, & administrative capacity
Adaptation Measures							
Temperature							
Temp-1	Map Critical Infrastructure Locations Vulnerable to Extreme Heat Events	Planning & Public Works	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
Temp-2	Develop Outreach Programs for Outdoor Workers	Planning & Public Health Division	Near-Term	Medium	Voluntary	Education & Outreach	Requires County collaboration & administrative capacity
Temp-3	Educate Residents on Heat-Related Illness Prevention	Planning & Public Health Division	Near-Term	Low	Voluntary	Education & Outreach	Requires County administrative capacity
Temp-4	Encourage the installation of Cool Roof Technologies and Rooftop Gardens	Planning	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration
Temp-5	Incorporation of Cool Pavement Technology	Planning & Public Works	Mid-Term	Medium	Voluntary	Program Research & Development	Requires County administrative capacity, & funding
Temp-6	Improve Parking Lot Shading and Landscaping	Planning	Near-Term	Varies	Voluntary	Program Research & Development	Requires County administrative capacity
Temp-7	Update the County's Excessive Heat Emergency Response Plan	Planning & Public Health Division	Mid-Term	Medium	Voluntary	Financing & Incentives	Requires County collaboration, funding, & administrative capacity
Temp-8	Support Research on the Effects of a Warmer Climate on the Agriculture and Wine Industries	Planning & the Agriculture Commissioner's Office	Near-Term	Low	Voluntary	Partnerships	Requires County collaboration, funding, & administrative capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
Temp-9	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Temperatures	Planning & the Agriculture Commissioner's Office	Mid-Term	Low	Voluntary	Program Research & Development	Requires funding, & administrative capacity
Temp-10	Develop Outreach Programs for Winemakers	Planning & the Agriculture Commissioner's Office	Mid-Term	Low	Voluntary	Education & Outreach	Requires County administrative capacity
Temp-11	Develop Strategies to Increase Energy Resiliency	Planning, Public Works, MCE, & PG&E	Mid-Term	Medium	Voluntary	Partnerships	Requires County collaboration & administrative capacity
Wildfire Risk							
Fire-1	Map and Identify Locations That Are Newly at Risk, or at Higher Risk for Fire Hazards	Planning, Napa Couny Fire Department, & CAL FIRE	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration, & funding
Fire-2	Map Critical Infrastructure Locations Vulnerable to Wildfires	Planning, Public Works, & Caltrans	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration, & funding
Fire-3	Collaborate Dissemination of Information with the Napa County Firefighters Association	Planning & Napa County Firefighters Association	Mid-Term	Low	Voluntary	Partnerships	Requires County collaboration
Fire-4	Coordinate Emergency Preparedness Systems	Planning, Napa County Firefighters Association, & Office of Emergency Services	Mid-Term	Low	Voluntary	Partnerships	Requires County collaboration, funding, & administrative capacity
Fire-5	Collaborate on Programs to Reduce Fire Hazards	Planning & Napa County Fire Department	Near-Term	Low	Voluntary	Partnerships	Requires County collaboration
Water Supply and Quality							
Water-1	Evaluate Vulnerabilities of Water Supply Systems and Networks	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration & administrative capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
Water-2	Consider Innovative Options to Meet Future Demand	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term	Varies	Voluntary	Program Research & Development	Requires County administrative capacity
Water-3	Promote Use of Rainwater Catchment Systems	Planning & Public Works	Mid-Term	Low	Voluntary	Partnerships	Requires County administrative capacity
Water-4	Support Napa Green Land Efforts	Planning	Near-Term	Low	Voluntary	Partnerships	Requires County collaboration
Water-5	Collaborate with Agencies to Identify Future Water Supplies and Explore Alternative Supply Sources	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term	Medium	Voluntary	Partnerships	Requires County collaboration, funding, & administrative capacity
Water-6	Pursue Grant Funding Opportunities for Water Resource Planning Projects	Planning & Public Works	Mid-Term	Low	Voluntary	Financing & Incentives	Requires County collaboration, funding, & administrative capacity
Flood Risk (Adaptation)							
Flood-1	Update the County's Operational Area Hazard Mitigation Plan to Address Flooding and Climate Change	Planning & Office of Emergency Services	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
Flood-2	Partner with Incorporated Cities and Local Organizations to Address Flooding	Planning, Napa County Flood Control and Water Conservation District, & Incorporated Cities[1]	Mid-Term	Medium	Voluntary	Partnerships	Requires County collaboration, funding, & administrative capacity
Flood-3	Identify Streamside Restoration Areas	Planning & Public Works	Near-Term	Low	Voluntary	Program Research & Development	Requires funding, & County administrative capacity
Flood-4	Replant Bare or Disturbed Areas	Planning & Public Works	Mid-Term	Medium	Voluntary	Program Research & Development	Requires funding, & County administrative capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
Flood-5	Coordinate Emergency Evacuation and Supply Transportation Routes	Planning & Office of Emergency Services	Mid-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
Flood-6	Improve Sewage and Solid-Waste Management Infrastructure	Planning & Public Works	Mid-Term	High	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
Flood-7	Improve Capacity of Storm Water Infrastructure	Planning & Public Works	Mid-Term	High	Voluntary	Program Research & Development	Requires County collaboration, & funding
Flood-8	Increase Use of Pervious Surfaces and Landscaping in Developed Areas	Planning & Public Works	Mid-Term	Medium	Voluntary	Program Research & Development	Requires County administrative capacity, & funding
Flood-9	Map Critical Infrastructure Locations Vulnerable to Flooding	Planning, Napa County Flood Control and Water Conservation District, & NVTA	Near-Term	Meidum	Voluntary	Program Research & Development	Requires County administrative capacity, & funding
Flood-10	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Flooding	Planning & the Agriculture Commissioner's Office	Mid-Term	Medium	Voluntary	Program Research & Development	Requires County administrative capacity
Flood-11	Design Programs to Address Vector- and Waterborne Diseases	Planning and Public Health Division	Mid-Term	Low	Voluntary	Program Research & Development	Requires County administrative capacity, & funding
Sea-Level Rise							
SLR-1	Identify Areas Affected by Sea-Level Rise	Planning	Mid-Term	Medium	Voluntary	Program Research & Development	Requires County administrative capacity, & funding
SLR-2	Update Napa County's Operational Area Hazard Mitigation Plan to Incorporate Sea-Level Rise	Planning & Office of Emergency Services	Near-Term	Medium	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
SLR-3	Floodplain Mapping Coordination	Planning, Napa County Flood Control and Water Conservation District, FEMA, DWR, & NVTA	Near-Term	Varies	Voluntary	Program Research & Development	Requires County administrative capacity

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[2]	Cost	Mandatory or Voluntary	Category	Other Considerations
SLR-4	Support Ongoing Analysis of Sea-Level Rise Data	Planning	Near-Term	Low	Voluntary	Partnerships	Requires County administrative capacity
SLR-5	Create a Comprehensive Outreach Strategy	Planning	Mid-Term	Medium	Voluntary	Program Research & Development	Requires County administrative capacity
SLR-6	Incorporate Sea-Level Rise Effects into Capital Improvement Plans	Planning & Public Works	Mid-Term	Varies	Voluntary	Program Research & Development	Requires County collaboration, funding, & administrative capacity
SLR-7	Assess Sea-Level Rise Impacts on Agriculture	Planning	Mid-Term	Varies	Voluntary	Program Research & Development	Requires County administrative capacity

Notes:
[1] Some voluntary measures do not apply broadly to all existing land uses or existing development but are included as mandatory measures in the CAP Consistency Checklist. Future projects subject to discretionary review and approval will be required to comply with certain applicable voluntary measures in the CAP. See Appendix D for the Checklist and additional details.
[2] Near-Term = 1-3 Years, Mid-Term = 4-7 Years, Long-Term = 8+ Years
BAAQMD = Bay Area Air Quality Management District, BAU = Business-As-Usual, CALGreen = California Green Building Standards Code, CAP = Climate Action Plan, CARB = California Air Resources Board, CNG = compressed natural gas, DWR = Department of Water Resources, FEMA = Federal Emergency Management Agency, GHG = greenhouse gas emissions, $MTCO_2e$ = metric tons of carbon dioxide equivalent, NVTA = Napa Valley Transportation Authority, PACE = property assessed clean energy, PG&E = Pacific Gas and Electric, RCD = Resource Conservation District, ZNE = zero net energy
Source: Ascent Environmental 2017.

5.3 Monitoring and Updates

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

Beginning in 2020, the County will:
- evaluate measure performance every two years,
- coordinate inventory updates every five years, and
- evaluate and summarize measures in a detailed report to the Board of Supervisors every five years.

Upon adoption, the CAP's measures and actions will begin to be implemented by the County. To track progress, County staff will coordinate updates to the inventory every five years beginning in 2022. This will help ensure progress is being made towards achieving emission reduction targets.

In addition to updating the County's emissions inventory, County staff will also evaluate the GHG emission reduction measures' capacity, cost, effectiveness, and benefits of each individual measure. Evaluating CAP measure performance requires monitoring the level of community participation, costs, barriers to implementation, and 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 County can identify successful measures and reevaluate or replace under-performing ones.

CEQA Guidelines Section 15183.5(b)(1)(E) requires that the County amend the CAP if it finds that the plan is not achieving the adopted GHG reduction targets.

Beginning in 2020, County staff will evaluate measures every two years and will summarize progress toward meeting the GHG reduction target at that time in a report to the Board of Supervisors. County staff, beginning in 2022 and every five years after, will update the inventory and prepare a more detailed report on the CAP to the Board that describes:

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

Additionally, the County will prepare a Target Year Report in 2027 for the Board of Supervisors. This report will present the most current inventory, status of measures, and will summarize achievements to date and demonstrate progress towards achieving the 2030 and 2050 targets. The report will also provide recommendations for any changes needed to the CAP to ensure that targets are met in 2030. Figure 5-1 below outlines the CAP monitoring schedule.

CAP Monitoring Schedule

2017	**CAP Adopted** Board of Supervisors adopts plan and staff begins to implement CAP measures.
2020	**Measure Status Review** County staff reviews measure performance and implementation status, and prepares report for presentation to the Board.
2022	**Inventory Update / Measure Status Review / CAP Report** County staff conducts update to inventory, reviews measure performance, provides an initial review of the status of implementation, summarizes achievements to date (i.e., meeting 2020 targets), and makes recommended changes to the CAP if measures prove infeasible, and prepares report to Board. The report will identify ways to adapt the plan to maintain the desired reduction path.
2024,2026	**Measure Status Reviews** County staff reviews measure performance and implementation status, and prepares report for presentation to the Board.
2027	**Inventory Update/ Target Year Report** County staff prepares inventory update and develops Target Year Report for presentation to Board that summarizes achievements to date and provides recommendations for meeting 2030 targets.
2030+	Repeat above process and develop appropriate actions to meet 2050 GHG reduction goals.

Figure 5-1. CAP Monitoring Schedule

5.4 Ongoing Community Engagement and Participation

As the County continues to implement and monitor progress on the CAP, continued engagement with and participation by the community is critical. This includes individual residents and businesses, community organizations (e.g., Napa Valley Vintners, Napa Valley Grapegrowers, Sustainable Napa County), other local and regional government agencies, and others. While this CAP focuses on measures in which the County has a role, many of the measures require partnership and collaboration.

Source: County of Napa

The County 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 County can only be achieved through efforts that continue to change the way individuals interact with the environment. Many of the measures in Chapters 3 and 4 are

focused on increasing community awareness and participation in existing programs, or connecting the community with new information, tools, funding or resources to take action. Thus, this CAP serves as a resource that supports community-based action.

Napa County Climate Action Plan

A Tradition of Stewardship
A Commitment to Service

Chapter 6

References

Source: County of Napa

Executive Summary

None present.

Chapter 1, Introduction

Intergovernmental Panel on Climate Change. 2007. Frequently Asked Questions: What is the Greenhouse Effect. Available: https://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq13.Html. Accessed May 28, 2016.

_____. 2014 (November). *Climate Change 2014 Synthesis Report: Approved Summary for Policymakers.* Available: http://www.ipcc.ch/. Accessed May 27, 2016.

Napa County Department of Public Works and Kenwood Energy. 2007. Emissions Reduction Plan for County Operations (ERD). Available: www.countyofnapa.org/emissionreductionplan/. Accessed June 3, 2016.

Napa County Department of Public Works and Kenwood Energy. March 15, 2016. Update of the 2008 Greenhouse Gas Emissions Inventory.

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

CARB. *See* California Air Resources Board.

California Air Resources Board. 2014 (May). *First Update to the Climate Change Scoping Plan*. Available http://www.arb.ca.gov/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf. Accessed June 29, 2016.

_____. 2016 (June). California Greenhouse Gas Inventory for 2000-2014. Available: http://www.arb.ca.gov/cc/inventory/data/data.htm. Accessed November 29, 2016. Last updated June 17, 2016.

_____. 2017a (January). The 2017 Climate Change Scoping Plan Update: The Proposed Strategy for Achieving California's 2030 Greenhouse Gas Target. Available: https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf. Accessed April 29, 2017.

_____. 2017b (March). Short-Lived Climate Pollutant Reduction Strategy. Available: https://www.arb.ca.gov/cc/shortlived/meetings/03142017/final_slcp_report.pdf. Accessed April 27, 2017.

California Department of Finance. 2014 (May). (December). *Report P-2. State and County Population Projections by Race/Ethnicity and Age (5-year groups). 2010 through 2060 (as of July 1).* Prepared by Walter Schwarm, Demographic Research Unit. Available: http://www.dof.ca.gov/Forecasting/Demographics/projections/. Accessed November 29, 2016.

DOF. *See* California Department of Finance.

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

IPCC. *See* Intergovernmental Panel on Climate Change.

U.S. Environmental Protection Agency. 2016 (May). Greenhouse Gas Equivalencies Calculator. Available: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator. Accessed December 15, 2016. Last updated May 2016.

Chapter 3, Greenhouse Gas Reduction Strategies and Measures

Caterpillar, Inc. 2016. Tier 4 Next Generation Products: Customer Success. Available: http://www.cat.com/en_US/support/operations/technology/tier-4-technology/customer-success.html. Accessed July 25, 2016.

Hade, Jason. County of Napa, Planner III. September 22, 2015—Email to Erik de Kok of Ascent Environmental with land use projections.

Empire Renewable Energy. 2011. Tier 4: Are You Ready. Frequently Asked Questions. Available: https://www.empire-cat.com/uploadedFiles/Empire_Cat/Power_Systems/Emissions_Solutions/Empire_Tier4Mlr.pdf. Accessed July 25, 2016.

EPA. See U.S. Environmental Protection Agency.

Napa County Transportation and Planning Agency. 2014 (December). *Napa County Travel Behavior Study. Draft Survey Results and Data Analysis Report.* December 8, 2014. Prepared by Fehr and Peers. Walnut Creek, CA.

NCTPA. See. Napa County Transportation and Planning Agency.

U.S. Environmental Protection Agency. 2011 (March). Transportation Control Measures: An Information Document for Developing and Implementing Emissions Reductions Programs. EPA-430-R-09-040. Available: https://www.epa.gov/sites/production/

files/2015-08/documents/430r09040_0.pdf. Accessed December 23, 2016.

Chapter 4, Climate Change Vulnerability and Adaptation

California Air Resources Board. 2017 (March). Short-Lived Climate Pollutant Reduction Strategy. Available: https://www.arb.ca.gov/cc/shortlived/meetings/03142017/final_slcp_report.pdf. Accessed April 27, 2017.

California Department of Forestry and Fire Protection. 2009 (March). Homeowners Checklist: How to Make your Home Fire Safe. Available: http://www.fire.ca.gov/communications/downloads/fact_sheets/Checklist.pdf. Accessed April 25, 2016.

California Energy Commission. 2016a. Cal-Adapt Local Climate Snapshots for Napa County. Prepared under contract by UC Berkeley Geospatial Innovations Facility. Available http://cal-adapt.org/tools/factsheet/. Accessed April 23, 2016.

_____. July 2012. The Impacts of Sea-Level Rise on the San Francisco Bay. Available: http://www.energy.ca.gov/2012publications/CEC-500-2012-014/CEC-500-2012-014.pdf. Accessed March 30, 2016.

California Natural Resources Agency. 2014 (July). *Safeguarding California: Reducing Climate Risk. An update to the 2009 California Climate Adaptation Strategy.* Available: http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf. Accessed April 23, 2016.

_____. 2012a (July). *California Adaptation Planning Guide: Planning for Adaptive Communities.* Available: http://resources.ca.gov/docs/climate/01APG_Planning_for_Adaptive_Communities.pdf. Accessed April 14, 2016.

CEC. *See* California Energy Commission.

CNRA. *See* California Natural Resources Agency.

IPCC. *See* Intergovernmental Panel on Climate Change.

Intergovernmental Panel on Climate Change. 2001. Climate Change 2001 Synthesis Report: Summary for Policymakers. Available: https://www.ipcc.ch/ipccreports/tar/vol4/english/ index.htm /. Accessed May 24, 2016.

Lee, Hanna et al. 2013. Climate change, wine, and conservation. Available: http://www.pnas.org/content/110/17/6907.short. Accessed April 25, 2016.

Mayton, Joseph. 2015a (August). California Wildfires threaten to make local wine “unpalatable.” The Guardian. Available: http://www.theguardian.com/us-news/2015/aug/05/california-wildfires-wine-industry. Accessed April 25, 2016.

_____. 2015b. California wildfires threaten wine vineyards at start of harvest season. Available: https://www.theguardian.com/us-news/2015/sep/17/california-wildfires-threaten-wineries-vineyards. Accessed July 27, 2016.

Napa County. 2005 (November). 2050 Napa Valley Water Resource Study. Available: http://www.napawatersheds.org/files/managed/Document/3067/2050_FactSheet.pdf. Accessed April 22, 2016

_____. 2009. HHSA Excessive Heat Emergency Response Plan. Available: http://www.countyofnapa.org/publichealth/preparedness/plans/. Accessed April 22, 2016.

_____. 2013. Napa County Operational Area Hazard Mitigation Plan: 2013 Update. Available: http://www.ci.calistoga.ca.us/home/showdocument?id=17868. Accessed April 25, 2016.

_____. 2016a. Water Conservation. Available: http://www.countyofnapa.org/WaterConservation/. Accessed April 25, 2016.

_____. 2016b. Flood District. Available: http://www.countyofnapa.org/flooddistrict/. Accessed July 7, 2016.

_____. 2016c. Napa County Fire Department Strategic Plan. Available: http://www.countyofnapa.org/CountyFire/. Accessed July 18, 2016.

Napa Valley Vintners. 2017. Napa Valley American Viticultural Area (AVA). Available: https://napavintners.com/napa_valley/. Accessed April 27, 2017.

U.S. Census Bureau. 2014. Quick Facts: Napa County. Available: http://www.census.gov/quickfacts/table/ PST045215/06055. Accessed April 2016.

Westerling, A.L. and B.P. Bryant. 2007 (October). Climate Change and wildfire in California. Available: http://ulmo.ucmerced.edu/pdffiles/08CC_WesterlingBryant.pdf. Accessed April 25, 2016.

Chapter 5, Implementation and Monitoring

None present.