Humboldt Regional Climate Action Plan

Public Review Draft

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List of Acronyms and Abbreviations

Acronym	Expansion
A	Amp
AB	Assembly Bill
AC	Alternating Current
AMRTS	Arcata-Mad River Transit System
BAU	Business As Usual
BEV	Battery Electric Vehicle
BMP	Best Management Practice
C&D	Construction and Demolition
CAISO	California Independent Systems Operator
CalEPA	California Environmental Protection Agency
CAP	Climate Action Plan
CAPE	Comprehensive Action Plan for Energy
CARB	California Air Resources Board
CAT	California Action Team
CCE	Community Choice Energy
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CPUC	California Public Utilities Commission
CSU	California State University
EIAS	Environmental Indicator Accounting Services
EIR	Environmental Impact Report
EO	Executive Order
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
FIT	Feed-in Tariff
FTE	Full Time Equivalent

FY	Fiscal Year
GHG	Greenhouse Gases
GPU	General Plan Update
HCAOG	Humboldt County Association of Governments
HFC	Hydrofluorocarbon
HSU	Humboldt State University
HTA	Humboldt Transit Authority
HWMA	Humboldt Waste Management Authority
ICLEI	International Council for Local Environmental Initiatives
ICT	Innovative Clean Transit
IEPR	Integrated Energy Policy Report
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Analysis
LEED	Leadership in Energy and Environmental Design
MFH	Multi-Family Home
MMT	Million Metric Tons
MT	Metric Tons
MW	Megawatt
NCRAQMD	North Coast Regional Air Quality Management District
NCRP	North Coast Resource Partnership
NCUAQMD	North Coast Unified Air Quality Management District
NEM	Net Energy Metering
O&M	Operations and Maintenance
OPR	Office of Planning and Research
PEV_FleEt	PEV Fleet Evaluation Tool
PG&E	Pacific Gas & Electric
PHEV	Plug-in Hybrid Vehicle
PRC	Public Resources Code
PSPS	Public Safety Power Shutoff
RCAA	Redwood Community Action Agency
RCEA	Redwood Coast Energy Authority

RPS	Renewable Portfolio Standard
RTS	Redwood Transit System
SB	Senate Bill
SCS	Sustainable Communities Strategies
SEEC	Statewide Energy Efficiency Collaborative
SERC	Schatz Energy Research Center
SIP	State Implementation Plan
SLCP	Short-Lived Climate Pollutants
SOC	Soil Organic Carbon
SUV	Sport Utility Vehicle
TMA	Transportation Management Association
U.S. EPA	United States Environmental Protection Agency
UNFCCC	United Nations Framework Convention on Climate Change
V	Volt
VMT	Vehicle Miles Traveled
WUI	Wildland Urban Interface
ZEB	Zero Emission Bus
ZEV	Zero Emission Vehicle

EXECUTIVE SUMMARY

This Public Review Draft Humboldt Regional Climate Action Plan (CAP) is a collaborative effort between the County of Humboldt, City of Arcata, City of Blue Lake, City of Eureka, City of Ferndale, City of Fortuna, City of Rio Dell, and City of Trinidad to craft a regional approach for addressing the challenges of climate change. A regional approach leverages staff time and resources, making the overall effort less of a burden compared to each jurisdiction drafting a CAP from scratch. It also enables improved coordination which will maximize the effectiveness of GHG reduction measures and may prove useful in securing grant funding.

The primary goal of the CAP is to reduce greenhouse gas (GHG) emissions from local sources because the scientific consensus is that significant reductions in human-caused GHG emissions are needed by the mid-21st century to prevent the most catastrophic effects of climate change.

The CAP begins with an inventory of baseline GHG emissions for the region in 2015 which leads to an understanding of where emissions are being generated and begins to reveal where effective emission-reduction strategies might be targeted. The inventory shows most local emissions come from transportation (53%), a difficult sector to address. Most of the remaining emissions are from livestock (13%), stationary combustion sources such as the use of natural gas and propane within buildings (12%), and electricity consumption (11%).

Geographically, emission sources loosely follow population figures, so Humboldt County with more than half of the region's population contributes the most (61%), followed by the Cities of Eureka (18%) and Arcata (12%). All the other cities combined contribute less than 10% of the countywide GHG emissions.

Based on the inventory results, the CAP makes forecasts of what countywide GHG emissions will be in the future out to the year 2040. Several scenarios are compared - one scenario uses a "Business as Usual" prediction assuming no GHG emission reduction measures will occur, and this scenario results in the highest emission rate in the future – 1.4 million metric tons of carbon dioxide equivalent ($MTCO_2e$) per year for the region by 2030.

A second scenario incorporates emissions reductions anticipated as the result of previous State and local actions, such as the waste reduction requirements mandated by SB 1383, without considering the measures in the CAP. This "legislative adjusted" emissions scenario forecasts a reduction in the emission rate to 1.2 $MTCO_2e$ by 2030. This amount is well short of the statewide goal of 0.96 $MTCO_2e$ per year for the region by 2030.

The third scenario assumes all the emission reduction measures in the CAP are implemented as well as the statewide measures. Only this third scenario – the one involving local efforts – is forecasted to achieve the statewide planning goals. It results in a forecasted GHG emission rate of 0.54 $MTCO_2e$ per year in 2030 for the region. This scenario meets the State's 2030 goals and puts the region in position to meet the longer-term goal of net-zero emissions by 2045 per Executive Order B-55-18.

Following examples from other CAPs and guidance from the International Council for Local Environmental Initiatives' *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (Community Protocol) the draft CAP proposes an inventory that

excludes project-level industrial sources of GHG emissions, also known as "point source" emissions. This approach makes sense considering local governments normally have no discretion over industrial air pollutants which are regulated by the North Coast Unified Air Quality Management District.

But there is room for debate on this issue, and because of the closure of pulp mills on the Samoa Peninsula and other industrial uses since 1990, an inventory that includes point source industrial emissions would show the County is closer to meeting statewide planning targets for 2030. This will be a topic of discussion for jurisdictions as the draft CAP moves forward to adoption.

The proposed GHG reduction measures in the CAP build on a long history of Humboldt residents' actions on climate change. The City of Arcata took an early lead in addressing GHG emissions in 2000 by establishing an Energy Committee and joined the International Council for Local Environmental Initiatives' (ICLEI) Cities for Climate Protection campaign. The City of Blue Lake adopted its first Climate Action Plan in 2014, and Humboldt County and the local energy provider Redwood Coast Energy Authority committed to 100% renewable energy sources by 2025.

The primary GHG reduction measures identified in the CAP will result in measurable, quantifiable reductions in emissions. Supporting measures are qualitative measures that are difficult to quantify but will still contribute to achieving local GHG reductions.

The top five measures in the CAP that achieve the most local GHG emissions reductions by

the year 2030 include:

- Measures 1.1.1.2 and 1.1.1.3: Replacing gas powered vehicles with electric vehicles will reduce annual emissions by 69,301 $MTCO_2e$.
- Measures 3.2.1.1 and 3.2.1.2: Replacing gas/propane residential water heating systems with electrically-powered systems will reduce emissions annually by 38,623 $MTCO_2e$.
- Measure 3.2.6.1: Replacing gas/propane commercial heating systems with electrically-powered systems will reduce emissions annually by 20,928 $MTCO_2e$.

While the measures included in the CAP are geared towards reducing GHG emissions, many will also result in environmental or economic "co-benefits," including improvements to public health. The CAP also discusses some GHG reduction measures that have not yet been quantified, but with further study may make important contributions to meeting the GHG reduction targets. For example, wetland restoration and enhancement projects such as those in the sloughs around Humboldt Bay are highly effective in sequestering additional carbon over time and holding it out of the atmosphere for long periods. Wetland restoration and enhancement projects also achieve the co-benefits of improvements in aquatic diversity and ecosystem health and productivity, and increase the resilience of these biologically rich systems to climate warming and sea level rise.

Implementation of the measures in the CAP will require the jurisdictions adopt new ordinances, programs and projects. Monitoring is an important aspect of the CAP to ensure the region is on track to achieve the GHG reduction targets. The CAP assumes regular

updates of the baseline information at least once every five years to track the community's progress on CAP implementation.

If statewide targets are met, jurisdictions may use the CAP to streamline the analysis of project-level GHG emissions during environmental review, pursuant to CEQA Guidelines Section 15183.5. Projects that are consistent with the CAP have no further GHG impact analysis requirements, which could save applicants thousands of dollars in permitting large projects.

Local actions to reduce GHG emissions and adapt to climate change require active and ongoing partnerships between residents, businesses, the cities and County, and many other agencies and organizations in the region. Refinement and adoption of the CAP is an important step in a long series of local actions that have and will be taken toward reducing the effects of climate change.

1. Introduction: The Framework for Humboldt County Climate Action

The Humboldt Regional Climate Action Plan (CAP) is the product of a multi-year, collaborative effort between:

- the County of Humboldt,
- City of Arcata,
- City of Blue Lake,
- City of Eureka,
- City of Ferndale,
- City of Fortuna,
- City of Rio Dell
- City of Trinidad, and
- the Redwood Coast Energy Authority (RCEA).

The following paragraphs summarize the chapters in the CAP:

Chapter 1 provides background on how and why this plan was created and how it will work. This chapter also contains a brief overview of GHG's, climate science and policy, as well as context on existing efforts to curb GHG emissions within the community.

Chapter 2 details GHG emissions in Humboldt County. In this chapter, GHG inventories are presented by sector with a discussion of baseline inventory years, data collection and the choice of sectors included in the analysis. Results are presented by sector and jurisdiction.

Chapter 3 presents a vision for our region in the coming decades, as well as broad goals to help achieve that vision. These goals are translated into GHG emissions targets and compared to business-as-usual forecasts. This vision and set of goals and targets are placed in the context of State, national, and global efforts.

Chapter 4 presents a plan for reducing our region's emissions to meet our targets. Strategies for each sector, including the potential for emissions reduction for individual sectors, are presented at the beginning of each sub-section. The rationale for focusing on certain strategies, legal and regulatory limitations, and the impacts of existing legislation and rulemaking are provided. Individual measures are the "tactics" that fit into these overall, sector-based strategies.

Co-benefits are also described in Chapter 4. These are other noteworthy benefits of the implementation measures beyond GHG reduction. For instance, encouraging commuters to use bikes instead of gas-powered vehicles to get to work not only reduces GHG emissions, but has health co-benefits as well.

Chapter 5 includes high-level actions to enhance carbon storage on Humboldt County's natural and working lands (forest lands, agricultural lands, and wetlands) and in its urban areas.

Chapter 6 describes how the region will work together in the coming years to maximize the effectiveness of the CAP and contains jurisdiction commitments, along with specifics of implementation, updating, monitoring, and adaptive management. It also includes reference citations for each chapter.

1.1 KEY OUTCOMES

Key outcomes of the Humboldt Regional Climate Action Plan include:

Reduce greenhouse gas emissions. The immediate goal of the draft CAP is to reduce greenhouse gas emissions to 40% below 1990 levels consistent with statewide targets. Achieving this goal will improve the chances our region can meet the state's longer term goal to become carbon neutral by 2045.

An integrated approach. This effort was founded on the principle that more can be achieved by working together. An important outcome of this plan will be enhanced regional coordination on GHG emission reduction programs and other initiatives addressing climate change. A staff position dedicated to CAP coordination, referred hereafter as the "CAP Coordinator" and described in section 6.1, will be created to facilitate coordination between jurisdictions and implementation of the CAP.

Public engagement. Development of the draft CAP was guided by public input at several workshops, and an extensive public outreach effort will be undertaken for environmental review and adoption of the CAP. Implementation of this plan will require active participation and engagement from the community, as well as with agencies' management and elected officials. A stakeholder group is anticipated to be convened after adoption of this CAP, and public education and outreach will occur throughout implementation of the CAP's action items.

Permit Streamlining. Adoption of a CAP that meets State requirements enables a streamlined path through the analysis of project-level GHG emissions during environmental review. Finding consistency with the CAP is the only documentation needed for analysis of GHG emissions, which could save applicants thousands of dollars in permitting large projects.

Clean energy jobs. This plan encourages investments in renewable energy workforce development and clean energy infrastructure. By 2030 local electricity is expected to be 100% renewable which will support this new workforce.

Waste diversion. SB 1383 Short-Lived Climate Pollutants, adopted in 2016 by the State Legislature, establishes a target to divert 75 percent more waste from landfills by 2025 to help reduce carbon emissions. Measures to divert organic waste from landfills will help our community achieve State mandates as emissions are cut. Limiting the amount of waste sent to landfills helps conserve valuable materials and reduces burden on the environment.

More accessible communities. Implementing this CAP will make it easier, cheaper, and more fun to get around the County and the cities by improving accessibility of public transit, expanding shared mobility, promoting active transportation modes like walking and biking; and making communities more compact and connected.

Leveraging the carbon sequestration ability of natural and working lands. Efforts to restore, manage, and conserve natural and working lands (forest and agricultural lands) can have profound impacts on the climate and our ability to adapt. This CAP includes a high-level overview of carbon sequestration and wildland adaptation, along with measures to support conservation and restoration of natural and working lands.

Cleaner indoor and outdoor air. Several CAP measures encourage fuel-switching from fossil fuels like gasoline, diesel, natural gas and propane to all-electric in homes and vehicles. In addition to emitting GHGs, the burning of fossil fuels releases pollutants that can harm human health. Electrification measures presented in Chapter 4 of the CAP helps us reduce GHG emissions and breathe healthier air.

1.2 OVERVIEW

Climate change is increasingly negatively affecting local ecosystems, human health, economic values, infrastructure, and water supplies. For example, the Humboldt Bay region is experiencing the highest rate of sea level rise on the west coast of North America, and flooding in coastal communities such as Fairhaven, Fields Landing, and King Salmon is expected to become more commonplace in the coming decades. In California, wildfire hazards are intensifying due to higher temperatures, which affects air quality, and in turn, health. As global GHG emissions continue to rise, these problems are expected to intensify.

In the meantime, communities, governments, and businesses have been working to cut emissions and end fossil fuel dependence. Per Executive Order N-79-20, California will no longer allow sales of new gas or diesel-powered vehicles in the State past 2035. General Motors, one of the world's largest automakers, has pledged to stop making gasoline or diesel-powered vehicles by 2035 as well. In California, communities are ending the construction of new fossil fuel infrastructure in homes by passing decarbonization ordinances. For instance, the City of Petaluma recently banned the construction of new gas stations to become carbon neutral by 2030. It is clear that an energy transition is coming, but how will that affect Humboldt County?

Climate action planning provides an opportunity to make global and statewide efforts relevant at the local level. Cities and counties typically control land use, infrastructure, and community services; thus, local governments have an important role to play in collaborative efforts to address climate change.

This CAP recognizes local actions to reduce GHG emissions and adapt to climate change requires active and ongoing partnerships between residents, businesses, the cities and County, and many other agencies and organizations in the region. This CAP outlines strategies to be implemented between 2022 and 2030 to reduce county-wide GHG emissions[1] to 40% below 1990 levels by 2030 and make progress toward the State's goal of zero net emissions by 2045.

In California, local climate action planning is typically comprised of the following six planning steps:

[1] Net-zero emissions means that any greenhouse gas emissions from human activity are balanced by additional efforts to capture and store carbon

Approval of this draft CAP by jurisdictions will complete the first three steps and sets a course for completion of all the rest.

The GHG inventories in Chapter 2 of this CAP (Step 1) include the following sectors:

- Mobile Combustion (transportation)
- Livestock
- Electricity
- Stationary Combustion (e.g. home heating)
- Solid Waste
- Wastewater Treatment
- Leaked Refrigerants

Site-specific or "point source" industrial sources of GHG emissions are also described in some detail. The draft CAP proposes to exclude these emissions from the inventory following examples from other CAPs and guidance from the International Council for Local Environmental Initiatives' *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (Community Protocol). While this approach has merit, other considerations suggest industrial point sources should be included in the GHG inventory, so it will be an alternative for discussion. More information on the issue is presented in Chapters 2 and 3.

Based on the inventory of GHG emissions this CAP articulates a set of goals, strategies, objectives and quantified measures to reduce emissions from:

- Mobile Combustion (transportation)
- Electricity
- Stationary Combustion (e.g. gas and propane appliances)
- Solid Waste

High-level unquantified measures to sequester carbon on working lands and natural areas will supplement the measures reducing GHG emissions and position the region to become carbon-neutral by 2045. These measures were reviewed by representatives from each jurisdiction with input from public workshops, and they will be refined by more extensive public outreach during the environmental review and adoption phases. Community meetings in 2022 will help each jurisdiction select the measures that best fit, and they will all be combined together to form the Regional CAP.

The proposed measures in this CAP achieve GHG emission reductions that meet the State's target for 2030 (40% below 1990 levels), and if the final adopted version also meets that target, the CAP will be helpful for streamlining environmental review of future development. It should be noted that some communities in California have chosen a different path, approving instead CAPs that are more aspirational and don't meet State targets. In these communities, permitting development of large projects can be more cumbersome because of the project-level GHG analysis required, which adds time and costs to the permit review process. While to date there has been no support expressed for this alternate approach for the CAP, it is an option available to Humboldt County jurisdictions.

Ultimately, this CAP will be a commitment by the County of Humboldt and the seven cities within its boundaries to a set of measurable, concrete actions that will enable meeting targets agreed upon by member jurisdictions. It is anticipated a staff position will be created and a stakeholder group formed after the CAP is approved to assist local governments implement and monitor the CAP measures, and guide future updates.

In developing and implementing the CAP, this region recognizes its place in solving a global problem. It demonstrates how Humboldt County's local governments are committed to working in partnership with the State to address the impacts of climate change.

1.3 CLIMATE SCIENCE BACKGROUND

There is broad consensus in the scientific community that the Earth's climate is changing rapidly, primarily because of human activity—namely, the release of heat-trapping GHGs into the atmosphere. The impacts of rising temperatures will be wide-ranging, with different areas facing unique sets of challenges. A 2018 study of projected climate change impacts in California's North Coast region—encompassing Mendocino, Humboldt, Del Norte, Lake, Trinity and Siskiyou Counties—found the following:[2]

- Average annual maximum temperatures are likely to increase by 5-9 °F throughout the region through the end of the 21st century. Interior regions will experience the greatest degree of warming, with less warming projected along the coast.
- Annual precipitation is not expected to change significantly but will likely be delivered in more intense storms and within a shorter wet season. As a result, the region is expected to experience prolonged dry seasons and reduced soil moisture, even if annual precipitation stays the same or moderately increases. Less precipitation will fall as snow, snow will tend to melt more quickly and average snowpack will fall to historically low levels.
- A rise in extreme precipitation events is likely to increase the frequency and extent of flooding in low-lying areas, particularly along the coast, where food production will be impacted by rising sea levels.

[2] Grantham, Theodore (University of California, Berkeley). 2018. North Coast Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCC4A-2018-001. Disclaimer: This report summarizes recent climate research, including work sponsored by the California Natural Resources Agency and California Energy Commission. The information presented here does not necessarily represent the views of the coordinating agencies of the State of California.

- Streamflow in the dry season is expected to decline, and peak flows in the winter are likely to increase.
- Sea level rise projections vary along the coast but are greatest for the Humboldt Bay region and Eel River delta, threatening communities, prime agricultural land, critical infrastructure and wildlife habitat. Rising sea levels will result in rising groundwater levels near the coast, causing increased backwater flooding from reduced stormwater drainage capacity and emerging groundwater.
- Wildfires will continue to be a significant disturbance in the region. Future wildfire projections suggest a longer fire season, an increase in wildfire frequency and severity and an expansion of the area susceptible to wildfire.

These changes will have significant consequences for ecosystems, working lands and the built environment. These include:

- Increased flood and landslide risks to critical infrastructure, including major transportation corridors, water supply systems, wastewater treatment plants and energy and communication networks.
- Increased public health risks from wildfire, floods, heat waves, and disease. These risks are greatest for vulnerable populations along the coast and in remote inland communities.
- Reduced productivity of rangelands.
- Habitat loss for sensitive plant and wildlife species, including cold-water fish species such as salmon.

The Humboldt Bay Area Plan Sea Level Rise Assessment, released in 2018, projects the impacts of sea level rise in the coming decades. With a sea level rise of three feet near Humboldt Bay, which, in a business-as-usual emissions scenario, is projected to occur by 2070, “roughly 35 miles of barrier shoreline could be overtopped. King tides could reach that level as early as 2050, based on current high projections for sea level rise. In addition, approximately 10,000 acres of agricultural land; Highways 101 and 255; municipal water and wastewater lines; electrical distribution infrastructure, gas lines, and optical fiber communications lines; and the communities of King Salmon, Fields Landing and Fairhaven, could all become tidally inundated if tidal waters on Humboldt Bay rise three feet.”

The findings of two reports mentioned above likely represent just a fraction of potential impacts of climate change on Humboldt County. Research on potential climate change outcomes is ongoing; these impacts are complex and will ripple throughout communities.

These planning documents have been prepared to reflect a “business-as-usual” or “high” emissions scenario where emissions continue to rise to the end of the century. Much of the harm done to communities, infrastructure and ecosystems is unavoidable because of the emissions that have already been released and the warming that has already occurred; however, there is still time to reduce emissions and stave off some of the very worst impacts of climate change.

In December of 2015, most of the world’s countries came together at the United Nations Framework Convention on Climate Change (UNFCCC) annual meeting in Paris. The international treaty adopted there, known as the “Paris Agreement,” set a goal of limiting global average temperature rise to below 2° Celsius relative to pre-industrial average temperatures. Current data suggests global average temperatures have risen 1° Celsius since the beginning of the industrial revolution, so we are halfway to the limit set by the Paris Agreement.

Emissions targets set at the local, state and federal levels reflect targets set in international agreements. International agreements are based on recommendations from the IPCC. The IPCC collaboratively evaluates worldwide scientific efforts to model climate change and its impact on earth systems. To achieve the goal of the Paris Agreement, nations will need to transition to renewable energy resources for transportation, home heating, and electricity generation by 2045. As that transition progresses, vehicles and buildings will need to become more energy efficient. To offset any remaining human-caused GHG emissions, we must also find ways to maximize carbon sequestration in forests and agricultural lands, and develop technological solutions and other innovations to sequester carbon.

1.4 Regulatory, Legislative, and Agreements Framework

To stabilize GHG emissions and reduce the impacts of climate change, international agreements, as well as federal and State actions have been occurring since as early as 1988. This section highlights some key State agencies, programs and regulations that are relevant to this climate action planning effort.

California Air Resources Board

The California Air Resources Board (CARB), a part of the California Environmental Protection Agency (CalEPA), is responsible for the coordination and administration of both federal and State air pollution control programs in California. In this capacity, CARB conducts research, sets air quality standards, compiles emissions inventories for GHGs and other pollutants and develops suggested control measures.

Assembly Bill 32, "Global Warming Solutions Act of 2006" and Senate Bill 32 (2016)

In 2006, the California State Legislature passed the Global Warming Solutions Act, a bill that established GHG reduction targets for the State and sketched out a program of action to reach those targets. AB 32 required CARB to adopt rules and regulations directing State actions to reduce GHG emissions to 1990 statewide levels by 2020.

In October 2007, CARB published its Final Report for Proposed Early Actions to Mitigate Climate Change in California. Resulting from this were three new regulations, including a low carbon fuel standard and improved standards for landfill methane capture.

In 2008, CARB adopted the Climate Change Scoping Plan, detailing California's strategy to achieve its 2020 GHG target. The Scoping Plan proposes a comprehensive set of actions designed to reduce overall GHG emissions in the State, improve the environment, reduce dependence on oil, diversify energy sources, save energy, create new jobs and enhance public health. An update to the Scoping Plan occurred in 2017, and a 2022 Scoping Plan Update is currently in development.

In 2016 with passage of Senate Bill 32 the California State Legislature updated the 2006 law to set a new target ensure that statewide greenhouse gas emissions are reduced to at least 40 percent below 1990 levels no later than December 31, 2030.

California Code of Regulations (CCR) Title 24, Parts 6 and 11 Building Code Energy Efficiency Standards

CCR Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24) was first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated every three years to allow consideration and possible incorporation of new energy efficiency technologies and methods. The 2019 Title 24 update includes a requirement for all new residential buildings under three stories to install solar panels.

On January 12, 2010, the California Building Standards Commission adopted the 2010 California Green Building Standards Code, otherwise known as CALGreen (CCR Title 24, Part 11). Like Part 6 described above, these standards are updated every three years with 2019 being the most current version (soon to be 2022). The list below identifies the most significant CALGreen requirements. Additionally, CALGreen encourages local governments to adopt more stringent voluntary provisions, known as Tier 1 and Tier 2 provisions, to further reduce air pollutant emissions, improve energy efficiency, and conserve natural resources. If a local government adopts one of the tiers, the provisions become mandates for all new construction within that jurisdiction. CALGreen includes the following provisions (amongst other requirements):

- A 20 percent mandatory reduction in indoor water use, with voluntary goal standards for 30 percent, 35 percent, and 40 percent reductions.
- Separate indoor and outdoor water meters to measure nonresidential buildings' indoor and outdoor water use, with a requirement for moisture-sensing irrigation systems for larger landscape projects.
- Diversion of 50 percent of construction waste from landfills.
- Mandatory periodic inspections of energy systems (i.e., heat furnace, air conditioner, mechanical equipment) for nonresidential buildings over 10,000 square feet to ensure all are working at their maximum capacity according to their design efficiencies.
- Mandatory use of low-pollutant-emitting interior finish materials such as paints, carpet, vinyl flooring, and particleboard.

CEQA Guidelines (Section 15183.5): Tiering and Streamlining the Analysis of Greenhouse Gas Emissions

In 2010, the State revised California Environmental Quality (CEQA) Guidelines to address the analysis and mitigation of GHG emissions. CEQA Guidelines Section 15183.5 allows a Climate Action Plan to provide streamlining benefits for agencies leading the CEQA process for a project if the CAP meets certain requirements, including demonstration that the CAP's emission reduction measures, implemented on a project-by-project basis, will collectively achieve the plan's target. This Climate Action Plan is designed to fulfill these requirements. Once the CAP is adopted, future projects subject to CEQA may address GHG impacts by demonstrating compliance with the applicable measures in the CAP.

Renewable Portfolio Standard

The State's Renewable Portfolio Standard (RPS) was established in 2006. The RPS program requires sellers of electricity to provide renewable energy. The initial goal of RPS was 20% renewable energy production by 2010. In 2018, the State adopted RPS goals of 60% renewable electricity by 2030 and 100% carbon-free electricity by 2045.

Vehicular Emissions Regulations

In 2002, Assembly Bill (AB) 1493 ("Clean Car Standards") was passed, which required CARB to develop and adopt regulations that achieve "the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty trucks and other vehicles determined by the ARB to be vehicles whose primary use is noncommercial personal transportation in the state." These regulations required automakers to produce vehicles that, on average, reduced GHGs by approximately 30% from 2002 levels by 2016. A second set of regulations "Low Emission Vehicle (LEV) III GHG" covers model years 2017 through 2025.

Executive Order S-1-07 (2007). established a goal of reducing the carbon intensity of transportation fuels sold in California. A recent update established a goal to reduce the carbon intensity of transportation fuels by 20% by 2030.

Organic Waste Regulations

In September 2016, the State Legislature set methane emissions reduction targets for California in a statewide effort to reduce emissions of "short-lived climate pollutants" (SLCP). The targets must reduce organic waste disposal 50% by 2020 and 75% by 2025, and reduce by 20% the amount of currently disposed surplus food by 2025.

1.5 Building on Existing Climate Action Efforts in Humboldt County

In addition to advancing local government efforts, this CAP seeks to build on existing initiatives outside the scope of city and county agencies. Throughout Humboldt County, educational institutions, nonprofits and tribal governments have shown leadership in climate action. A few examples of such leadership are highlighted below.

California Polytechnic University, Humboldt

Cal Poly Humboldt (formerly "Humboldt State University" or "HSU") adopted a Climate Action Plan on December 12, 2016, that sets goals to reduce GHG emissions to 1990 levels by 2020, to 80% below 1990 levels by 2040, and to become carbon neutral by 2050. Cal Poly Humboldt's CAP includes strategies to curb GHG emissions resulting from the university's energy consumption and indirect emissions from related activities – business travel, student and employee commute, and solid waste disposal. The plan calls for cutting energy-related emissions through energy efficiency and energy conservation projects, on-site renewable energy generation and the purchase of power generated by renewable sources. Cal Poly Humboldt's CAP calls for reducing indirect emissions through campus-wide waste reduction strategies and alternative transportation and public transit programs that will lessen business travel and lead to reductions in single-occupant vehicle commuter trips.

Tracking and reporting progress towards achieving reduction targets takes place on an annual basis. The Cal Poly Humboldt reviews its CAP every five years to update its strategies and reduction targets. The university released a draft update, "CAP 2.0," in early 2022 and will publish a final draft in April 2022.

North Coast Resource Partnership (NCRP)

The North Coast Resource Partnership (NCRP) is a stakeholder-driven collaboration among local governments, watershed groups, Tribes and interested partners focused on a sustainable environmental and socio-economic framework for the North Coast. The NCRP coalition (formerly known as the North Coast Integrated Regional Water Management Plan) consists of seven north coast counties (Del Norte, Siskiyou, Modoc, Humboldt, Trinity, Mendocino, and Sonoma), the Sonoma County Water Agency, the Mendocino County Water Agency, and North Coast Tribes. The NCRP focuses on attracting funding to the North Coast Region.

The NCRP planning team has identified and described key issues of concern in the North Coast region. The themes that have guided the NCRP's work are:

- Beneficial uses of water
- Salmonid enhancement
- Energy independence
- Climate adaptation/mitigation
- Economic vitality
- Local autonomy
- Intraregional cooperation
- Adaptive management

Redwood Coast Energy Authority (RCEA)

RCEA is a local government Joint Powers Agency founded in 2003 whose members include the County of Humboldt, the Cities of Arcata, Blue Lake, Eureka, Ferndale, Fortuna, Rio Dell,

and Trinidad and the Humboldt Bay Municipal Water District. RCEA develops and implements sustainable energy initiatives that reduce energy demand, increase energy efficiency and advance the use of renewable resources.

RCEA's guiding strategic document is RePower Humboldt. It was initially adopted in 2012 and updated in 2019. The first RePower plan outlined how Humboldt County could transition to a low-carbon, renewable energy-powered economy by 2030. A key recommendation in the plan was to create a local Community Choice Energy (CCE) program. In 2017, RCEA launched Humboldt County's CCE program, which provides service to most Humboldt County electricity customers.

The State's Renewable Portfolio Standard (RPS) puts California on a path toward 100% zero-carbon electricity by 2045. RCEA plans to meet this goal in an accelerated timeframe for Humboldt County. The RePower Plan update establishes a goal to procure only local renewable sources of electricity by 2030.

Native American Tribes

(Note: this discussion will be added with tribal consultation during the review of the Environmental Draft. It is acknowledged some tribes are way out in front of many jurisdictions in their climate action planning efforts.)

- Blue Lake Rancheria
- Bear River Band of the Rohnerville Rancheria
- Hoopa Valley Tribe
- Karuk Tribe
- Trinidad Rancheria
- Wiyot Tribe
- Yurok Tribe

2 GHG Emissions in Humboldt County

2.1 Introduction to GHG emission inventories

GHG emissions inventories identify and quantify emissions sources in the community which is critical for development of effective emission-reduction strategies.

To Initiate the Climate Action Plan (CAP) process, Redwood Coast Energy Authority (RCEA) inventoried local emissions in the past, present and future.

The **2015 Emissions Inventory** described in detail later in this chapter beginning on page 2-5 gives a snapshot of local emissions from a variety of sources and activities in the year 2015. For the purposes of this CAP, it serves as an estimate of present-day emissions.

The **1990 Emissions Inventory** provides historical information that puts current emissions levels in perspective. This historic data serves as a baseline for this CAP's target of reducing emissions 40% below 1990 levels by 2030. The participating cities and the County chose 1990 as a baseline year to follow the State of California's lead—Assembly Bill (AB) 32 and Senate Bill (SB) 32 set statewide targets that use 1990 emissions levels as a baseline.

The **Countywide Emissions Forecasts** model future emissions scenarios using the 2015 inventory data as a starting point.

The inventories use RCEA's Humboldt County GHG Inventory tool which was developed in accordance with the International Council for Local Environmental Initiatives' (ICLEI) *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (Community Protocol). The Community Protocol is the standard methodology for emissions accounting in local government Climate Action Plans. For more information on RCEA's inventory methodology, see Appendix G - County-Wide 2015 Emissions Inventory Report.

The inventories serve primarily as a tool to inform policies, rather than a comprehensive analysis of all the ways our communities contribute to climate change. They estimate the primary sources of emissions that can be reduced through the actions of local governments and regional entities. The Inventory Methodology in Appendix G details the rationale used to select the categories included in the inventory.

Following adoption of this CAP, it is anticipated RCEA will regularly prepare inventory updates to monitor progress towards emissions targets.

2.2 Comparing GHGs

The largest contributor to climate change is CO_2, and it is also the most recognized GHG. However, the Humboldt County inventories also include emissions of other GHGs such as methane, nitrous oxide, and refrigerant gases. Compared to CO_2, these GHGs are emitted in lower quantities locally. Still, they are important to include in the analysis due to their potency in trapping heat in the atmosphere.

Global Warming Potential (GWP) is the most common means of comparing the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time (how much heat it will trap in our atmosphere), relative to the emissions of one ton of carbon dioxide (CO_2). The time period usually used for GWPs is 100 years.

GHG	Atmospheric Lifetime (yrs.)	Global Warming Potential (GWP)	Primary Current Sources
Carbon Dioxide (CO_2)	200 - 500	1	Fossil fuel use, land use, cement
Methane (CH_4)	12	21	Fossil fuel use, agriculture
Nitrous Oxide (N_2O)	120	310	Agriculture
Hydrofluorocarbons (HFCs)	2,600-50,000	150 to 11,700	Refrigeration systems

Table 2-1. Global warming potential of some GHGs. Source US EPA
https://www.epa.gov/ghgemissions/overview-greenhouse-gases

To allow for comparison of different GHGs, emissions inventories typically use 100-year GWP values to convert emissions of GHGs like methane, nitrous oxide, and refrigerants into a measurement known as **carbon dioxide equivalent (CO_2e).** The standard unit for GHGs in an inventory is Metric Tons (MT) CO_2e. The CO_2e measurement can be useful to translate amounts of other GHGs into an equivalent amount of CO_2 for an "apples to apples" comparison. In the case of methane, 1 MT of methane is converted to 28 MT CO_2e, because one unit of methane absorbs 28 times more energy (trapping more heat in our atmosphere) than one unit of CO_2.

2.3 Overview of Sources and Activities Included in the Inventories

There are two categories of emissions captured in the CAP's GHG inventories:

1) **GHG emissions produced by sources located within the community boundary**. For example, transportation is considered an emissions source, because GHGs from vehicle use are produced within the community boundary. For this CAP, the community boundary is the entirety of Humboldt County.

2) **GHG emissions resulting from community activities**. For example, emissions from power plants that provide electricity to local homes and businesses are included, even though many of the power plants may not be located within the county.

The inventory primarily focuses on emissions sources. Some activities that generate emissions outside county boundaries are included, but only to the extent that such emissions are the direct result of community activities that can be reduced through local government actions.

Below is a brief overview of the sources and activities included in the GHG inventories:

ACTIVITY: ELECTRICITY CONSUMPTION

Emissions associated with electricity used in Humboldt County are generated at fossil fuel-fired power plants both within and outside county boundaries.

SOURCE: STATIONARY COMBUSTION

Stationary combustion refers to the on-site use of natural gas, propane, and wood in residential and commercial buildings. The combustion of these fuels directly emits GHGs

SOURCE: TRANSPORTATION

GHGs like CO_2 are a byproduct of fuel combustion within a vehicle's engine. This category captures emissions from the combustion of gasoline, diesel, and other fuels by on and off-road vehicles traveling within Humboldt County.

ACTIVITY: SOLID WASTE GENERATION

The decomposition of solid waste releases GHGs—primarily methane—into the atmosphere. This inventory activity captures emissions associated with the decomposition of the most common types of landfilled waste (paper, food, plant, animal, wood, and textile wastes) generated within Humboldt County, regardless of landfill location. Humboldt County no longer has any active landfills, and landfill-bound waste generated here is trucked to facilities outside of the county. Emissions resulting from the transport of waste are accounted for in the transportation sector.

SOURCE: CUMMINGS ROAD LANDFILL

The Cummings Road Landfill was slated for closure in 2000 and has not received any solid waste since 2005. Though the landfill is closed and capped with sand and soil, it still releases some methane.

SOURCE: WASTEWATER TREATMENT

GHGs are emitted directly from the processing of wastewater. The inventories include emissions from wastewater treatment plants and fugitive emissions from septic tanks.

SOURCE: LEAKED REFRIGERANTS

Even though the quantity of leaked refrigerants is generally small, refrigerant gases can be hundreds or even thousands of times more potent than CO_2 in terms of their heat-trapping effects. The Humboldt County inventory estimates the emissions associated with stationary and mobile refrigeration equipment (such as refrigeration units carried by food delivery trucks) operated within county boundaries.

SOURCE: INDUSTRIAL POINT SOURCES

"Point source" emissions are generated directly from processes at industrial facilities within the county, such as lumber mills, cement plants, asphalt plants, and other goods and materials manufacturing facilities. Industrial facilities are required to monitor pollutant emissions, and this data is tracked by the North Coast Unified Air Quality Management District (NCUAQMD).

ACTIVITY: AIR TRAVEL

Air travel contributed a very minor percentage of County-wide emissions in each of the inventory years. Emissions associated with commercial and private airplane flights are estimated using total fuel sales data obtained from the County Public Works Department of Aviation.

SOURCE: **MARINE VESSELS**

Emissions from marine vessels also constitute a small percentage of the inventory totals. This source includes emissions associated with marine freight and passenger vessels. Freight-carrying vessels may include ships, barges, tugboats, towboats, fishing vessels, patrol boats, and industrial boats (such as drilling boats and dredges). Passenger-carrying vessels consist of recreational boats. This source is only likely to be significant if an operating port exists within the community, which is the case for Humboldt Bay.

SOURCE: **LIVESTOCK**

The digestion process of ruminant animals like cows and sheep produces the GHG methane. The inventory includes estimates of emissions generated by beef cattle, dairy cows, and sheep in Humboldt County, as well as emissions resulting from manure management.

2.4 2015 GHG Inventory

In the year 2015, sources and activities in the County generated the equivalent of 1.5 million tons of carbon dioxide. This is comparable to a single car driving four billion miles, or roughly a year's worth of carbon sequestration in two million acres of U.S. forests.

The 2015 countywide inventory presented in the chart below reveals four categories of GHG emissions are responsible for the vast majority (83%) of emissions in he region: transportation, livestock, stationary combustion, and electricity consumption.

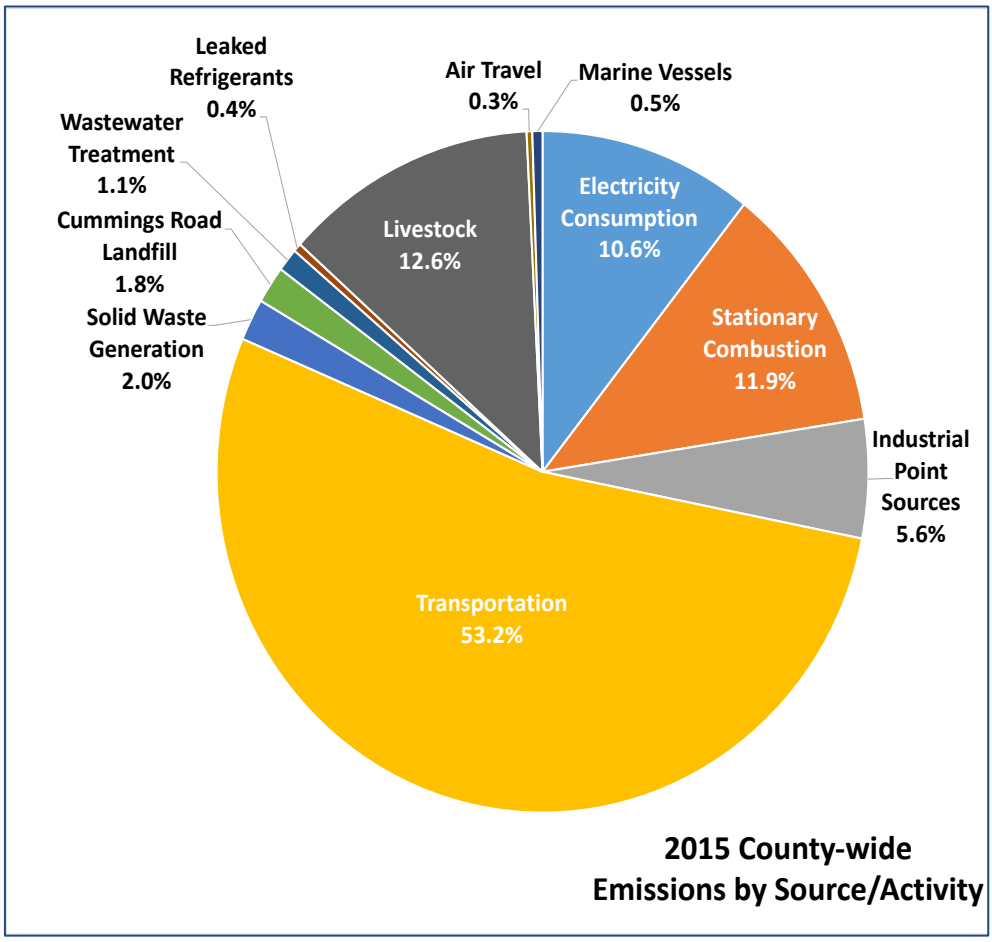

Figure 2-1. Total 2015 emissions broken down by source and activity in Humboldt County, including Industrial Point Source emissions.

Looking closely at these categories allows us to develop climate action strategies to effectively address the primary drivers of emissions in our community.

TRANSPORTATION (53%)

Mobile combustion accounts for 53% of total countywide emissions. The transportation inventory category includes emissions from passenger vehicles, retail and commercial trucks and off-road vehicles and equipment.

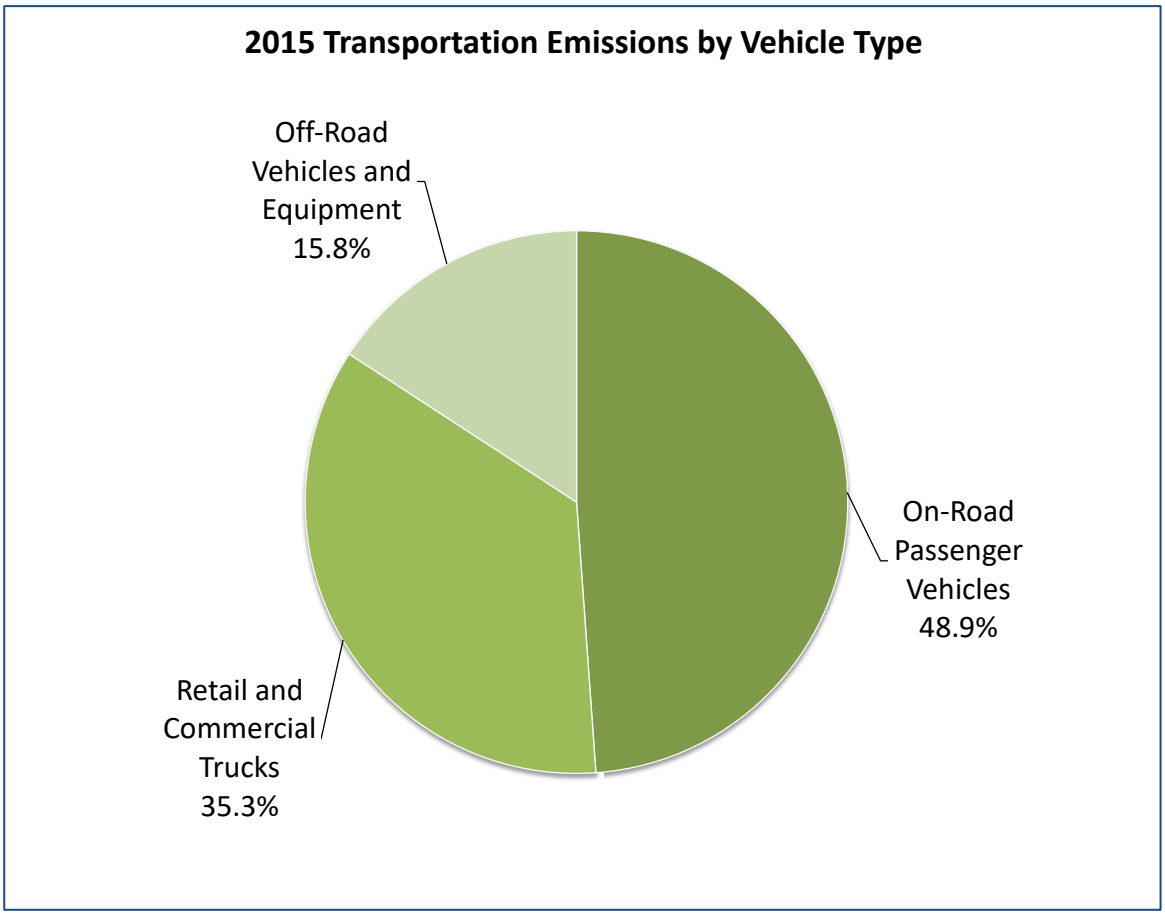

Figure 2-2. Breakdown of transportation emissions

To calculate transportation emissions, RCEA relied on a Caltrans' estimate of the total miles traveled by vehicles within Humboldt County in the year 2015. Emissions vary with vehicle and fuel type, so RCEA also incorporated data on fuel consumption and types of vehicles registered in the county.

LIVESTOCK (13%)

Agricultural land uses make up about one quarter of total land area in Humboldt County. The vast majority of these farms and ranches are located in unincorporated areas.

Using head count data from the County Agricultural Commissioner, RCEA estimated the methane and nitrous oxide generated by beef cattle, dairy cows and sheep in Humboldt County, as well as manure from those animals.

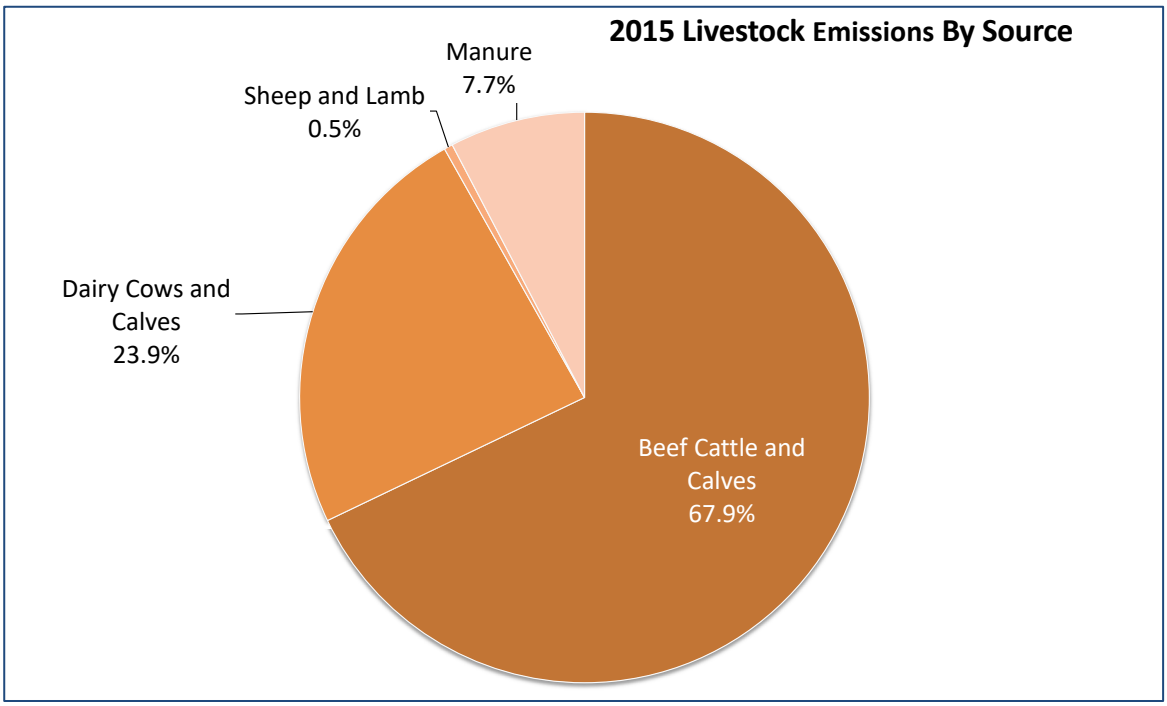

Figure 2-3. Breakdown of livestock emissions

In the 2015 inventory, 73% of total livestock emissions are attributed to beef cattle. Dairy cows produce more methane per cow than beef cattle; however in 2015 there were nearly four times as many beef cattle in Humboldt County than dairy cows.

The methodology used for the inventory may have overestimated the climate impacts of pasture-raised cattle, which is the method used for local beef cows.[3]

STATIONARY COMBUSTION (12%)

This inventory category estimates the emissions from three fuel sources used in buildings: natural gas, propane and wood. In Humboldt County buildings, these fuels are primarily used for cooking and space heating. PG&E provides natural gas service in many areas of Humboldt County. Homes and businesses in Trinidad, Ferndale and many unincorporated areas rely on propane and wood for fuel.

[3] UC Davis. Rethinking methane. https://clear.ucdavis.edu/news/methane-has-been-achilles-heel-cattle-emissions-it-may-be-part-climate-solution

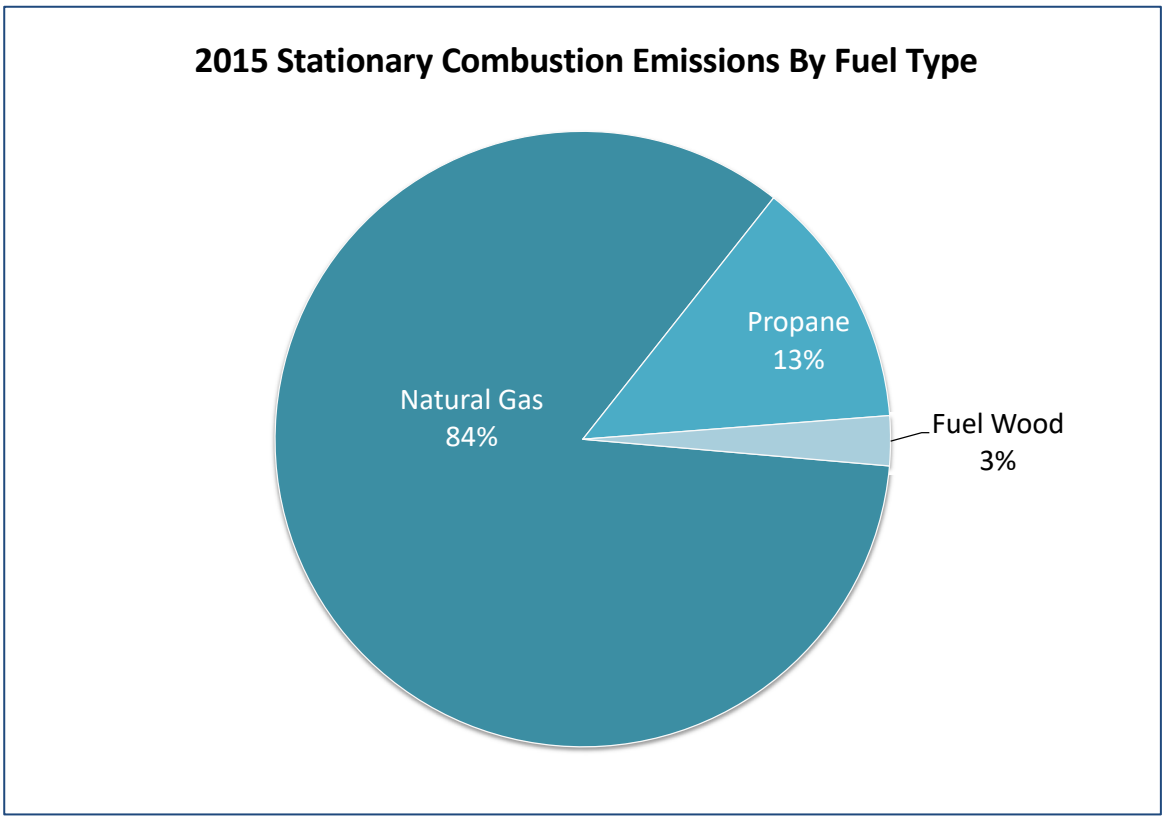

Figure 2-3. Breakdown of emissions from stationary combustion

Data on natural gas consumption is sourced from PG&E. Propane and wood usage estimates are limited to residential buildings only and based on US census data.

ELECTRICITY CONSUMPTION (11%)

In the 2015 inventory, electricity consumption emissions are based on two factors: the amount of electricity consumed in Humboldt County and where that power came from.

Different electricity sources have different "emissions factors"—for example, in producing 1 MW of electricity, a coal-fired power plant generates more GHGs than a natural gas facility does. The emissions factors used to convert electricity consumption into GHG emissions were sourced from Pacific Gas & Electric (PG&E) and reflect the average mix of electricity procured in the inventory year. Figure 1 below depicts PG&E's power mix in the year 2015.

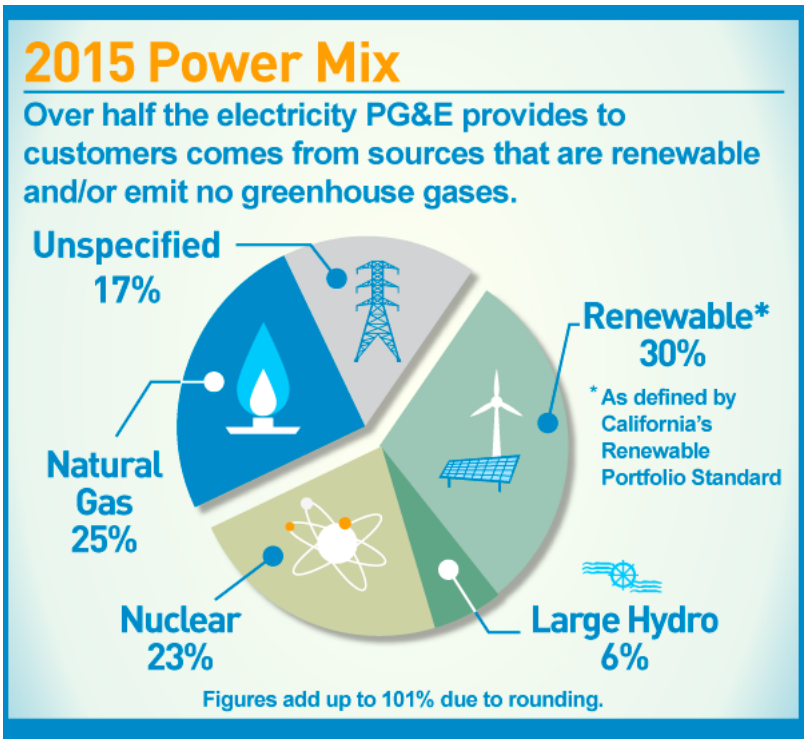

Figure 2-4. 2015 PG&E Power Mix. According to PG&E, "Unspecified" sources of power means "electricity from transactions that are not traceable to specific generation sources". Source: https://www.pgecurrents.com/2016/04/25/infographic-power-mix-2015/

As mentioned in Figure 2-4 above, PG&E uses the State's definition of "renewable" sources of electricity, which includes wind, solar, geothermal and biomass. Following the State's lead, these sources were assigned an emissions factor of zero in the Humboldt County GHG inventories.

Emissions by Jurisdiction

RCEA's GHG analysis for the year 2015 also includes a separate inventory for each jurisdiction participating in this CAP. An overview of emissions data for the unincorporated areas and the cities of Arcata, Blue Lake, Eureka, Ferndale, Fortuna, Rio Dell and Trinidad can be found in Appendix G: County-Wide 2015 Emissions Inventory Report.

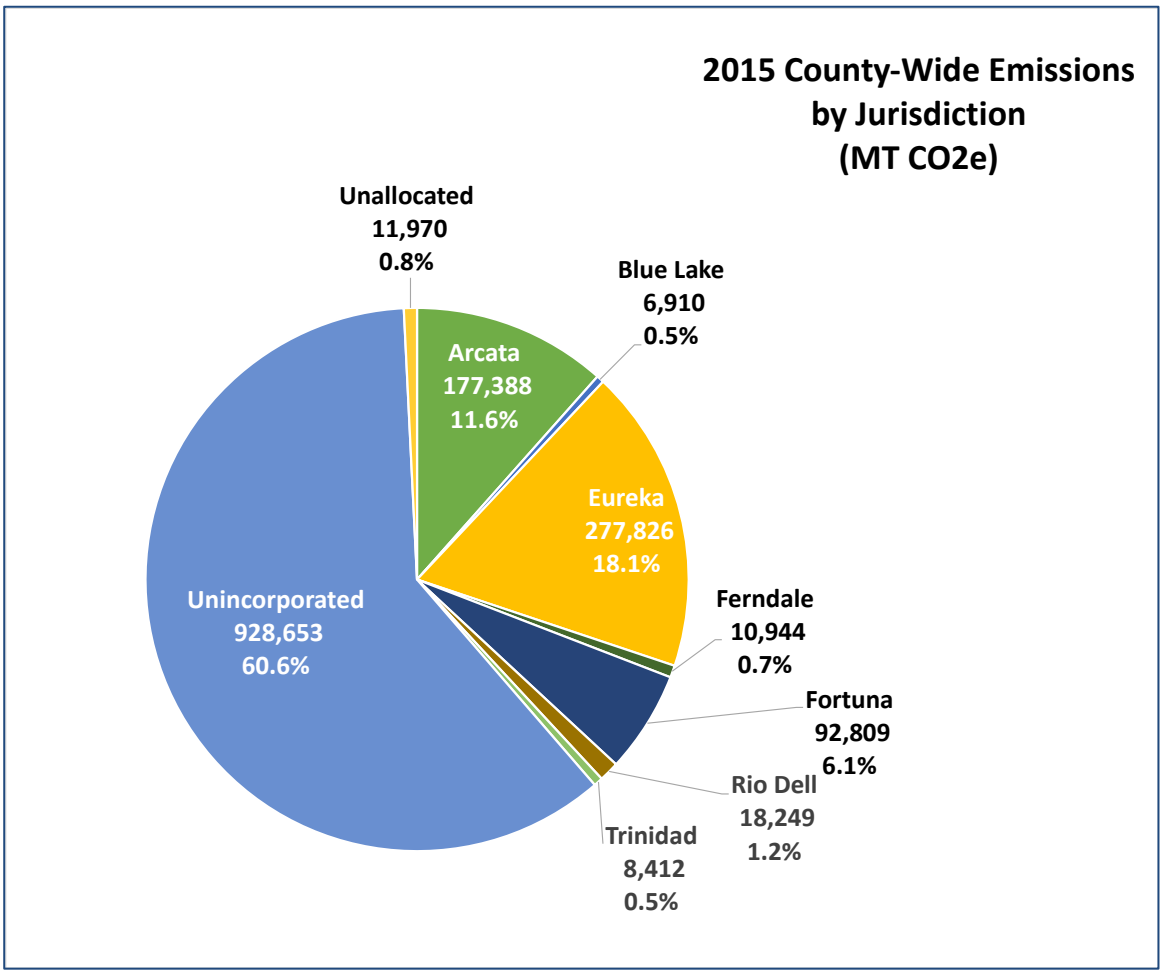

Figure 2-5. Total 2015 emissions in each jurisdiction in Humboldt County. The "Unallocated" category is the sum of air travel and marine vessel emissions. These sources can't be attributed to any one jurisdiction.

The relative emissions total for each jurisdiction (shown above in Figure 2-5) generally corresponds to the population share of each jurisdiction. Most local drivers of emissions, such as vehicle use and energy consumption, are closely correlated to population size. Livestock presents an exception to this trend, as the vast majority of dairy and cattle operations are located in unincorporated areas. Largely as a result, unincorporated areas have 53% of the total County population but generated 63% of total GHG emissions in 2015.

2.5 1990 GHG Inventory

An estimate of community-wide emissions levels in 1990 was developed to understand historic trends and provide a baseline for measuring future GHG reductions. This baseline year aligns with the statewide GHG targets established by AB 32 and SB 32, which also use 1990 as a benchmark year.

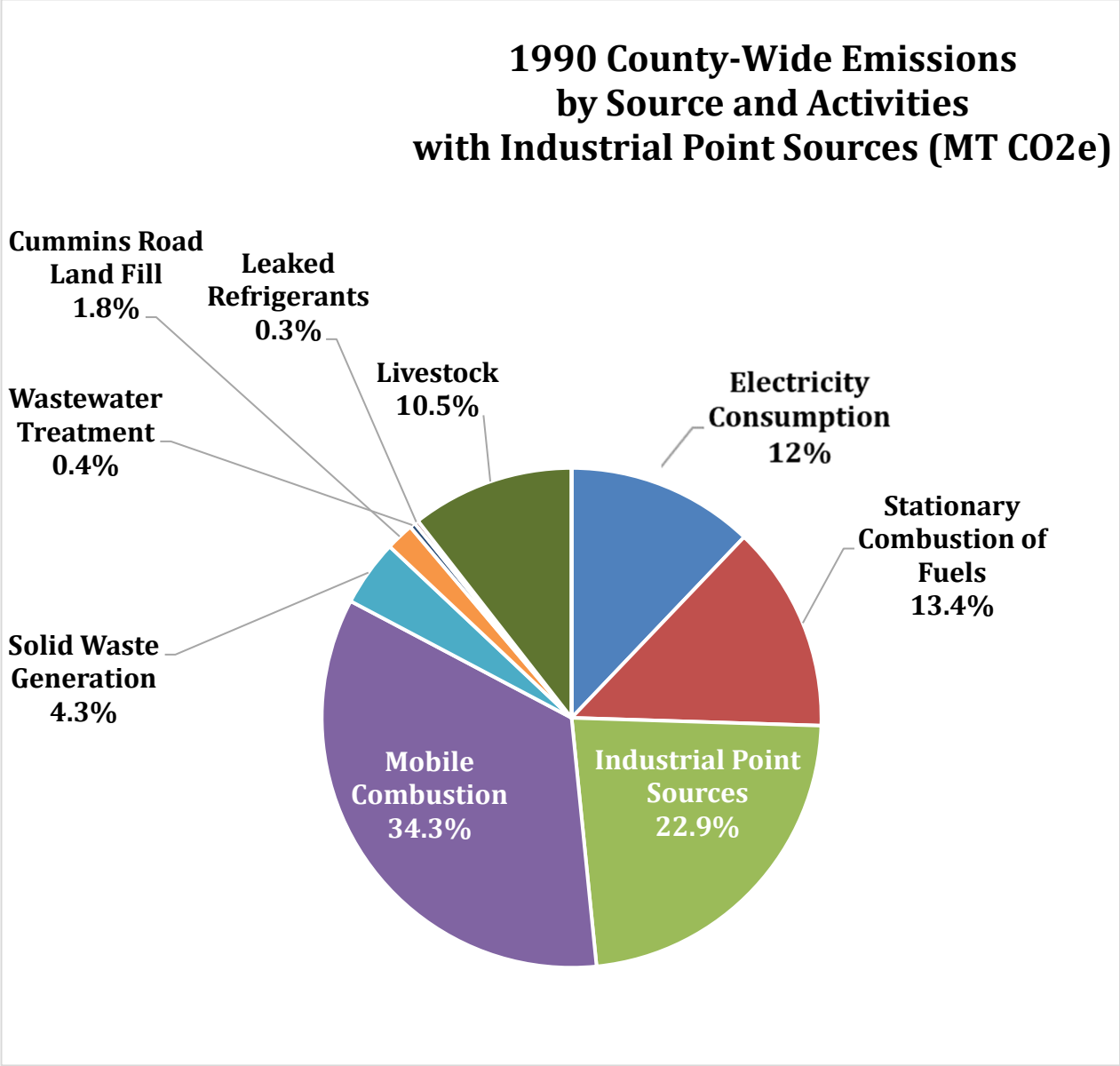

Figure 2-6. Total 1990 emissions broken down by source and activities in Humboldt County. Air travel and marine vessel emissions are excluded from the 1990 inventory due to lack of reliable data sources

Humboldt County experienced a significant decrease in emissions between 1990 and 2015, a period over which our region experienced modest population growth. This trend is primarily due to the closure of timber processing facilities, such as the Samoa pulp mill. By 2015, industrial point source emissions had dropped to around 83,000 MT CO_2e—16% of 1990 levels. This change accounts for nearly 75% of the decline in emissions observed between 2015 and 1990.

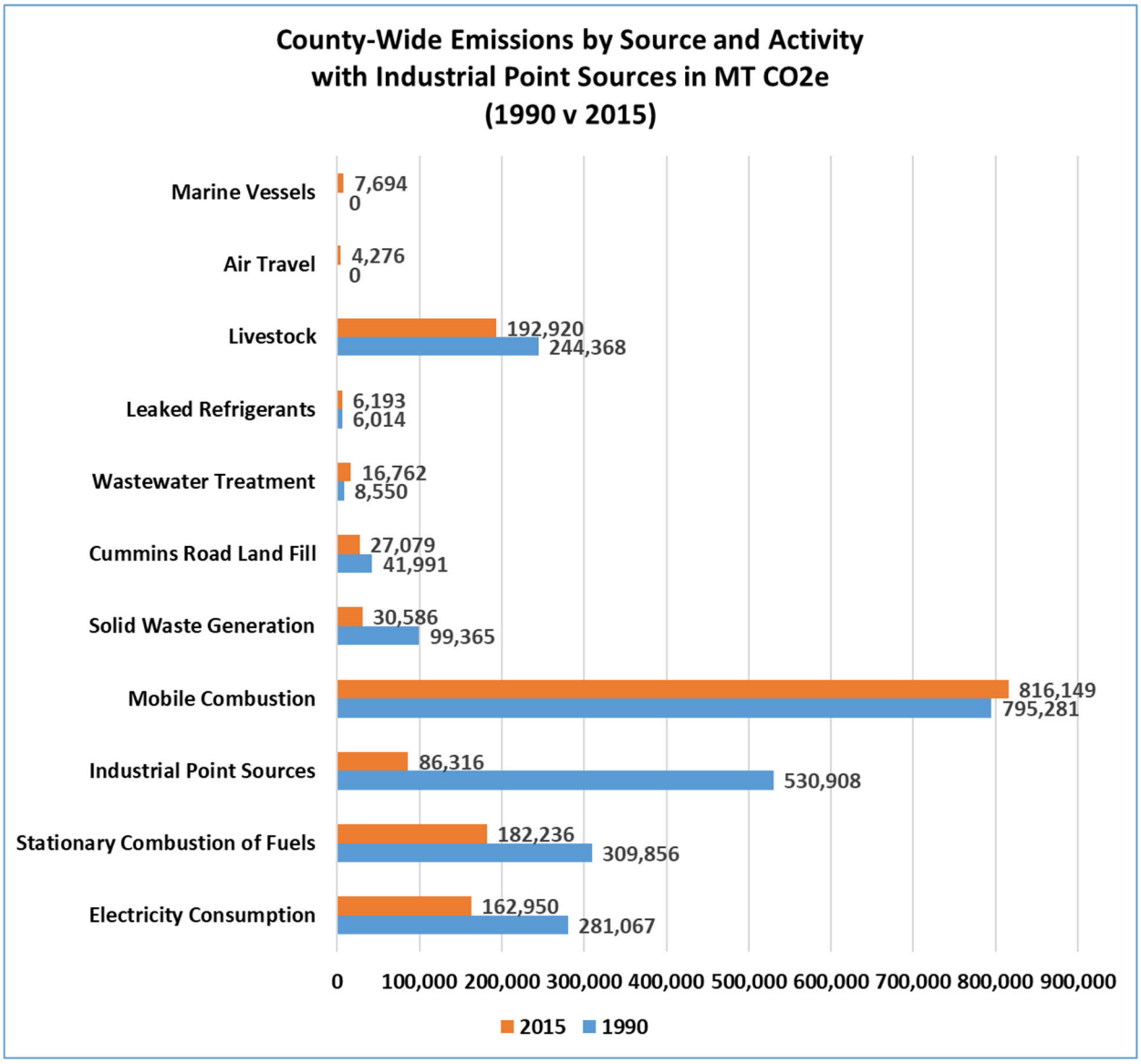

Figure 2-7. Comparison of emission by source/activity between 1990 and 2015 inventories.

California's emissions inventories reveal a different trend: statewide emissions increased by 2% between 1990 and 2015. Many city and county inventories match the statewide trajectory, showing minimal reductions or even an increase in emissions between 1990 and 2015.

As is evident in Figure 2-8 below, Humboldt County is an exception to this trend. When including industrial point sources in the inventories, 2015 emissions are around 29% below 1990 levels, and forecasted 2030 emissions (presented in Chapter 3) are more than 40% below 1990 levels – the State target. Recognizing the State target would be reached without any new local programs, staff from the cities and the County decided for this public review draft to **exclude** industrial point sources from the 1990 baseline in the GHG forecasts (Chapter 3) and modeling of measures to reach the target (Chapter 4). Further rationale for this decision is presented in Chapter 3 Section 3.1.

While this approach has merit, good arguments can also be made to support a different approach, one that **includes** industrial point sources in the 1990 baseline. For instance, one reason the GHG inventory excludes industrial point sources is because local governments typically do not regulate air pollutants from industrial sources. However new industrial uses around Humboldt Bay require GHG analysis because they occur within the coastal zone, and coastal development permits must be approved before construction can occur in these areas. The merits of including or excluding industrial point sources from the GHG inventory will be evaluated in the environmental review of the CAP and informed by public comment in the adoption phase. The chart below compares GHG emissions for the region under each alternative.

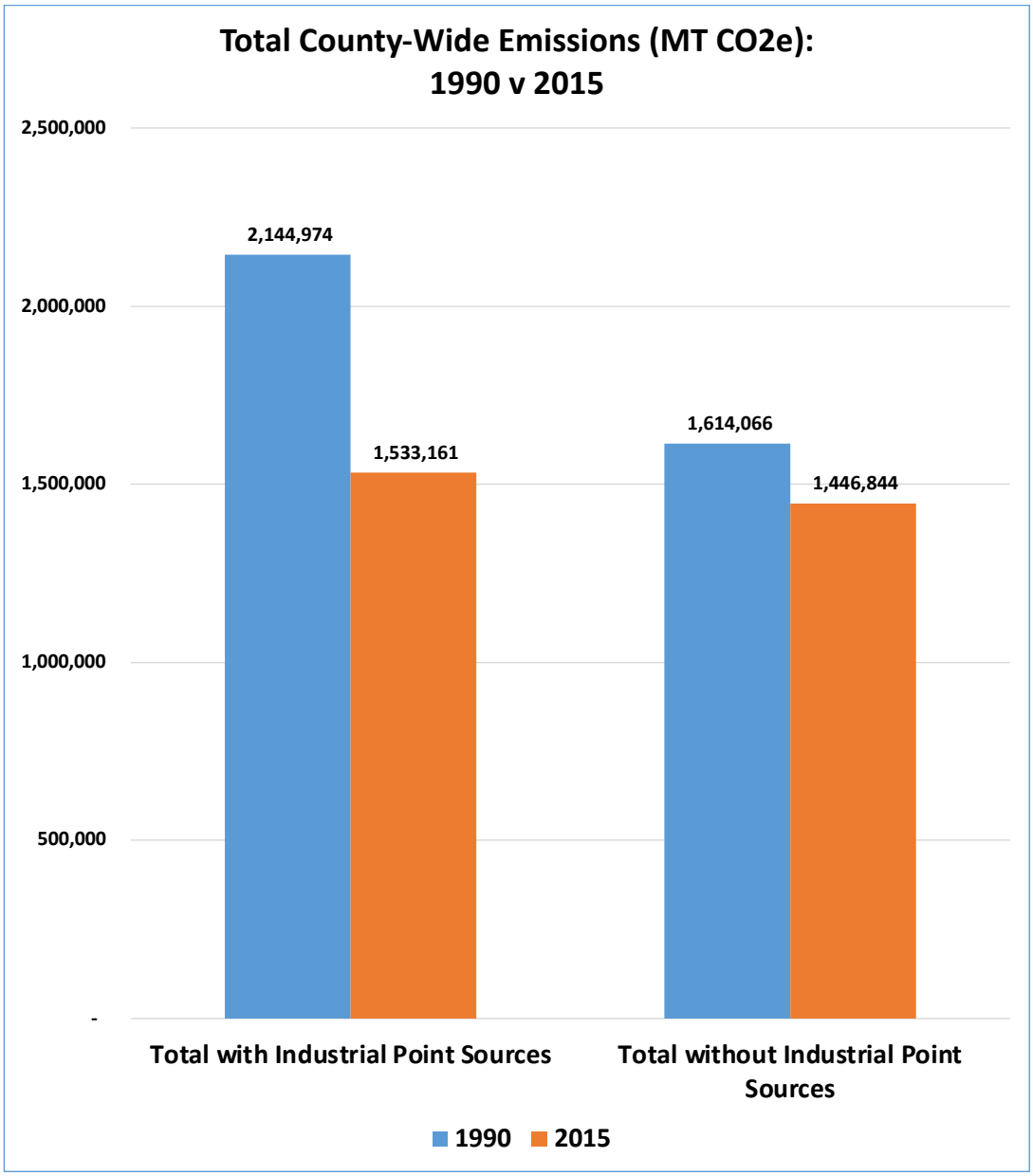

Figure 2-8. 1990 and 2015 inventory totals, with and without industrial point sources.

3 GHG Emissions Reduction Goals

3.1 Countywide GHG Emissions Forecasts

Forecasting future community GHG emissions gives us information about the magnitude of emissions reductions needed in the future and are an integral part of climate action planning. Three forecasting scenarios were developed for the CAP described below. These scenarios all assume no technological advances or new federal regulations or policies significantly reducing GHG emissions or improvements to sequestering carbon.

- A **business-as-usual (BAU) emissions forecast,** which is an estimate of what the volume of emissions will be in the future without any State or local actions to reduce emissions. The ICLEI ClearPath emissions accounting tool was used to develop the BAU forecast. It is an online suite of emissions management tools packaged together to allow jurisdictions to calculate, forecast, plan, and monitor emissions.

- A **legislative adjusted BAU emissions forecast (leg-adj BAU)**, which is an estimate of emissions reductions resulting from State and local actions without considering the measures in the CAP. This forecast includes all the following:

  State programs implementing the Clean Car Standards (AB 1493)

  - Advanced Clean Trucks (State program)
  - Innovative Clean Transit
  - Advanced Clean Cars
  - CARB Mobile Source Strategy requirements for off-road vehicles
  - Executive Order N-79-20 (All new vehicle registrations to be ZEVs by 2035)
  - Waste requirements per SB 1383

  Local programs

  - RCEA RePower Plan goals
  - RCEA Community Choice Energy 100% clean and renewable energy by 2025 goal

- A **CAP- adjusted forecast**, which assumes all proposed CAP measures are implemented.

Figure 13 shows the BAU, leg-adj BAU, and CAP-adjusted emissions forecasts relative to SB32 targets. The leg-adj BAU forecast does not meet the State's goals, so the measures in this CAP are proposed to get us to the 2030 goal of 40% below 1990 levels by 2030. Significant additional cuts will be necessary to reach the State's 2045 carbon neutrality goal.

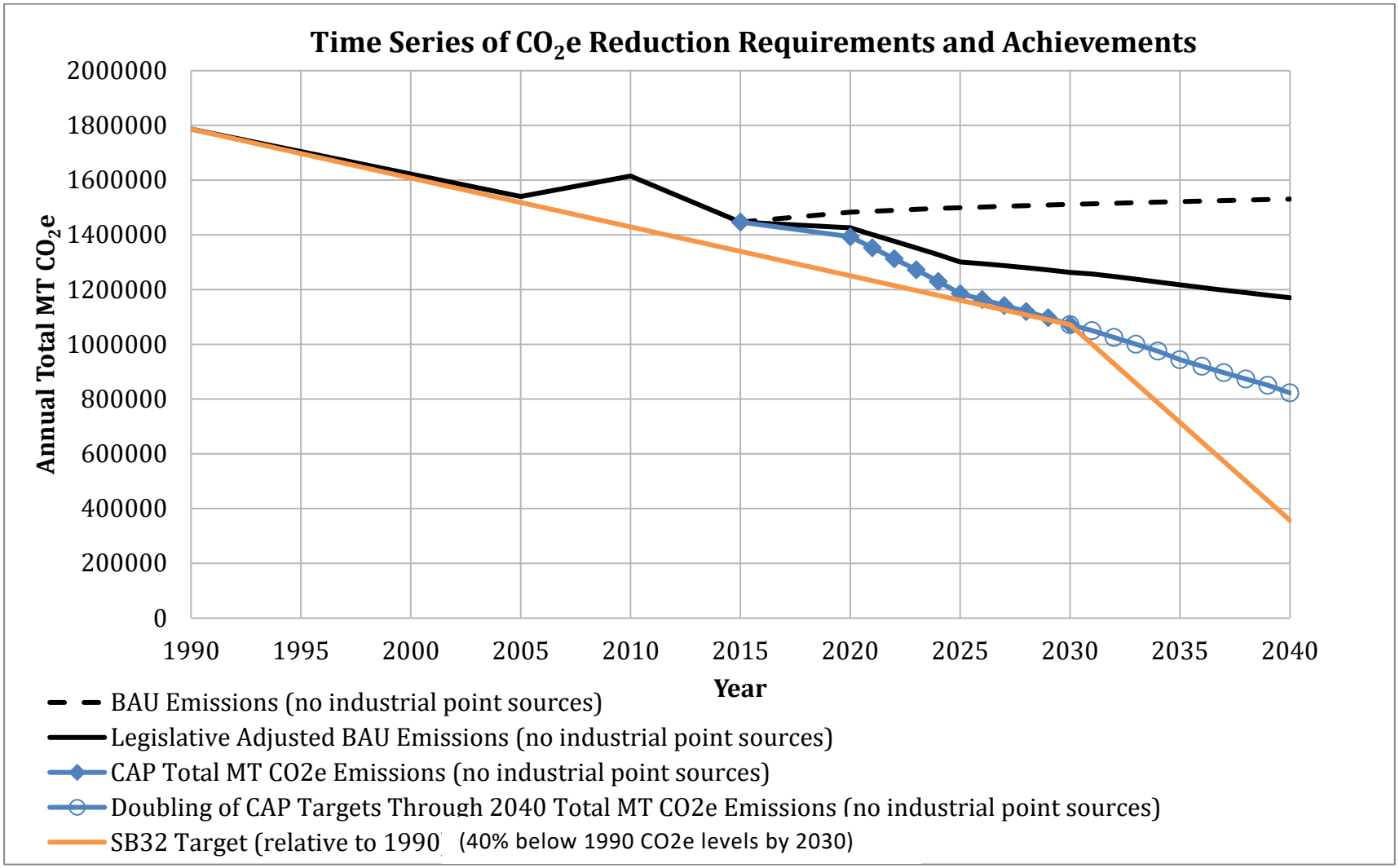

Figure 13. Time Series of CO2e Reduction Requirements and Achievements

3.2 COUNTYWIDE EMISSIONS TARGETS

The State has established the following GHG reduction goals: 1990 levels by 2020 per AB 32, 40% below 1990 levels by 2030 per SB 32, an 80% reduction below 1990 levels by 2050 per Executive Order S-3-05, and net-zero emissions by 2045 per Executive Order B-55-18.

CARB guidance to local governments recommends using 1990 as a baseline year as a preferred way to demonstrate compliance with State targets.

This CAP proposes a goal of reducing GHGs to 40% below the 1990 level by 2030. Staff from Humboldt County jurisdictions considered numerous reduction targets and the 40% reduction from 1990 levels by 2030 target was selected because it was the target most consistent with State planning per SB 32 and the 2017 CARB Scoping Plan Update.

As described briefly in Chapter 2, this target is *non-inclusive* of industrial point sources. In other words, the 1990 emissions baseline does not include emissions from industrial point sources, and emission reductions associated with the decrease of industrial point source emissions do not count toward achieving the 2030 target. The decision to exclude point sources from the draft CAP aligns the CAP's emissions reporting with ICLE's Community Protocol (referenced in Section 2.2), which recommends that cities and counties include in their inventories sources of emissions over which they have a "significant influence." An argument can be made that Humboldt County jurisdictions do not have great authority or ability to control GHG emissions from industrial point sources; instead, permitting and regulating emissions from point sources is largely within the State's and local Air Quality Management Districts' purview. In addition, city and county CAPs in California typically do not address industrial point source emissions because they are largely not controlled by Humboldt County local governments.

On the other hand, new development on all 1,000 acres of Humboldt County's Coastal Dependent Industrial zoned properties in the Humboldt Bay region require coastal development permits, so the County does have authority through that mechanism to regulate GHG emissions of new development on those properties. Good arguments can be made supporting both sides. Whether or not to include industrial point sources in the approved CAP inventories and forecasts will be a future decision informed by public comment and alternatives evaluated in the environmental impact report for this draft CAP.

Table 2 below compares the 1990 GHG emissions with the 2030 target per SB32 (40% below 1990 levels), and the forecasted emissions if all the CAP measures are implemented. Both countywide and per-capita figures are provided. The table shows that with all the CAP measures implemented, the total GHG emissions for the region will be just below the SB32 target level for 2030.

1990 GHG Emissions Rate (MT CO2e/Yr.)	2030 Target Emissions Level per SB32 (40% below 1990 level - MT CO2e/Yr.)	CAP-adjusted 2030 Forecasted Emissions (MT CO2e/Yr.)
1,786,493	1,071,896	1,071,863

Table 1. Comparison of 1990 Inventory GHG Emissions, SB32 Target Level and Cap-adjusted Forecasted 2030 Level

The GHG emission forecasts incorporate the modest population growth rate predicted for the region, which is shown in the table below.

Year	Total County Population	Average Annual Increase (Countywide Total)	Total Percent Change Over Period (Countywide Total)
1980	108,525		
1990	119,118	0.94%	9.76%
2000	126,518	0.60%	6.21%
2010	134,623	0.62%	6.41%
2020	139,033	0.72%	2.90%
2030	140,608	0.11%	1.13%
2040	138,307	-0.16%	-1.64%
Source: Humboldt County General Plan, 2016			

Table 2. Historic and Projected Population Growth in Humboldt County, 1980-2040

4 GHG Emissions Reduction Measures

4.1 Measure Development and Selection Process

Introduction

The CAP measures in this chapter were developed by staff from the County of Humboldt, Redwood Coast Energy Authority (RCEA), and Environmental Indicator Accounting Services (EIAS) in consultation with city staff and stakeholders. This project team audited previous Humboldt County climate action plans and climate action plans from other regions to gain an understanding of common GHG emissions reductions measures. They specifically sought out measures from CAPs in rural regions to better align with local conditions. In addition to researching published climate action plans, they reviewed Redwood Coast Energy Authority's (RCEA) RePower Humboldt Plan. The draft measures were refined by comment at several public workshops.

The project team prioritized measures which would lead to the largest GHG reduction per dollar spent. Other criteria used in selecting measures were feasibility, local control, desirability to local jurisdictions and community members. Many CAP strategies presented in this chapter work in tandem with the RePower strategies described in Chapter 1 (page 1-25); the objectives and measures for grid decarbonization are drawn directly from RePower.

Goal, Strategy, Objective, and Implementation Measure Format

The presentation of emissions reduction measures is organized into four tiers:

- A **Goal** is a broad, primary outcome.
- A **Strategy** is an approach taken to achieve that Goal.
- An **Objective** is a step used to fulfill that Strategy. Some Objectives are so direct they can be quantified, and those targets are provided.
- **Implementation Measures** are discrete and quantifiable subsets of Objectives that can be monitored and reported. Related Implementation Measures are presented together with specific targets where appropriate. **Implementation Actions** are ways for jurisdictions to achieve the targets quantified in Objectives and Implementation Measures.

Timelines, funding and financing mechanisms, and estimated staff time for each Implementation Measure are provided in Appendix E: Implementation and Monitoring Table & Funding Matrix.

Figure 16. The relations between Goals, Strategies, Objectives, and Implementation Measures

4.2 Climate Action Plan Goals, Strategies, Objectives and Implementation Measures

Goal 1: Transition transportation systems and mobile sources from fossil fuels to renewable fuels

Countywide, transportation emissions account for more than half of total GHG emissions. If we are to achieve our GHG targets of a 40% reduction from 1990 levels by 2030 and carbon neutrality by 2045, Humboldt County needs to drastically cut transportation emissions over the next few decades. This can be accomplished by reducing vehicle miles traveled (the focus of the following goal, Goal 1) and transitioning different vehicle fleets—including passenger vehicles, transit, municipal vehicles and heavy-duty trucks—away from fossil fuels (the subject of this Goal). As the electricity grid becomes carbon neutral (per State and local commitments), GHG emissions from electric vehicles will become insignificant. Electrifying transportation will also substantially enhance the quality of life - streets will be quieter and safer, the air will be cleaner, and stormwater runoff from streets will be less polluted.[4]

Electric vehicles (EVs) include battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell electric vehicles (FCEVs):

- BEVs are solely powered by electricity, and many models can go hundreds of miles on a single charge.
- PHEVs run on electricity for shorter ranges (up to ~50 miles) then switch over to an internal combustion engine running on gasoline when the battery is depleted.[5] BEVs and PHEVs have much lower fuel costs on average than conventional gasoline vehicles, as electricity is less expensive than gasoline.

[4] California Energy Commission. 2017. Preliminary Analysis of Benefits From 5 Million Battery-Electric Passenger Vehicles in California. https://ww2.energy.ca.gov/2017publications/CEC-999-2017-008/CEC-999-2017-008.pdf

[5] US Office of Energy Efficiency and Renewable Energy. Electric Vehicle Basics. https://www.energy.gov/eere/electricvehicles/electric-vehicle-basics

- FCEVs use compressed hydrogen gas as fuel, which is then fed into a fuel cell in the vehicle to combine with oxygen to form water. This process generates the electricity which propels the car's motor. FCEVs are quiet and fuel-efficient, just like their other EV counterparts, but have much longer ranges (up to 360 miles) and only take approximately 3 to 5 minutes to refuel.

Zero emissions vehicles (ZEVs) is another term used in this CAP for vehicles that do not emit GHGs from the onboard source of power, such as BEVs and FCEVs.

Electricity is not the only alternative to gasoline. Renewable biomass feedstocks and renewable diesel made from waste oils are also viable options. Both fuels have advantages in certain circumstances. Renewable diesel can be used in all existing diesel engines. When renewable diesel is made from waste, it has a carbon intensity of approximately one-third of petroleum-derived diesel.[6]

STRATEGY 1.1: PROVIDE INFRASTRUCTURE AND INCENTIVES FOR ELECTRIFICATION IN PASSENGER VEHICLES

In 2020, Governor Newson adopted Executive Order N-79-20 requiring that all new passenger vehicle registrations be all-electric by 2035. The Governor also adopted a goal for EVs to make up 100% of vehicle ownership by 2050. The State is implementing and planning a variety of regulations, infrastructure investments, incentives and educational programs to achieve these goals, including several financing and rebate programs for new EV owners coordinated by CARB.

Locally, Redwood Coast Energy Authority's (RCEA) RePower Plan establishes a goal to accelerate the adoption of EVs in Humboldt County from 6,000 in 2025 to 22,000 EVs in 2030. RCEA's goal is to "maintain a trajectory of emissions reduction to eliminate the use of fossil fuels by 2050." To do this, RCEA will conduct outreach campaigns, complete fleet analyses, provide ZEV decision support, and support low-carbon transportation initiatives at other agencies. RCEA currently provides an incentive for ZEVs and has identified priority areas for charging station development.

[6] RCEA and Schatz Energy Research Center. 2016. Northwest California Alternative Fuels Readiness Plan. https://redwoodenergy.org/wp-content/uploads/2019/02/Northwest-California-Alternative-Fuels-Readiness-Plan.pdf

Objective 1.1.1. Public Light Duty BEV Adoption

2030 TARGET: 34% OF PASSENGER VEHICLES IN HUMBOLDT COUNTY ARE ZEVS (18,301 ZEVS PURCHASED).

With these measures, cities, the County, RCEA, and others will take action toward a target of 34% ZEV ownership in Humboldt County by 2030. This goal is in line with where the State needs to be in 2030 if it is to reach its 2050 EV ownership target of 100% of vehicles. Currently, less than 1% of passenger vehicles in Humboldt County are ZEVs. To reach 34% by 2030, local governments and other agencies will have to collaborate on promoting ZEVs, implementing incentive programs and expanding charging station networks.

Implementation Measure 1.1.1.1 Promote Purchasing of Electric Vehicles Through Outreach

2030 TARGET: ANNUAL PROMOTION EVENTS

ZEVs are a relatively new technology to some people, and outreach is needed to build interest and understanding through the following actions:

Implementation actions

- Conduct promotional events to disseminate information about charging station options, BEV or FCEV servicing, and buying a BEV or FCEV. Promotional events could include ZEV car shows.
- Develop educational materials pertaining to EV purchase incentives and charging infrastructure.
- Disseminate educational materials pertaining to EV purchase incentives and charging stations at planning and building offices and websites.

Implementation Measures 1.1.1.2. and 1.1.1.3: Provide Incentives for ZEV Adoption

2030 TARGET: 34% OF PASSENGER VEHICLES IN HUMBOLDT COUNTY ARE ZEVS (17,652 EVS PURCHASED)

To increase ZEV adoption, local governments and agencies will also need to take actions to make it as easy as possible for people to purchase and own these types of vehicles.

Implementation actions

- Expand the charging station network (further detailed under 1.1.1.3 and 1.1.1.4)
- Continue and expand existing programs providing incentives, rebates, and financing for ZEVs and FCEVs.
- Create a retire-and-replace program* to incentivize replacement of older, more polluting gas- or diesel-powered vehicles with EVs.
- Investigate implementation of the State's Enhanced Fleet Modernization Program by the North Coast Unified Air Quality District to fund old vehicle trade-ins.

*One example of a retire-and-replace program is Clean Cars for All, an initiative implemented by the Bay Area Air Quality Management District that provides grants for Bay Area residents to retire their older vehicles and replace them with a ZEV alternative. Programs like Clean Cars for All can help retire old, polluting gas or diesel vehicles while expediting ZEV adoption.

Implementation Measure 1.1.1.4 & 1.1.1.5: Install Public and Workplace L2 and L3 Charging Stations

2030 TARGET: 2,486 L2 PLUGS INSTALLED; 83 L3 PLUGS INSTALLED

Expanding Humboldt County's charging station network is necessary if we are to achieve and exceed State targets for EV adoption. There are three types of EV chargers: Level 1, Level 2, and Level 3.

Most public charging stations are Level 2 (L2) or Level 3 (L3). Level 3 (L3) charging stations offer a fast charge, averaging less than an hour to completely refill an EV's battery. Level 3 stations are expensive and, in Humboldt County, primarily installed by private entities such as Tesla. As of March 2021, there are five L3 charging locations in the County.

L2 charging stations take longer—usually about eight hours—to fully charge a vehicle. They are more common than L3 stations and are found throughout Humboldt County at many offices and businesses. Currently, RCEA maintains a local network of L2 EV charging stations and plans to expand this network.

Light utility poles may be another low-cost option for public charging infrastructure. Unlike most other public ZEV chargers, utility pole chargers can be installed without trenching or electrical upgrades; when fitted with an LED bulb, light utility poles typically have available load capacity. If all streetlight bulbs in Eureka are switched to LEDs, 12 level-two chargers could be added to light poles without electrical upgrades. Research conducted at Cal Poly Humboldt involved mapping to determine light pole charging locations in Eureka, located near multi-unit dwellings where residents might not have access to off-street parking.

Office and commercial buildings are priority locations for EV charging stations. 36% of EV charging occurs at the workplace.[7] Given that an L2 charger can charge up to 20 miles per hour, EVs with a battery capacity of up to 200 miles could fully recharge their battery during an eight-hour workday.

Implementation actions

- Identify potential installation sites, including municipal facilities.
- Implement the North Coast Plug-In Vehicle Readiness Plans (North-Coast-Plug-in-Electric-Vehicle-Readiness-Plan.pdf).
- Install light utility pole chargers.
- Adopt an ordinance allowing EV charging on the street.
- Adopt an ordinance requiring a certain number of charging stations at workplaces with over 25 employees.
- Secure funding for electrical panel upgrades.
- Develop streamlined permitting for EV charging infrastructure.
- Adopt building codes requiring EV charging infrastructure in new buildings.
- Adopt building codes requiring homes to have EV charging infrastructure in major remodels.
- Develop educational materials pertaining to EV charging infrastructure.

[7] Idaho National Laboratory. Plugged In: How Americans Charge Their Electric Vehicles. https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf

- Disseminate educational materials pertaining to EV charging at planning and building offices and websites.

Implementation Measure 1.1.1.6: Install Home EV Charging Infrastructure

2030 TARGET: 5,296 HOME CHARGING PLUGS INSTALLED

The majority of EV charging (60%) occurs at home.[8] L1 and L2 chargers are used for home charging. L2 chargers require a higher-voltage circuit, so homes with limited electrical capacity may require electrical upgrades prior to installation. L1 chargers can simply be plugged into a 110V outlet and are an affordable alternative to L2 and L3 charging. Implementation actions listed below that involve adoption of new building codes may be required or encouraged by the 2022 Energy Code currently under review with an effective date of January 1, 2023.

Implementation actions

- Adopt building codes requiring EV charging infrastructure in new buildings.
- Adopt building codes requiring homes to have EV charging infrastructure in major remodels.
- Secure funding for electrical panel upgrades.
- Adopt ordinances allowing EV charging on the street.
- Develop streamlined permitting for EV charging infrastructure.
- Develop educational materials pertaining to EV charging infrastructure.
- Disseminate educational materials pertaining to EV charging at planning and building offices and websites.

Objective 1.1.2: Encourage Public Light Duty FCEV Adoption

Fuel cell electric vehicles are an important element of the State's clean transportation goals. This vehicle type must be refueled with liquid hydrogen. There are several ways to harness liquid hydrogen as a fuel source. If done by electrolysis, a process by which an electric current splits water, hydrogen fuel can be considered renewable if the electricity used is renewable. State law requires 33% of all hydrogen dispensed through State-funded hydrogen fueling stations to be produced using renewable sources of energy.[9]

The California Air Resources Board aims to have 200 hydrogen refueling stations in California by 2025 and 1,000 stations by 2030. The "North Coast and Upstate FCEV Readiness Plan," prepared by RCEA, is intended to prepare nine of California's northernmost counties - including Humboldt - for the introduction of FCEVs. The plan identifies priority locations for hydrogen fueling in the Humboldt Bay area. The measures below identify recommended targets for encouraging fuel cell electric vehicle use.

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[8] Smart, John Galloway, and Salisbury, Shawn Douglas. Plugged In: How Americans Charge Their Electric Vehicles. United States: N. p., 2015. Web. doi:10.2172/1369632.

[9] Redwood Coast Energy Authority et al. 2017. Regional Hydrogen Readiness Plan. https://redwoodenergy.org/wp-content/uploads/2017/08/10_19_17.FINAL_FCEV_Infrastructure_Plan.pdf

Implementation Measure 1.1.2.1 Promote Public Adoption of FCEVs

2030 Target 2030 Target: Garner one or more fleet commitments per year through Outreach Campaigns

Implementation Measure 1.1.2.2 Install Hydrogen Fueling Stations to Support Light Duty Vehicles

2030 Target: Seven Hydrogen Fueling Stations Permitted

Implementation actions

- Work with RCEA to discuss the feasibility of hosting a hydrogen fueling station within each city's and the County's jurisdictional boundary as described in the "North Coast and Upstate FCEV Readiness Plan."
- Use media and various promotional outlets to conduct FCEV outreach campaigns.
- Provide permitting support for hydrogen fueling stations.
- Work with owners of existing fueling stations to provide hydrogen fuel.

Strategy 1.2: Transition to a carbon-neutral goods-movement system

As of 2015, retail and commercial trucks account for nearly 35% of the emissions associated with transportation in Humboldt County. The State is taking action to address these emissions and transition to a carbon-neutral goods-movement system. For example, the Advanced Clean Truck Regulation is part of a strategy to accelerate a large-scale transition to zero-emission medium-and heavy-duty vehicles.[10] The regulation has two components:

- Manufacturers of light/medium to heavy-duty trucks are required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2030.
- Large employers including retailers, manufacturers, brokers and others are required to report information about shipments and shuttle services. Fleet owners, with 100 or more trucks, are required to report their existing fleet operations. This information will help identify future strategies to ensure that fleets purchase available zero-emission trucks and place them in service.

Objective 1.2.1: Electrify Heavy Duty Fleets

2030 Target: 13% of Medium and Heavy-Duty Vehicles on the Road in Humboldt County are ZEVs (489 trucks incentivized)

[10] California Air Resources Board. 2019. Advanced Clean Trucks Fact Sheet. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet

Local planning and external incentives could be used to accelerate EV truck adoption above Advanced Clean Trucks requirements. State and federal incentives exist for decarbonizing this sector (see Appendix E for a funding matrix). In their Regional Transportation Plan (RTP), adopted in 2022, the Humboldt County Association of Governments (HCAOG) outlines policies to decarbonize the goods movement system. The proposed Implementation Measures and Actions below support the 2022 RTP (*VROOM 2022-2042*).

Implementation Measure 1.2.1.1: Convene a Freight/Offroad Electrification Working Group

2030 TARGET: WORKING GROUP CONVENED

Implementation Measure 1.2.1.2: Incentivize Accelerated Zero-emission Freight Ahead of Advanced Clean Truck Adoption Rates

2030 TARGET: 489 VEHICLES PURCHASED

Implementation Measure 1.2.1.3: Install "On-route" Charging Stations for Battery Electric heavy duty trucks

2030 TARGET: 268 CHARGING STATIONS INSTALLED

Implementation Measure 1.2.1.4: Install Hydrogen Fueling for Fuel Cell Electric Heavy Duty Trucks

2030 TARGET: 5 CHARGING STATIONS INSTALLED

Implementation actions

- Support HCAOG in its efforts to decarbonize Humboldt's goods-movement system.
- Incentivize retirement of diesel- or gas-powered trucks or purchase of a BEV/FCEV.
- Convene a freight/off-road electrification working group to pursue funding and identify ways to develop charging infrastructure.
- Expand the charging station network as outlined in 1.1.1 above.
- Facilitate installation of hydrogen fueling stations as outlined in 1.1.2 above.

Strategy 1.3: Decarbonize Municipal Fleets

In 2019, the State of California began prohibiting State agencies from buying any sedans with internal combustion engines.[11] While there are no current State mandates for municipal fleets at this time, per Executive Order N-79-20, all in-State sales of new passenger cars and trucks will be zero emission by 2035. jurisdictions have direct control over GHG emissions for their own vehicle fleets. By purchasing EVs and installing EV charging infrastructure, cities and the County can lead by example and realize substantial emissions reductions.

Objective 1.3.1: Electrification of Light Duty Municipal Fleets

2030 Target: 1,023,944 electrified miles (BEV and FCEV)

As part of the North Coast PEV Readiness Plan, the Schatz Energy Research Center (SERC) developed a tool to help cities and the County incorporate zero emission vehicles into their fleets. This tool, called the PEV Fleet Evaluation Tool (PEVFleET), uses a set of inputs to calculate lifetime GHG reductions and payback time on various ZEV purchases. The proposed Implementation Measures and Actions below anticipates local jurisdictions will use this tool to include zero emission vehicles in their fleets.

Implementation Measure 1.3.1.1: Install Fueling infrastructure

Implementation Measure 1.3.1.2: Replace High Mileage Vehicles with BEVs

2030 Target: 724,612 Electrified miles

Implementation Measure 1.3.1.3: Replace high-mileage Vehicles with FCEVs

2030 Target: 299,332 Electrified miles

Implementation actions

- Install fueling infrastructure for municipal ZEVs.
- Replace all light-duty municipal vehicles with BEVs or FCEVs.
- Complete fleet analysis (or work with RCEA to update current fleet analysis).

[11] Thompson, Don. 2019. California Rules set Lower Emissions for State Vehicle Fleet. https://apnews.com/020d5674b2e34641960ff1fefbd36ba3

Strategy 1.4: Work with Humboldt Transit Authority to Decarbonize Public Transit

The California Air Resources Board's Innovative Clean Transit (ICT) Regulation was adopted in December 2018 and requires all public transit agencies to gradually transition to a 100% zero-emissions bus fleet. Beginning in 2026, 25% of new bus purchases by small transit agencies must be zero-emission buses; and by 2029, 100% of new bus purchases by all transit agencies must be zero-emission buses[12], with a goal of full transition by 2040. The Schatz Energy Research Center and Humboldt Transit Authority (HTA) developed the Climate Resilient Electrified Transit Plan to meet these requirements. HTA brought its first ZEB online in 2019, and owns and operates 33 buses across four transit systems that may be transitioned to ZEBs.

Objective 1.4.1: Achieve and Exceed Statewide Transit Electrification Targets

2030 Targets: 16 battery electric buses purchased; 24 fuel cell electric buses purchased

With this CAP measure, cities and the County commit to supporting HTA in purchasing electric buses at an accelerated rate above State requirements. This means that HTA would purchase electric buses before 2026 and/or exceed a 25% zero emission bus purchase rate between 2026 and 2029.

Implementation Measure 1.4.1.1: Install Fueling infrastructure

Implementation Measure 1.4.1.2: Purchase Battery Electric Buses

2030 Target: 16 ZEBs

Implementation Measure 1.4.1.3: Purchase Fuel Cell Electric Buses

2030 Target: 24 ZEBs

Implementation actions

- Assist HTA in installing fueling infrastructure for new transit vehicles.
- If needed, devote staff time to assist HTA and/or other transit systems in pursuing funding for electric buses.

[12] California Air Resources Board Innovative Clean Transit Rule. https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit

LOW-CARBON TRANSPORTATION – COMMUNITY CO-BENEFIT OUTCOMES:

The following paragraphs describe other benefits of the implementation measures for this goal which are outside the focus of the CAP, but noteworthy for other reasons.

Electric vehicles (EVs) will save drivers money in the long-term, as fuel and maintenance expenses are significantly lower than those of their conventional gas-fueled counterparts.

A transition from fossil fuel combustion vehicles to electric vehicles will also improve air and water quality. Emissions of criteria pollutants like carbon monoxide and particulate matter will be reduced, as EVs do not emit these pollutants directly from tailpipes like combustion engine vehicles. As a result of reduced air pollution, the community could see resulting health benefits like reductions in asthma and lung health related conditions[12].

Regarding water pollution, almost half of the vehicles currently driven in the United States leak fluids that can be toxic to people and to wildlife[13]. Antifreeze, engine oil, transmission fluid, and other fluids leak, often onto impermeable pavement, and drain off into waterways or soil and wildlife areas. Electric vehicles do not use many of the hazardous fluids needed in combustion vehicles. This includes petroleum, which leaks into our environment through small accidents at gas stations at a rate of over half a million gallons per year in California alone[14].

STRATEGY 1.5: PROMOTE BIOFUELS AS A TRANSITION STRATEGY

Biofuels and renewable diesel are non-fossil, low-carbon transportation fuel options. To promote biofuels and renewable diesel locally, jurisdictions can use them in their operations and support RCEA in relevant initiatives.

Objective 1.5.1: Increase Consumption of Renewable Diesel

Renewable diesel is a direct substitute for diesel fuel. Renewable diesel is refined from lower carbon and renewable sources, and can be produced from a variety of different feedstocks such as animal fats, corn, soybean and used cooking oil. Renewable diesel is an ideal and cost-effective fuel option for medium and heavy-duty vehicles for which there are not currently electric alternatives. Current diesel vehicles can be fueled by renewable diesel without the need for retrofits. Additionally, renewable diesel can be distributed using existing fueling station infrastructure.

In terms of greenhouse emissions, the State considers all common renewable diesel feedstocks are considered by the State to be more climate-friendly than petroleum-based diesel. However, different

[13] Litman, Todd. 2011. Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications Second Edition. Victoria Transport Policy Institute.

[14] Hilpert, Markus, and Patrick N. Breysse. 2014. "Infiltration and Evaporation of Small Hydrocarbon Spills at Gas Stations." Journal of Contaminant Hydrology 170: 39-52. doi: 10.1016/j.jconhyd.2014.08.004.

feedstocks have varying carbon intensities. An average of the carbon intensities of all certified renewable diesel feedstocks was used in the GHG reduction calculations for this measure.

Implementation Measure 1.5.1.1: Increase Use of Renewable Diesel

2030 Target: 277,351 Gallons of renewable diesel sold. Renewable diesel makes up 0.75% of diesel consumption from retail/commercial vehicles; 36 gas stations in the County supply renewable diesel

Implementation actions

All the following implementation actions will help achieve the 2030 target for this measure:

- Purchase renewable diesel annually to fuel municipal vehicles.
- Hire contractors who use renewable diesel or alternative fuels.
- Work with RCEA to explore opportunities for the development of renewable diesel and advanced fuels.

Strategy 1.6: Promote Electrification of Yard Equipment

Gas-powered yard equipment can harm air quality as well as emitting GHGs. A new gas-powered mower running for 1 hour produces similar emissions to the average car driving for 100 miles. Electric lawn and garden equipment models are widely available, and some landscapers and lawn maintenance companies use all-electric equipment. The objectives and implementation measures proposed below would incentivize the conversion of gas-powered yard equipment to electric powered yard equipment.

Objective 1.6.1: Gas-Powered Yard Equipment trade-in program

Implementation Measure 1.6.1.1: Trade in Gas Powered Lawn Mowers

Target: 420 lawn mowers traded in for an electric Version

Implementation Measure 1.6.1.2: Trade in Gas Powered Chainsaws

Target: 340 Chain Saws traded in for an electric Version

Implementation Measure 1.6.1.3: Trade in Gas Powered Trimmers

2030 Target: 420 Trimmers traded in for an electric Version

GOAL 2: MODE SHIFT FROM SINGLE-OCCUPANCY VEHICLES TO ACTIVE TRANSPORTATION AND SUSTAINABLE MASS TRANSIT

As mentioned under the previous goal, transportation emissions account for more than half of total GHG emissions Countywide, and reducing vehicle miles traveled (VMT) is a critical component of reaching our 2030 emissions reduction goal, and our 2045 carbon neutrality goal. Making our communities more connected and accessible without the use of personal vehicles will also greatly improve our quality of life, as discussed in the co-benefits section below.

VMT reduction goals articulated in the State's Climate Change Scoping Plan include quadrupling the number of trips taken by foot by 2030 and striving for a nine-fold increase in the proportion of trips taken by bicycle by 2030. Locally, RCEA's RePower Plan pledges to assist HCAOG and HTA in their efforts to reduce VMT by 400 million miles traveled by 2030 (a 25% reduction from 2020 VMT levels). Modeling for the CAP is more conservative; implementing the following measures results in a 12% reduction in VMT by 2030.

High-level CAP strategies include designing communities to be more walkable and bikeable and promoting ridesharing, carsharing, and bike and scooter sharing programs that allow people to get around without owning a car. In this Plan, the term ridesharing includes carpooling and refers to services such as Uber and Lyft. Carsharing is distinct from ridesharing and refers to a service that provides users with access to a fleet of vehicles (or one vehicle) on a time-limited basis[15]. Similarly, bike and scooter sharing are services that provides users with access to a fleet of scooters or bicycles.

One important tool to encourage and facilitate development projects that further this CAP's VMT goals is the CAP consistency checklist in Appendix E. When a new development project is proposed, the Cities and County can use the CAP consistency checklist to evaluate the consistency of proposed new development projects with this CAP. If a project design is consistent with all required elements of the checklist, the project can show that it is consistent with the CAP and thus the emissions it generates are not cumulatively considerable under CEQA. This CEQA streamlining can be a significant incentive for furthering CAP goals.

STRATEGY 2.1: BUILD MORE ACCESSIBLE COMMUNITIES

Increased density reduces the distance people have to travel between destinations (work, home, store, etc.), lowering VMT and providing greater options for travel modes. Infill development—developing vacant parcels in existing urban areas—improves density in already developed areas. Infill also improves access to transit, as Humboldt County's urban and suburban centers are the most well-served areas by our local transit system. Active transportation and mass transit become more viable options for Humboldt County residents when new development is located near transit corridors and bike and pedestrian networks. All the cities in the County have good examples of infill residential development in and near the downtown areas, which allow residents to eat out, go shopping, recreate or even commute to work without getting in a personal vehicle.

Shifting the housing balance to areas with access to key services reduces the need for vehicle trips to access those services. Mixed-use development combines residential and commercial spaces, making

[15] Millard-Ball A., Murray G., Ter Schure J., Fox C., Burkhardt J. (2005). Transit Cooperative Research Program Report 108: Car Sharing: Where and How It Succeeds.

communities more accessible for pedestrians. Eureka's Old Town neighborhood, where many buildings host both storefronts and apartments, is an excellent example of mixed-use development in Humboldt County. The cities of Rio Dell, Fortuna, Blue Lake and Trinidad all have historic downtowns that are further excellent examples of mixed use. Several jurisdictions, including Eureka, Arcata, and the County have set goals in their Housing Elements to encourage mixed-use development.

Objective 2.1.1: Increase Density and Mixed Use Development in Infill Priority Areas

2030 TARGET: 3,439 NEW RESIDENCES CONSTRUCTED IN MIXED USE AREAS

Density is usually measured in terms of persons, jobs, floor area or dwellings per unit area. With this measure, cities and the County commit to increasing density in urban areas, downtowns, and suburban centers ("infill priority areas").

The balance of jobs and housing is a good indicator of the mix of uses in an area. With a more equal ratio of jobs and housing, people can live close to where they work and more easily walk, bike, or use transit to access critical services. With these measures, cities and the County also commit to zoning more areas for mixed-use development.

Implementation Measure 2.1.1.1: Infill Development

2030 TARGET: INCREASE HOUSING AND/OR JOB DENSITY BY 200% IN INFILL PRIORITY AREAS

Implementation Measure 2.1.1.2: Increase Mixed Use

2030 TARGET: INCREASE MIXED USES TO ACHIEVE A RATIO OF 1.5 JOBS PER HOUSEHOLD IN INFILL PRIORITY AREAS

Implementation actions

- Update zoning codes to facilitate infill and mixed-use development in infill priority areas.
- Use the CAP consistency checklist in Appendix E to encourage new development in infill areas.

Objective 2.1.2: Improve Accessibility of New Development by Transit, Walking and Biking

2030 TARGET: 3,439 NEW RESIDENCES CONSTRUCTED IN AREAS SERVED BY PUBLIC TRANSIT AND BICYCLE AND PEDESTRIAN PATH NETWORKS

With this objective and related measures, participating jurisdictions will employ a variety of strategies to incentivize low-carbon, transportation-friendly development. This will primarily be accomplished through changes to local zoning regulations that incentivize siting development near transit/bicycle/pedestrian infrastructure and designing development to support use of that infrastructure.

Implementation Measure 2.1.2.1: Increase Location Efficiency

NEW RESIDENCES ARE CONSTRUCTED IN URBAN AREAS, DOWNTOWN BUSINESS DISTRICT OR SUBURBAN CENTERS

Implementation Measure 2.1.2.2: Increase Destination Accessibility

NEW RESIDENCES ARE CONSTRUCTED NEAR DOWNTOWNS OR MAJOR JOB CENTERS

Implementation Measure 2.1.2.3: Increase Transit Accessibility

NEW RESIDENCES ARE CONSTRUCTED WITHIN ¼ MILE OF A TRANSIT STOP

Implementation Measure 2.1.2.4: Orient Towards Non-Auto Corridors

NEW RESIDENCES ARE CONSTRUCTED THAT ENCOURAGE USE OF MULTI-MODAL TRAVEL

Implementation Measure 2.1.2.5: Improve Location of Development

NEW RESIDENCES ARE CONSTRUCTED IN AREAS WITH A HIGH PERCENTAGE OF MULTI-MODEL AND/OR PEDESTRIAN-ORIENTED INTERSECTIONS

Implementation Measure 2.1.2.6: Provide Pedestrian Network Improvements

NEW RESIDENCES ARE CONSTRUCTED WITH PEDESTRIAN ACCOMMODATIONS ON-SITE AND CONNECTING TO OFF-SITE INFRASTRUCTURE

Implementation Measure 2.1.2.7: Provide Traffic Calming Measures

PEDESTRIAN/BICYCLE SAFETY AND TRAFFIC CALMING MEASURES ON STREETS AND INTERSECTIONS

Implementation actions

- Update zoning codes to facilitate development in areas accessible to existing bicycle, pedestrian, and transit infrastructure.
- Update zoning codes to include standards/incentives for new development to provide on-site bicycle/pedestrian accommodations that connect to off-site bicycle and pedestrian infrastructure.

- Use the CAP consistency checklist in Appendix E to encourage new development in areas with access to public transit and bicycle/pedestrian networks.
- Construct traffic calming measures on streets and intersections.

Objective 2.1.3: Include Bicycle Accommodations in New Commercial and Multifamily Residential Development

2030 TARGET: 3,439 NEW RESIDENCES CONSTRUCTED THAT ENCOURAGE BICYCLE USE

Cities and the County can establish standards and incentives that facilitate bicycle use associated with new commercial and multifamily residential developments.

Implementation Measure 2.1.3.1: Increase Destination Accessibility

NEW RESIDENCES ARE CONSTRUCTED WITHIN 3.5 MILES OF DOWNTOWN BUSINESS DISTRICT OR MAJOR JOB CENTERS

Implementation Measure 2.1.3.2: Locate Project Near Bike Path

NEW RESIDENCES ARE CONSTRUCTED WITHIN ½ MILE OF CLASS I OR CLASS II BIKE LANES

Implementation Measure 2.1.3.3: Improve Design of Development

NEW RESIDENCES ARE CONSTRUCTED IN AREAS WITH A HIGH PERCENTAGE OF MULTI-MODEL AND/OR PEDESTRIAN-ORIENTED INTERSECTIONS

Implementation Measure 2.1.3.4: Incorporate On-Site Bike Lane Street Design

NEW RESIDENCES ARE CONSTRUCTED IN AREAS WITH A MINIMUM OF ONE MILE OF BIKE LANE PER PROJECT SQUARE MILE

Implementation Measure 2.1.3.5: Provide Bike Parking In New Development

NEW RESIDENCES ARE CONSTRUCTED IN AREAS WITH BIKE PARKING

Implementation Measure 2.1.3.6: Dedicate Land for Bike Trails

NEW RESIDENCES ARE CONSTRUCTED IN AREAS WITH BIKE TRAILS

Implementation actions

- Update zoning codes to provide incentives for projects that meet the implementation measures above based on their location.
- Require bike parking in new multifamily and commercial developments.
- For larger projects, dedicate land for onsite bike trails, or contribute to the development and maintenance of off-site bike trails that link the project to designated bicycle routes with a minimum one mile of bike lane per project square mile.

STRATEGY 2.2: TRAFFIC IMPACT FEE WITH VMT WAIVER

This strategy would establish traffic impact fees to fund transportation infrastructure consistent with CAP goals, and a fee waiver for projects that include features to reduce VMT.

STRATEGY 2.3: ELIMINATE MINIMUM PARKING REQUIREMENTS AND ESTABLISH MAXIMUMS

Local building requirements often incentivize vehicle use by requiring the construction of parking spaces, often at cost to a builder or developer. With this measure, local governments commit to eliminating minimum parking requirements for all new development, and instead establish parking maximums. These new parking maximums would be set below the standard level of parking provided for new development over the last several decades. In the coastal zone, this will need to be paired with additional provisions that ensure coastal public access parking is maintained and provided.

Implementation actions

Update zoning codes to eliminate minimum parking requirements and establish maximums.

STRATEGY 2.4: INCREASE USE OF ACTIVE TRANSPORTATION

Active transportation—such as walking and biking—reduces GHG emissions by replacing vehicle trips. It has the co-benefit of also allowing people to build exercise into their daily routines.

According to HCAOG's 2018 Bike Plan, 1.7% of Humboldt County commutes are made on a bike. 2.3% and 6.2% of commuters travel by bike in the City of Eureka and City of Arcata, respectively. This is higher than the average for California (0.8%) or the country (0.4%). However, it is still much lower than other cities in California. By comparison, the City of Davis has a bike commute mode share of 15.5%, and the City of Santa Cruz's mode share is 13.2%.[16]

[16] League of American Bicyclists. 2017. Where we Ride: Report on the 2017 American Community Survey Data by the League of American Cyclists. https://bikeleague.org/sites/default/files/Where_We_Ride_2017_KM_0.pdf

Objective 2.4.1: Increase Adoption of Active Transport

Implementation Measure 2.4.1.1: Educate the Public About Active Transportation

Youth programs can educate students about the benefits of walking and bicycling and provide the skills how to do so safely.

Safe Routes to School is one such youth education initiative. Safe Routes to School programs teach students how to safely walk and bicycle with traffic and teach family and community members how to model these skills. A Countywide Safe Routes to Schools Task Force, with participation open to everyone, promotes active transportation education, emphasizing streets and sidewalks around school campuses.

Implementation actions

This measure could be implemented by working with representatives from local school districts to implement a bicycle and pedestrian safety program in local schools. Projects and programs could be coordinated through participating with the Countywide Safe Routes to School Task Force. (humboldtsaferoutes.org)

Implementation Measure 2.4.1.2: Expand Regional Trail and Bike Lane Network

2030 Target: 100 Miles of New Class I or II Bikeways

With this measure, jurisdictions commit to expanding the regional bicycling network by developing or expanding bike trails and lanes within their boundaries. This measure will be most effective if complete bike networks are rapidly created. Bike networks should also be connected to pedestrian and transit networks.

The measure calls for the creation of new miles of Class I, II, and IV bike lanes. Below is a summary of the different classes of bikeways (page 3-10 of the 2018 Humboldt Regional Bike Plan contains more detailed information):

- Class I: Bike Path (paved, shared-use between bicyclists and pedestrians).
- Class II: Bike Lane (demarcated area on a street or highway for one-way bicycle travel).
- Class III: Bike Route (roadway without demarcated bike lane that is signed to indicate that bicyclists share the road with motor vehicles).
- Class IV: Separated Bikeway (right-of-way designated exclusively for bicycle travel adjacent to a roadway and protected from vehicle traffic).
- Class III bikeways are not included as a metric for this measure because it is assumed that bike routes have far less potential to reduce VMT than other types of bikeways.

HCAOG's 2018 Bike Plan calls for adding or redesigning approximately 506 miles of bikeways over the next 20 years. Class I and II bikeways make up 94 miles, with the remaining future projects designated as Class III. For this measure, only Class I, II, and IV bikeway projects were considered.

Implementation actions

This measure could be supported by jurisdictions doing the following:

- Devoting staff time toward working with HCAOG to fund and implement the 2018 Bike Plan.
- Developing and implementing plans to re-allocate the existing right of way to form complete bicycle networks linked to transit and pedestrian networks.

Implementation Measure 2.4.1.3: Add Traffic Calming Measures to Roadways

2030 TARGET: AT LEAST 25% OF STREETS AND INTERSECTIONS HAVE IMPROVEMENTS

High vehicle speeds contribute to decreased road safety and increased GHG emissions. Local governments lower travel speeds using road design modifications to "calm" traffic. Traffic-calming measures include reducing the number of travel lanes, temporarily closing streets to vehicle use, and building "median islands" at often-used crosswalks.

Implementation actions

This target would be supported by the following actions:

- Identify key intersections and roadways that are candidates for traffic calming designs and pursue grant funding for traffic calming projects.
- Encourage events that temporarily dedicate streets to pedestrians.
- Explore opportunities for permanent pedestrian-only streets in downtown areas.

Implementation Measure 2.4.1.4: Pedestrian Streets

2030 TARGET: COMPLETE PEDESTRIAN NETWORKS EXIST FOR ALL DESTINATIONS IN URBAN AREAS.

Providing access to complete pedestrian networks encourages people to walk instead of drive. Pedestrian networks should include safe paths to all destinations, and barriers such as fences, walls, etc. should be eliminated.

Implementation actions

- Implement a comprehensive policy of improving pedestrian access in urban areas.

Implementation Measure 2.4.1.5: Implement Complete Streets Measures

"Complete Streets" enable a shift to healthier, more active modes of transit by providing safe and convenient access for bicyclists, pedestrians, and transit service. The Complete Streets Act of 2008 requires California cities and counties to adopt transportation plans that accommodate all users of roadways, including the elderly and disabled. Design features of Complete Streets include accessible sidewalks, crosswalks, bike lanes, and bike parking. Complete Streets design can bring economic benefits to local businesses and increase property values. Humboldt County Association of Governments (HCAOG) incorporates Complete Streets policies into their planning efforts—most recently in the Complete Streets

Element of the 2018 Regional Transportation Plan. With this measure, participating jurisdictions commit to working with HCAOG to implement their local complete streets policy priorities.

Implementation actions

- Devote staff time to working with HCAOG to pursue funding for infrastructure projects and planning for pedestrian, bicycle, and transit facility improvements.

Implementation Measure 2.4.1.6: Promote Purchasing of E-Bikes

2030 TARGET: 2,209 *E-Bikes Incentivized*

E-bikes can remove many barriers to bicycling, especially for those with physical limitations or longer commute trips. According to Project Drawdown, e-bikes are the "most environmentally sound means of motorized transportation in the world today."[17] A study in Portland found that just a 15% increase in e-bike mode share resulted in an 11% decrease in CO_2 emissions.[18] E-bikes currently make up 4-5% of total bike sales.

CARB has identified e-bikes as an important component in the shift to sustainable transportation. Through the Clean Cars 4 All program, California residents can scrap their older, high-polluting cars and receive rebates and vouchers for cleaner alternatives. This program includes e-bike vouchers.[19] The State of California is also issuing e-bike rebates through its Clean Vehicle Rebate Project (CVRP), administered by the Center for Sustainable Energy. And, locally, RCEA recently incentivized the purchase of new e-bikes and electric scooters (e-scooters) through a pilot program.

Jurisdictions can support these existing State and local efforts by assisting RCEA with e-bike incentives, holding safety workshops, and using their outreach channels to promote purchases.

Implementation Measure 2.4.1.7: Install Bike Parking Infrastructure at New and Existing Facilities

2030 TARGET: ALL CITIES AND THE COUNTY ADOPT ORDINANCES REQUIRING BIKE PARKING IN NEW DEVELOPMENT

Policy 1.4 in the Humboldt Regional Bike Plan briefly describes strategies for promoting bike parking in new development. In the text of the Policy, HCAOG pledges to "assist local jurisdictions in adopting an ordinance that requires bicycle facilities in new development and redevelopment."

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[17] Project Drawdown. https://drawdown.org/solutions/electric-bicycles Accessed 6-15-2019.

[18] Portland State University Transportation Research and Education Center. 2019. The E-Bike Potential: Addressing Our Climate Crisis by Incentivizing Active Transportation. https://trec.pdx.edu/news/e-bike-potential-addressing-our-climate-crisis-incentivizing-active-transportation

[19] Office of Senator Tom Umberg. 2019. E-bike vouchers bill signed by Governor Newsom. https://sd34.senate.ca.gov/news/992019-e-bike-vouchers-bill-signed-governor-newsom

Implementation actions

With this measure, participating jurisdictions commit to:

- Work with HCAOG to develop and adopt an ordinance requiring bicycle facilities in new public, multifamily residential, commercial, industrial and mixed-use development and redevelopment.
- Build bike parking at existing locations in the Bike Plan.

Implementation Measure 2.4.1.8: Use Traffic Signals to Encourage Active and Public Transit

Signalized intersections can be improved to prioritize pedestrians, bicyclists, and buses over private vehicles.

Implementation actions

The following actions would support this measure:

- In high-use areas, program signals for bicycle and pedestrian intervals, install bicycle and pedestrian priority signals, or all-way pedestrian "scrambles" (open areas which allow free movement of pedestrians at intersections).
- Program all pedestrian signals to provide sufficient time for all pedestrians, including pedestrians with disabilities, to cross the street safely.
- Replace pedestrian-activated signals in favor of automatic pedestrian signals.
- Install transit-priority signals along main bus routes.

STRATEGY 2.5: REDUCE SINGLE PERSON, PERSONAL VEHICLE COMMUTES

Humboldt County residents tend to travel to school or work in a personal vehicle. According to the *U.S. Census Bureau 2010-2014 American Community Survey 5-Year Estimates*, 73.5% of all employees within the County commute by car alone. There are 18,170 K-12 students in Humboldt County[20]; according to HCAOG's Safe Routes to School prioritization tool, [21]59% of those students are driven to school in private vehicles.

Ridesharing reduces VMT, resulting GHG emissions and driving costs. As of 2020, Cal Poly Humboldt offers a ridesharing program, Zimride, to students. Zimride allows students to track their commute patterns and

[20] Education Data Partnership. 2020. County Summary: Humboldt. https://www.ed-data.org/county/Humboldt

[21] HCAOG, 2012. Safe Routes to School Prioritization Tool. http://hcaog.net/sites/default/files/hcaog_sr2s_prioritzn_tool_report_final_draft_0.pdf

network with others who might want to share a ride. This program or others like it may be applied to establishments outside of the Cal Poly Humboldt setting.

Telework reduces commute trips and can reduce VMT and associated GHG emissions. During the COVID-19 pandemic, telework has allowed many Humboldt County residents to work safely from home. As the pandemic subsides, many cities and counties throughout the State are developing telework policies that allow for employees to work from home under certain conditions. This paradigm shift presents an opportunity for Humboldt County local governments to greatly reduce emissions from employee commutes.

Objective 2.5.1: Implement a Commute Trip Reduction Ordinance for Workplaces

This objective calls for the implementation of a mandatory commute trip reduction program applying to employers that employ over 25 people. The intent of this program is to reduce single-occupancy vehicle trips by encouraging employees of large employers to use an alternate form of transportation—such as public transit, active transportation, carpooling, or telecommuting—at least once a week. Implementation of a trip reduction program ordinance includes the development of performance standards, mandatory implementation, monitoring, and reporting.

The following sub-measures are designed to be components of the trip reduction program. They apply only to establishments that employ over 25 people.

Implementation Measure 2.5.1.1: Carpooling—workplace

2030 Target: 35% of employees eligible for establishments employing over 25 persons

Implementation Measure 2.5.1.2: Telecommuting--Workplace

2030 Target: 14% of Employees Telecommute 1.5 Days Per Week on Average

Implementation actions

- Jurisdictions adopt a trip-reduction ordinance that requires employers with over 25 employees to develop and implement a commute trip reduction program.
  - The ride-sharing measure will include a ride-sharing program and membership within a transportation management association. The ride-sharing program will consist of:
    - Designated parking spaces for ridesharing vehicles,
    - Passenger loading, unloading, and waiting zones; and
    - A website, message board, or app for coordinating ride-sharing.
  - The measure will include a provision to allow employees to work remotely 1.5 days per week when feasible.
- Jurisdictions develop telecommute policy for municipal employees that eliminates commuting for most employees at least once a week.

Implementation Measure 2.5.1.3: Subsidize Transit Passes—Employer Program

2030 Target: 4,170 free transit passes provided

Transit authorities across the country—from Washington D.C. to Portland, Oregon—partner with major employers to subsidize employee commutes, with employers using tax breaks to fund some or all transit subsidy costs.

An excellent local model for this type of program is HTA and Cal Poly Humboldt's Jack Pass offering. Through Jack Pass, Cal Poly Humboldt students ride Redwood Transit System (RTS) free (the program is funded through college tuition fees). Jack Pass users make up about 1/3 of total ridership on RTS and 61% of the Arcata Mad River Transit System (AMRTS).

Implementation actions

With this measure, jurisdictions commit to incentivizing or requiring large employers to provide free transit passes to employees. This type of program could be required via ordinance or implemented as a voluntary program with incentives for businesses to provide passes.

Objective 2.5.2: Commute Trip Reduction (School)

Carpooling reduces VMT, thus reducing GHG emissions. The intent of this program is to reduce VMT for schools by encouraging families to carpool when transporting students.

BOLDT Rides for Resilience is a local initiative to connect students with rides to after school activities using two apps: GoKid and GoKid Connect. The apps can be used by families, guardians, administrators, educators, counselors, and school staff.

Implementation Measure 2.5.2.1: Promote Carpooling to School

2030 TARGET: 16-35% PARTICIPATION RATE AMONG FAMILIES IN JURISDICTION

Implementation actions

- Coordinate with BOLDT program leaders to implement the BOLDT Rides for Resilience program, including the following near-term actions:
    - Create a workable timeline,
    - Conduct outreach,
    - Pilot the GoKid apps,
    - Create informational packets and distribute via mail and email, and
    - Create licensed schoolwide databases within the first year.

Objective 2.5.3: CalPoly Humboldt Commute Reduction

Cal Poly Humboldt (located within the city limits of Arcata) adopted a Climate Action Plan on December 12, 2016, that sets goals to reduce GHG emissions to 1990 levels by 2020, to 80% below 1990 levels by 2040, and to become carbon neutral by 2050. While the City of Arcata does not have any direct authority over the university's actions to achieve its climate goals, all the local jurisdictions in the County commit to supporting Cal Poly's goals to reduce its GHG emissions from commuter trips to and from the university.

Implementation Measure 2.5.3.1: Support CalPoly Humboldt Climate Action Plan

2030 TARGET: 3,584 MT CO2E REDUCTION in GHG EMISSIONS FROM COMMUTE TRIPS AS DESCRIBED IN THE CAL POLY HUMBOLDT 2016 CAP.

STRATEGY 2.6: REDUCE RURAL VEHICLE TRIPS

Over half of the land in the County's unincorporated areas is designated for low density, homestead-style development which explains why the VMT per person is higher in the unincorporated County than in any other jurisdiction which all have higher densities. Due to limited transit accessibility and active transportation infrastructure, personal vehicles are often the only viable transportation option for people living within these rural areas. Thus, ridesharing and e-bikes may be an effective way to reduce overall driving in low-density areas of the county.

Implementation actions

- Support the development of vanpool programs for workers regularly commuting to urban centers.
- Support the development of an online network allowing community members to consolidate shopping and other household trips.
- Promote e-bike incentives in rural areas.

STRATEGY 2.7 EXPAND CARSHARE

Objective 2.7.1: Attract Carshare Services

Car-sharing allows people to rent cars on a short-term basis as needed. Carshare is generally much cheaper than owning a car, and people who participate in a carsharing subscription service tend to drive less, relying on active transportation and/or transit for short trips.

Major car-sharing companies have not yet established significant operations in Humboldt County. With this measure, jurisdictions commit to working with HCAOG, local businesses, and entrepreneurs to increase the supply and demand for car-sharing and potentially facilitate the development of a "home-grown" car-sharing service.

Implementation Measure 2.7.1.1: Implement a Carshare Program

2030 TARGET: CAR SHARE PROGRAM(S) WITH 10,525 PARTICIPANTS

Implementation Measure 2.7.1.2: Require Car Share Parking in New Development

2030 TARGET: RECOMMEND FOR ALL NEW DEVELOPMENT

Implementation actions

- Explore cost-sharing strategies and incentives for local businesses and major developments to include car-sharing spaces
- Adopt an ordinance to require carshare parking in new large multifamily and commercial development
- Facilitate the development of local car-share services by coordinating with providers and pursuing grant funding.

STRATEGY 2.8: BIKESHARE

Objective 2.8.1: Implement A Bike/Scooter-sharing Program

2030 TARGET: BIKE/SCOOTER-SHARING AVAILABLE IN EACH CITY AND THE COUNTY

Bike share and scooter share programs allow people to use bicycles on a short-term basis. Bikes and scooters can be rented or provided for free. The City of Arcata has an active bike-share program and the City of Eureka is looking at initiating a scooter share program in the near future. Roughly 25% of all trips in the County are one mile or less in length which is an appropriate distance for scooters.

Implementation Measure 2.8.1.1: Implement a Bike/Scooter Share Program

2030 TARGET: BIKE/SCOOTER SHARE PROGRAM IMPLEMENTED

Implementation actions

This measure would be supported by jurisdictions doing all the following:

- Work with RCEA and HCAOG to identify ideal locations for new bike/scooter share facilities, including kiosks at entrances to town and local businesses.
- Explore cost-sharing strategies and incentives for local businesses and major developments.
- Based on the above, expand local bike/scooter-share services.

STRATEGY 2.9: TRANSIT RIDERSHIP

VMT and related transportation emissions can be reduced by increasing transit ridership. The measures in this section are meant to make public transit more convenient and less costly, thus encouraging car commuters to take the bus more often.

Objective 2.9.1: Increase Transit Ridership by Improving Service and Reducing Cost

Implementation Measure 2.9.1.1: Active Transportation and Transit Education

2030 TARGET: ONE PROMOTION EVENT ANNUALLY. DISSEMINATION OF INFORMATION

Outreach and community education can increase ridership.

Implementation actions

- Develop outreach campaigns and educational materials in coordination with HTA and local transit agencies.

Implementation Measure 2.9.1.2: Increase Transit Frequency/Speed

2030 TARGET: 15% REDUCTION IN HEADWAY IN 50% OF TRANSIT ROUTES

To reduce headway (wait time between buses), transit managers have two options. They can either increase the number of buses running at a given time or streamline service by moving buses to priority routes. This measure will involve streamlining existing transit routes to focus on more densely populated areas and utilizing park-and-ride infrastructure to bring transit riders from low-density areas to stops along streamlined routes. Where it is appropriate, jurisdictions will allocate transit-only lanes from the existing right-of-way.

The target for this measure is to reduce headway by 15% in many Humboldt Transit Authority/Arcata Mad River Transit Service (HTA/AMRTS) routes. This is a regional measure that requires coordination between HTA and member jurisdictions to streamline transit throughout the County. Some jurisdictions, such as Blue Lake and Ferndale, will not be able to utilize this measure because they are not served by HTA/AMRTS routes.

Implementation actions

Support HTA/AMRTS in their efforts by dedicating staff time to pursue funding for:

- a High-Frequency Shuttle between Cal Poly Humboldt and Downtown Arcata in Peak Periods , and
- a Mainline Eureka–Arcata Express Service (RTS).

Implementation Measure 2.9.1.3: Subsidize Transit Passes—Community Program

2030 TARGET: 8,905 TRANSIT PASSES FULLY SUBSIDIZED (15% OF JURISDICTION RESIDENTS)

Providing free transit routes should encourage ridership by reducing travel costs. Furthermore, eliminating fares can reduce the time it takes for passengers to board, increasing overall bus speed and decreasing wait times for passengers.

Several US communities have offered free fare, including Olympia, Washington, Denver Colorado, and Austin, Texas. Within California, transit systems must maintain a certain level of ridership to be eligible for Transit Development Fund (TDA) funding. To implement this measure, jurisdictions and transit authorities will need to find funding to match what would be collected at the farebox.

Jurisdictions can also create a culture of public transportation ridership by offering free transit passes to their employees, a measure that HTA and member jurisdictions have previously considered. The City of Arcata, College of the Redwoods and Cal Poly Humboldt already offer free or subsidized passes. In Del Norte County, Redwood Coast Transit Authority allows all middle school, high school, and college students to ride for free. Humboldt County recently initiated a pilot program offering 10 free bus passes for 100 employees on a first-come-first-served basis that was so quickly oversubscribed they offered a second round for another 50 employees that also went quickly.

Implementation actions

- Coordinate with HTA to determine the monetary commitment required from each jurisdiction to match revenue from bus fares.
- Secure funding to subsidize passes and educate the public about fare-free transit.

Implementation Measure 2.9.1.4: Subsidize Transit Passes—Housing Developer Program

2030 TARGET: 500 SUBSIDIZED TRANSIT PASSES DISTRIBUTED

Transit passes can be subsidized by developers of new, multifamily, transit-oriented dwellings or by owners of existing rentals. One example of a residential transit pass program is Alameda-Contra Costa (AC) Transit's EasyPass, which offers passes for residents of complexes with over 100 units. The cost of passes may be covered by allowing developers to offer passes in lieu of dedicating land to parking spaces.

Implementation actions

- Form working group of staff from HTA, cities, and the County to coordinate rollout of and funding for subsidized transit passes for municipal employees.
- Include this measure as part of the CAP Compliance Checklist for new development. See Appendix F.

Implementation Measure 2.9.1.5: Increase Number of Transit Stops

2030 TARGET: 45 NEW TRANSIT STOPS

Increasing the availability of bus stops will make taking the bus an option for more people. An additional bus stop in Blue Lake was recommended in the 2017 Transit Development Plan , and subsequently added by incorporating into Willow Creek Transit's Saturday service. Other bus stops would be added in future updates to that Plan.[22]

Implementation actions

- Coordinate with HTA to determine additional bus stop locations.
- Coordinate with HTA to secure funding for additional bus stops.

Implementation Measure 2.9.1.6: Improve Transit Stops

Transit accessibility can be improved by installing sheltered stops, bike racks, bike lockers, and ADA facilities, and ADA compliant sidewalks. As identified by HCAOG in their Transit Development Plan, priority should be given to the installation of an ADA pad and ADA compliant sidewalks at bus stops.

Implementation actions

- Add bus top improvements in coordination with HTA.

Implementation Measure 2.9.1.7: Expand Park-and-Ride Facilities

Park-and-ride lots allow commuters to park their car at a transit stop and take the bus for the remainder of their journey. There is currently a park-and-ride lot in Trinidad and another in Fortuna. With this measure, jurisdictions will work with HTA to explore potential locations for additional park and ride lots and, if necessary, amend zoning regulations to facilitate their development.

Implementation actions

- Coordinate with HTA to expand park-and-ride infrastructure.

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[22] HCAOG, 2017. Transit Development Plan. http://hcaog.net/sites/default/files/humboldt_tdp_2017_plan_final_nov_2017.pdf

Implementation Measure 2.9.1.9: Increase Microtransit Services

2030 TARGET: 26 MICRO-TRANSIT VEHICLES SERVING JURISDICTIONS

Demand response (or micro) transit allows users to access transit within a defined service area and service timeframe, grouping rides whenever possible. Users can access transit through an app, website, or phone call. In 2021, a team of researchers with Montana State University analyzed transit feasibility for McKinleyville and recommended the development of demand response transit system using an app or website.[23]

Implementation actions

- Work with local transit providers to develop microtransit options.

Implementation Measure 2.9.1.10: Increase the Number of Transit Hubs

Transit hubs can allow for convenient access to walking and biking networks, shared micro-mobility services such as bike share services, and other current and future forms of mobility-on-demand, such as Uber and Lyft services. Infrastructure that provides convenience, comfort, and reliability of transit service can encourage a mode shift to public transit.

Implementation actions

- Coordinate with HTA and local transit agencies to fund and create additional transit hubs.

STRATEGY 2.10: PEDESTRIAN-FRIENDLY DOWNTOWN AREAS

Downtown areas tend to be the economic and social centers of a city. Due to the variety of land uses and the population and job density, these areas can be excellent for walking, biking, and riding public transit.

Objective 2.10.1: Reduce Vehicle Traffic in Downtown Areas

Implementation Measure 2.10.1.1: Initiate Parking Fees and Time Limits

2030 TARGET: ALL JURISDICTIONS IMPLEMENT PARKING POLICY WITH A 25% OR GREATER INCREASE IN PARKING PRICE

Implementing parking fees may help encourage a mode shift from single passenger driving to biking, walking, or public transit.

[23] Hamre, Kack, Fisher. 2021. McKinleyville Transit Study Interim Report. https://www.mckinleyvilletransitstudy.com/uploads/1/3/3/7/133791725/20210526_mckinleyville_interim_report.pdf

Implementation actions

- Create parking fees and/or metered parking in downtown areas with revenue potentially supporting pedestrianization.

Implementation Measure 2.10.1.2: Provide Premium Spaces for Carpool and Vans

Providing spaces for carpool and van pools and/or reducing parking prices or fees for carpools and vanpools can incentivize shared trips. Dedicated spaces could be offered at a reduced price or free, and they can be located close to key destinations.

Implementation actions

- Dedicate premium spaces for carpools and/or vanpools at municipal buildings with more than 25 employees.
- Provide parking at no cost or a reduced cost for carpools and vanpools.

Implementation Measure 2.10.1.3: Replace On-street Parking with Non-Vehicle Uses in Dense Downtown Areas

Curb management programs should be implemented in dense downtown areas. On-street parking can be transformed into parklets, bike corrals, expanded bus stops and loading/unloading zones for passengers and transit.

Implementation actions

- Develop and implement plans to shift some downtown curb space from vehicle parking to non-vehicle uses including parklets, bike corrals, expanded bus stops, and loading/unloading zones.
- Work with HCAOG to secure funding for curb management improvements.

ACTIVE AND SUSTAINABLE MASS TRANSIT - COMMUNITY CO-BENEFIT OUTCOMES:

The following paragraphs describe other benefits of the implementation measures for this goal which are outside the focus of the CAP, but noteworthy for other reasons.

A shift away from single-occupancy vehicles towards active transportation and sustainable mass transit will have meaningful impacts on the overall health and safety of the community. The Bureau of Transportation Statistics data indicates that as VMT per capita decreases, so too do fatalities from motor vehicle accidents[24]. People who use transit are more likely to be physically active during their daily commutes,

[24] United States Bureau of Transportation Statistics. (n.d.). State Transportation Statistics 2015. Retrieved from

which can improve their individual health[25]. Increasing the use of transit and active transportation has also shown to be correlated with community-wide improvements in mental and physical health[26].

Supporting sustainable mass transit and active transportation can also expand options for non-driving community members (or community members who don't drive), allowing increased access and variety across their lives--from healthier groceries to wider employment opportunities. It can also improve social equity by reducing expenses related to transportation (which can be substantial for lower income households), allowing income to be allocated to other necessities and helping to reduce poverty-related stress[27].

The direct, avoided cost resulting from CAP measures to reduce VMT amounts to $57 million in maintenance and gas costs for passenger vehicles alone. The average person spends over $9,000/year on a petroleum-fueled passenger vehicle.[28] If these measures provided an opportunity for even a small number of people to live without cars, the savings would be substantial.

GOAL 3: TRANSITION FROM FOSSIL FUELS IN RESIDENTIAL AND COMMERCIAL BUILDINGS AND INDUSTRIAL PROCESSES

All appliances that currently run on gas or propane fuel can be substituted with appliances that run on electricity, allowing for deep cuts in emissions.[29]

Integrating energy-efficient equipment into energy generation and storage can have major implications on the larger energy grid when it comes to mitigating power outages. Optimizing electricity management to allow for increased energy storage and control of when electricity is being used will provide relief to the grid when constrained, and reduce reliance on natural gas in these scenarios.

Appliances that run on electricity need to largely replace their fossil fuel-powered counterparts over the next few decades if we are to meet GHG reduction goals. Stationary combustion fuels include natural gas, propane and wood. Together, these sources comprise approximately 13% of overall Humboldt County GHG emissions, with roughly two thirds of these emissions coming from residential buildings and one third from

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http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/state_transportation_statistics/state_transportation_statistics_2015/index.html

[25] Besser, L., & Dannenberg, A. (2005). Walking to Public Transit: Steps to Help Meet Physical Activity Recommendations. American Journal of Preventive Medicine, 29 (4), 273-280.

[26] Ding, D., Gebel, K., Phongsavan, P., Bauman, A., & Merom, D. (2014). Driving: A Road to Unhealthy Lifestyles and Poor Health Outcomes. PLoSONE, 9

[27] Litman, T. (2011). “Evaluating Non-Motorized Transportation Benefits and Costs.” Victoria Transport Policy Institute.

[28] Bureau of Transportation Statistics. 2019. https://www.bts.gov/content/average-cost-owning-and-operating-automobilea-assuming-15000-vehicle-miles-year

[29] Lynch, Tyler Wells. 2019. If Induction Cooktops are so Great, Why Does Hardly Anyone Use Them? New York Times. https://www.nytimes.com/wirecutter/blog/why-dont-people-use-induction-cooktops/

commercial buildings). In the Legislative-Adjusted Forecast scenario, that share is projected to rise to 16% by 2030, while emissions from electricity use decline.

As the electrical grid is decarbonized, switching from stationary combustion to electricity becomes an increasingly effective way to curb the release of GHGs. Once the local Community Choice Energy program reaches 100% zero-carbon in 2025, emissions from electrical appliances can effectively equal zero. The efficiency of natural gas and propane appliances can also be improved to reduce carbon pollution.

State policy has focused on planning for building decarbonization and incentivizing these efforts. SB 32 directs the California Energy Commission to assess options to reduce emissions from buildings by 40% from 1990 levels by 2030. SB 1477 requires the California Public Utilities Commission to develop and supervise the administration of a statewide initiative requiring gas corporations to improve the State's market for low-emission space and water heating equipment for new and existing residential buildings. SB 1477 also requires the California Public Utilities Commission to develop and supervise the administration of a program to require gas companies to provide incentives for the deployment of near-zero-building emission technologies and directs the Commission to allocate funds for these programs.

Strategy 3.1: Outreach and Education

This strategy involves developing and disseminating educational materials describing the costs and benefits of transitioning from fossil fuels in buildings and commercial and industrial processes. The two Implementation Measures below would be developed similar to the educational programs for zero emission vehicles described earlier in this chapter.

Implementation Measure 3.1.1: Educate Stakeholders on Green Building Practices

Implementation Measure 3.1.2: Energy Efficiency Education Campaign

Strategy 3.2: Focus on Fuel Switching in Existing Infrastructure

According to the County's General Plan, Humboldt can expect only modest population growth over the planning period of this CAP. Thus, measures directed at new infrastructure will have a limited effect on overall emissions. According to countywide estimates prepared for this CAP, there are currently around 34,000 homes utilizing natural gas appliances and just over 5,000 powered by propane. If the region is going to achieve carbon neutrality by 2045, these homes will need to decarbonize.

Objective 3.2.1: Electrify Existing Homes

2030 Target: 26% of existing homes (14,293 homes) transition to electric

Under this objective, jurisdictions commit to transitioning existing homes powered by natural gas and propane to all-electric. It involves the replacement of a central or wall heating system, one dryer, one water heater and one cookstove, or other measures to achieve an equivalent reduction in gas use. Cities and the County can incentivize a transition in the existing building stock by providing financing

opportunities for the replacement of appliances. There may also be opportunities to require electrification in certain cases through building code requirements and regulations on the sale of propane and gas appliances.

Implementation Measure 3.2.1.1: Existing Natural Gas Home Transitions to All-Electric

2030 TARGET: 10,739 EXISTING HOMES THAT USE NATURAL GAS ARE CONVERTED TO ELECTRIC OR OTHER MEASURES THAT ACHIEVE AN EQUIVALENT REDUCTION IN GAS USE

Implementation Measure 3.2.1.2: Existing Propane Home Transitions to All-Electric

2030 TARGET: 3,152 EXISTING HOMES THAT USE PROPANE ARE CONVERTED TO ELECTRIC OR OTHER MEASURES THAT ACHIEVE AN EQUIVALENT REDUCTION IN GAS USE

Implementation actions

This measure would be supported by all the following:

- Adopt building codes to require new buildings to be "electrification ready" (e.g. minimum 200 amp service, and running conduit for electric appliances to water heater and stove locations).
- Consult the North Coast Unified Air Quality Management Board to determine if the agency would be willing and able to limit the sale of gas or propane appliances in areas served by public utilities.
- Work with RCEA to provide financing programs for all-electric appliances, panel upgrades, and wiring upgrades.
- Work with RCEA to provide incentives and rebates for the cost of appliances, panel upgrades and wiring upgrades.
- Consult with HWMA about offering appliance fee waivers for disposal of non-electric appliances.
- Work with PG&E to acquire funding for a program to provide customers with new appliance purchases, panel upgrades, etc. instead of investing in repairs or upgrades to old gas infrastructure.

Objective 3.2.2: Electrify Residential Space Heating

Together, residential space heating and water heating comprise the majority of building emissions. In this CAP, residential space heating has been accounted for separately from water heating to allow for programs that specifically target electrification of residential space heaters.

Implementation Measure 3.2.2.1: Replace Natural Gas Space Heating

2030 TARGET: 200 NATURAL GAS UNITS CONVERTED TO A HEAT PUMP SYSTEM (ASSUMES 50%/50% CENTRAL AND WALL UNITS REPLACED)

Implementation Measure 3.2.1.2: Existing Propane Space Heating

2030 TARGET: 20 PROPANE UNITS CONVERTED TO A HEAT PUMP SYSTEM (ASSUMES 50%/50% CENTRAL AND WALL UNITS REPLACED)

Objective 3.2.3 Electrify Residential Water Heating

Implementation Measure 3.2.3.1: Replace Natural Gas Water Heating

2030 TARGET: 200 NATURAL GAS WATER HEATERS CONVERTED TO HEAT PUMP WATER HEATERS

Implementation Measure 3.2.3.2: Replace Propane Water Heating

2030 TARGET: 20 PROPANE WATER HEATERS CONVERTED TO A HEAT PUMP WATER HEATERS

Objective 3.2.4 Electrify Residential Dryers

Implementation Measure 3.2.4.1: Replace Natural Gas Dryers

2030 TARGET: 200 NATURAL GAS DRYERS CONVERTED TO ELECTRIC HEAT PUMP

Implementation Measure 3.2.4.2: Replace Propane Dryers

2030 TARGET: 20 PROPANE DRYERS CONVERTED TO ELECTRIC HEAT PUMP

Objective 3.2.5 Electrify Residential Cookstoves

Implementation Measure 3.2.5.1: Replace Natural Gas Cookstoves

2030 Target: 200 natural gas cookstoves converted to electric (resistance or inductive) cookstoves

Implementation Measure 3.2.5.2: Replace Propane Cookstoves

2030 Target: 20 propane cookstoves converted to electric (resistance or inductive) cookstoves

Objective 3.2.6 Electrify Commercial Buildings

Implementation Measure 3.2.6.1: Transition Small Commercial Natural Gas Appliances to Electric

2030 Target: 9,055,522 total cumulative square feet all electric small commercial units in areas served by natural gas or other measures that achieve an equivalent reduction in gas use

Implementation Measure 3.2.6.2: Transition Small Commercial Propane Appliances to Electric

2030 Target: 21,057 total cumulative square feet all electric small commercial in areas served by propane or other measures that achieve an equivalent reduction in gas use

Objective 3.2.7: Electrify Commercial Space Heating

Implementation Measure 3.2.7.1: Small Commercial, Natural Gas

2030 Target: See Implementation Measure 3.2.6.1

Implementation Measure 3.2.7.2: Small Commercial, Propane

2030 Target: 1,000 Total cumulative square feet all electric in areas served by propane

Objective 3.2.8: Electrify Commercial Water Heating

Implementation Measure 3.2.8.1: Small Commercial, Natural Gas

2030 Target: See Implementation Measure 3.2.6.1

Implementation Measure 3.2.8.2: Small Commercial, Propane

2030 TARGET: 1,000 TOTAL CUMULATIVE SQUARE FEET ALL ELECTRIC IN AREAS SERVED BY PROPANE

Implementation actions

The implementation actions supporting Implementation Measures 3.2.6.1 and 3.2.6.2 also support all the other Implementation Measures in Strategy 3.2 described above.

Objective 3.2.9: Energy Assessments and Efficiency Upgrade Programs

Objective 3.2.10. Energy Efficiency Fair

Implementation actions

Jurisdictions can assist Redwood Coast Energy Authority in providing no cost energy assessments to eligible local businesses and information on available rebates and financing options for energy efficiency retrofits. Jurisdictions can also assist Redwood Community Action Agency (continue and expand their programs helping low to moderate income households reduce their energy burden through energy efficiency retrofits.

STRATEGY 3.3: PROMOTE ALL-ELECTRIC BUILDING DESIGN FOR NEW CONSTRUCTION (BY 2030, 100% OF NEW CONSTRUCTION IS ALL-ELECTRIC)

Transitioning away from natural gas and propane in new construction is critical to meeting emissions targets, as it prevents "locking in" significant future emissions. Although California's 2019 update to the Title 24 Building Energy Efficiency Standards allow natural gas and propane hookups, the new codes make it easier for builders to meet energy efficiency standards through all-electric design. Because jurisdictions can regulate buildings via building codes, they are well-positioned to make deep cuts in building emissions while helping the community avoid investing in natural gas infrastructure that may soon need to be abandoned.

Objective 3.3.1: Electrify Space and Water Heating, Dryer, and Cookstoves in New Residential Construction

For new single or multi-family homes, all-electric construction provides substantial capital savings, partly due to the lack of a need to pipe for gas.[30] Annual energy costs tend to be lower for new all-electric residences, although this depends on the electricity rate design, climate zone, load management for the water heater and the amount of solar PV installed on the home (California's 2019 building codes require PV solar to be installed on most new residential construction). With this measure, the County and cities commit to promoting all-electric building design. Jurisdictions have the option of adopting a reach code ordinance requiring electrification.

Implementation Measure 3.3.1.1: Require Electric Appliances in New Homes (Single and Multi-family) in Areas Served by Natural Gas

2030 TARGET: 3,196 NEW HOMES ARE ALL-ELECTRIC

Implementation Measure 3.3.1.2: Require Electric Appliances in New Homes (Single and Multi-family) in Areas Served by Propane

2030 TARGET: 143 NEW HOMES THAT WOULD BE BUILT ALL-ELECTRIC

Implementation actions

- Adopt a reach code ordinance or natural gas moratorium for new residential construction that requires all-electric design.
- Build capacity among developers and building inspectors to implement Title 24 electric-ready construction recommendations through workshops, outreach materials.
- Work with RCEA to explore funding for local incentive programs.

Objective 3.3.2: Electrify Space and Water Heating in New Small Commercial Construction

With this measure, cities and the County commit to promoting all-electric design in commercial buildings. Jurisdictions have the option of adopting a reach code ordinance requiring electrification.

[30] Synapse Energy Solutions, Inc. 2018. Decarbonization of Heating Energy Use in California Buildings. https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf

Implementation Measure 3.3.2.1: Require Electric Appliances in New Small Commercial Buildings in Areas Served by Natural Gas

2030 TARGET: 1,132,846 TOTAL CUMULATIVE SQUARE FEET NEW NATURAL GAS SMALL COMMERCIAL UNITS (ONLY COUNTS SPACE AND WATER HEATING)

Implementation Measure 3.3.2.2: Require Electric Appliances in New Small Commercial Buildings in Areas Served by Propane

2030 TARGET: 15,077 TOTAL CUMULATIVE SQUARE FEET NEW PROPANE SMALL COMMERCIAL UNITS (ONLY COUNTS SPACE AND WATER HEATING)

Implementation actions

The implementation actions for these Implementation Measures for small commercial buildings are the same as those described above in Objective 3.3.1 for new residences:

- Build capacity of developers and building inspectors to implement Title 24 electric-ready construction recommendations through workshops, outreach materials.
- Work with RCEA to explore funding for local incentive programs.

BUILDING ELECTRIFICATION – COMMUNITY CO-BENEFIT OUTCOMES:

Building electrification has a wide range of potential co-benefits. Transitioning to all-electric appliances can improve indoor air quality, avoiding carbon monoxide and nitrogen dioxide pollution resulting from the use of gas and propane stoves and heaters. Carbon monoxide pollution can cause death, headache, fatigue, queasiness, poor vision and concentration, and heart pains; nitrogen dioxide pollution can cause lung damage, lung disease, and respiratory infections. [61,31]

Electric heat pumps, which move rather than generate heat, can provide equivalent space conditioning at as little as one quarter of the cost of operating conventional heating or cooling appliances. High efficiency induction cooktops can boil water in nearly half the time of a gas or conventional-electric burner. Induction ranges are also safer than other types of cooktops, with no open flame and little residual heat after they have been turned off[60].

[31] California Air Resources Board. 2020. Combustion Pollutants and Indoor Air Quality. https://ww2.arb.ca.gov/resources/documents/combustion-pollutants-indoor-air-quality

STRATEGY 3.4: ENCOURAGE EFFICIENCY IN NEW AND EXISTING BUILDINGS

Eliminating the fossil fuel emissions associated with a building's energy use relies on three components: a clean supply of energy, high levels of energy efficiency, and demand flexibility (shifting electricity use to coincide with times when electricity is "cleanest"). Of those three, energy efficiency—finding ways to use less energy to perform the same task—is often the first area of focus when decarbonizing a building.

California has long been a leader in efforts to improve building energy efficiency. State law mandates a doubling of energy savings in natural gas and electricity end-uses statewide by 2030. California's Title 24 Building Energy Efficiency Standards include requirements for new construction to improve energy efficiency. Requirements vary depending on the type of construction (i.e., residential vs. commercial) and include standards related to lighting, insulation, and solar readiness.

Many cities and counties throughout the State have encouraged developers to go above and beyond State building energy efficiency requirements. To date, eighteen cities and counties (including the City of Arcata) have adopted local "reach codes" that set ambitious energy standards for new construction. Some of these codes expired with the last building code cycle. Arcata's residential reach codes which now no longer apply established requirements that improve energy efficiency in new single-family homes 30% beyond the State's 2016 Title 24 standards.

Objective 3.4.1: Encourage Weatherization in Low Income Housing

Objective 3.4.2: Improve Energy Efficiency in Existing Buildings

Energy efficiency in existing homes can be promoted through incentives and education. RCEA currently offers free energy efficiency kits and a free energy advisor consultation to homeowners. RCAA provides weatherization services to income-eligible renters and homeowners; examples of services include lighting retrofits, replacement of energy-inefficient refrigerators, installation of programmable thermostats, duct repair and replacement, installation of insulation, heater and water repairs/replacements, and microwave replacements. Community outreach and education will be crucial to facilitating the changes to buildings that will occur over the next few decades. Collaboration between jurisdictions, RCEA, RCAA, and other organizations working in this field is key to conveying the importance of energy efficiency and building decarbonization.

One component of this outreach could be a sustainable energy fair in partnership with community organizations. The fair could include:

- Testimonies from local homeowners, landlords, and renters who have cut their energy use
- Hands-on education from RCEA, RCAA, municipal staff, and other community organizations
- Promotion of available programs and incentives
- Awards for homeowners who cut their energy use

With the below measures, participating jurisdictions commit to promoting energy efficiency services and increasing participation within their jurisdiction.

Implementation Measure 3.4.2.1. Existing Residential, Natural Gas

2030 TARGET: SUPPORT RCEAS ONGOING ENERGY EFFICIENCY WORK

Implementation Measure 3.4.2.2: Existing Residential, Propane

2030 TARGET: SUPPORT RCEAS ONGOING ENERGY EFFICIENCY WORK

Implementation actions

- Work with RCEA to explore funding for local incentive programs.
- Work with RCAA to promote the weatherization program.
- Work with RCEA to promote and expand their energy efficiency residential programs.
- Develop reach codes for existing homes.
- Conduct energy assessments within each jurisdiction.
- Host an energy fair.

Objective 3.4.2: Upgrade Electric Appliances in Existing Businesses

2030 TARGET: SUPPORT RCEA EXISTING EFFORTS

As of the writing of this Plan, RCEA provides a no-cost, no-obligation assessment of lighting, refrigeration and other systems to all Humboldt County businesses and organizations regardless of whether they lease or own their building. Assessment program participants receive a report with specific product recommendations, a financial summary of potential projects, and available incentive estimates. These incentives can be paid directly to the contractor, reducing upfront costs. RCEA can refer customers with qualifying projects to financing opportunities such as zero percent interest financing.

Implementation Measure 3.4.2.1. Existing Residential, Natural Gas

2030 TARGET: SUPPORT RCEAS ONGOING ENERGY EFFICIENCY WORK

Implementation Measure 3.4.2.2: Existing Residential, Propane

2030 TARGET: SUPPORT RCEAS ONGOING ENERGY EFFICIENCY WORK

Implementation Measure 3.4.2.3. Existing Commercial, Natural Gas

2030 TARGET: SUPPORT RCEAS ONGOING ENERGY EFFICIENCY WORK

Implementation Measure 3.4.2.4: Existing Commercial, Propane

2030 TARGET: SUPPORT RCEAS ONGOING ENERGY EFFICIENCY WORK

Implementation actions

- Encourage or require new commercial establishments to apply for the energy assessment program through issuance of business licenses.
- Coordinate with RCEA on outreach to eligible business owners.

Objective 3.4.3: Improve Energy Efficiency in New Buildings

With this objective, cities and the County set a goal for reducing electricity consumption in new residential and commercial construction that goes beyond the requirements of the 2019 Title 24 Building Energy Efficiency Standards. This goal can be accomplished via mandatory building codes, voluntary incentives, and outreach to developers and permit applicants. A reach code ordinance would incorporate Title 24 "tier 1" voluntary energy efficiency measures into local code, increasing building energy efficiency by 15%.

According to this CAP's estimates of emissions, this measure will not result in any emissions reductions past 2025. It is targeting reductions in electricity consumption, and this CAP assumes that Humboldt County's supply of electricity will be 100% clean renewable by 2025 due to RCEA's efforts. Reducing electricity consumption will have benefits, but it will not substantially reduce GHG emissions.

Implementation Measure 3.4.3.1: Residential, Natural Gas

2030 TARGET: SEE IMPLEMENTATION MEASURE 3.2.1.1

Implementation Measure 3.4.3.2: Residential, Propane

2030 TARGET: SEE IMPLEMENTATION MEASURE 3.2.1.2

Implementation Measure 3.4.3.3: Small Commercial, Natural Gas

2030 TARGET: 1,323,552 TOTAL CUMULATIVE SQUARE FEET NEW NATURAL GAS SMALL COMMERCIAL UNITS

Implementation Measure 3.4.3.4: Small Commercial, Propane

2030 TARGET: 15,077 TOTAL CUMULATIVE SQUARE FEET NEW PROPANE SMALL COMMERCIAL UNITS

Implementation actions

- Adopt a reach code requiring new construction that goes beyond current Title 24 standards.
- Develop a reach code alternative in coordination with stakeholders and community partners.
- Adopt a target percentage of new buildings, on a per-area basis, that will be built to CALGreen Tier 1 voluntary standards (between 10% and 50%).
- Identify CALGreen voluntary standards as preferred mitigations for environmental impacts of new nonresidential projects.
- Educate builders through CALGreen workshops.
- Promote green building practices through outreach and education.
- Update checklists and provide information and guidance to permit applicants.

STRATEGY 3.5: JURISDICTIONS LEAD BY EXAMPLE

Objective 3.5.1: Jurisdictions Decarbonize Existing Municipal Buildings

Cities and the County have direct control over the energy use in their buildings and facilities. Improving energy efficiency in municipal buildings allows cities and the County to act as ambassadors for building decarbonization.

Implementation Measure 3.5.1.1: Decarbonize Buildings Using Natural Gas

Implementation Measure 5.5.1.2: Decarbonize Buildings Using Propane

Implementation actions

- Implement a facility energy efficiency program including energy audits for all municipal facilities, and retrofits where feasible.
- Require that newly constructed, purchased, or leased municipal space meet Leadership in Energy and Environmental Design (LEED) criteria.
- Switch facilities to all-electric.

STRATEGY 3.6: ENCOURAGE EFFICIENCY IN LARGE COMMERCIAL AND INDUSTRIAL MANUFACTURING PROCESSES

Objective 3.6.1: Energy Efficiency in Large Commercial and Industrial Manufacturing Processes

Efficiency measures can be encouraged through incentives and technical assistance.

Implementation Measure 3.6.1.1: Reduce Electricity Consumption by 5%

2030 TARGET: 428,800 TOTAL CUMULATIVE SQUARE FEET MANUFACTURING AND PROCESSING SPACE

Implementation Measure 3.6.1.2 Reduce Natural Gas Consumption by 5%

2030 TARGET: 458,800 TOTAL CUMULATIVE SQUARE FEET MANUFACTURING AND PROCESSING SPACE

Implementation actions

- Work with large industrial and commercial building operators to determine ways to reduce energy use.

Objective 3.7.1: Cal Poly Humboldt Climate Action Plan

As identified above in Objective 2.5.3, Cal Poly Humboldt within the city limits of Arcata has a Climate Action Plan to reduce GHG emissions to 80% below 1990 levels by 2040, and to become carbon neutral by 2050. While the none of the cities nor the County have any direct authority over the University's actions to achieve its climate goals, all jurisdictions in the County commit to supporting Cal Poly's goals to reduce its GHG emissions from fossil fuel energy use in buildings.

Implementation Measure 2.5.3.1: Support CalPoly Humboldt Climate Action Plan

2030 TARGET: 2,994 MT CO2E REDUCTION in GHG EMISSIONS FROM BUILDINGS AS DESCRIBED IN THE CAL POLY HUMBOLDT 2016 CAP.

ENERGY EFFICIENCY – COMMUNITY CO-BENEFIT OUTCOMES:

The following paragraphs describe other benefits of the implementation measures for this goal which are outside the focus of the CAP, but noteworthy for other reasons.

Indoor environments are where people spend most of their time, and the conditions of these spaces can have lasting impacts on both physical and mental health. Energy efficiency measures in homes and workplaces can improve ventilation reducing the concentrations of things like mold, allergens, particulates, and chemical contaminants. Proper ventilation reduces risks of respiratory illnesses and of impaired cognitive development, particularly among children. Energy efficiency measures that address temperature control and humidity can also reduce risks of these symptoms in occupants of homes and workplaces.[32]There are also general benefits of comfort to having efficient and well-designed temperature control. In Humboldt County homes, this means spare rooms in houses are not cold in the middle of the day and homes are not too hot at night.

Efficient and intentional lighting has co-benefits as well. The source, intensity, and location of lighting in homes and workplaces can affect strain on eyesight and mental stress. Occurrences of seasonal affective disorder can be reduced, and workplace productivity can be increased with appropriate and efficient lighting design.[33]

Low-income households tend to live in homes that are older and less efficient, resulting in poorer people paying disproportionately more in electricity bills and compounding the health risks mentioned above. Energy efficiency measures will reach populations who need the most support to the greatest effect.[34]

GOAL 4: DECARBONIZE ELECTRICITY SOURCES

RCEA's *RePower Humboldt Plan* documents the community's vision for the future of energy: by 2030, the County will be a net exporter of renewable energy and a "thriving research and development center and incubator for energy technology and related manufacturing." The renewable energy sector will be a "stable source of local jobs," keeping money spent on energy in the county while increasing the community's adaptability to any major external changes in energy supply or technology. Humboldt is well-positioned to achieve this vision due to the County's abundant natural resources and the ambitious renewable energy development goals of its Community Choice Energy (CCE) provider.

RePower identifies the following interim goals for energy generation and utility services in Humboldt County:

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[32] Younger, M., H. Morrow-Almeida, S. Vindigni, A. Dannenberg (2008). "The Built Environment, Climate Change, and Health: Opportunities for Co-Benefits." American Journal of Preventive Medicine 35(5): 517-526

[33] Edwards, L., P. Torcelli (2002). "A Literature Review of the Effects of Natural Light on Building Occupants." National Renewable Energy Laboratory

[34] CEC (2004). "California Statewide Residential Appliance Saturation Study." California Energy Commission.

"By 2025, 100% of RCEA's power mix will be from a combination of State-designated renewable energy sources (solar, wind, biomass,[35] small-hydroelectric, zero-emission large hydro-electric facilities and geothermal). By 2030, Humboldt County will be "a net exporter of renewable electricity and RCEA's power mix will consist of 100% local, net-zero-carbon-emission renewable sources."

RCEA will achieve the 2025 and 2030 goals through securing energy purchase contracts from renewable energy providers. Collaboration with cities and the County on achieving their CAP commitments will support these goals. RCEA plans to help "build the clean energy sector into a cornerstone of the local economy through a breadth of strategies that include innovation, research and development, local energy-related business development, and establishing Humboldt Bay as the primary west coast hub for the offshore wind energy industry."

RePower Humboldt identifies several potential sources of local renewable energy, including both utility-scale and rooftop solar, offshore and onshore wind, small hydropower, biomass, and biogas. Table 3 below identifies several potential sources of renewable energy in the area. RCEA seeks to ensure a diversity of renewable power sources, recognizing that a variety of sources will have roles to play in Humboldt's renewable energy future

[35] Section 398.4 of the Public Utilities Code considers biomass to be a renewable energy resource under the California Renewables Portfolio Standard Program. Furthermore, the Energy Commission does not consider emissions from combustion of biomass (Public Utilities Code Section 1393): "The Energy Commission shall not attribute carbon dioxide emissions associated with electricity production from biogenic fuels to retail suppliers for GHG emissions intensity calculations." "Biogenic fuels" means biomass, biowaste, or biomethane from an eligible renewable generator. Biomass plants do typically produce some non-biogenic emissions from use of other fuels, which are treated separately in emissions accounting.

Generator Name	Resource	Location	Operational Capacity (MW)	Potential Capacity (MW)
DG Fairhaven Power	biomass	Humboldt	0	15
Humboldt Sawmill Cogeneration	biomass	Humboldt	25	25
Baker Station Hydro Plant	hydro	Humboldt	1.5	1.5
Big Creek Water Works	hydro	Trinity	5	5
Gosselin Hydroelectric Plant	hydro	Trinity	2	2
Kekawaka Hydro Plant	hydro	Trinity	5	5
Three Forks Waterpower Project	hydro	Trinity	1	1
Additional local small hydropower	hydro	Humboldt	not built, unplanned	8
Redwood Coast Airport Solar Microgrid	solar	Humboldt	2.2	2.2
RCEA Feed-In Tariff Projects	various	Humboldt	not built, planned	12
Humboldt onshore wind	wind	Humboldt	not built, unplanned	125
Redwood Coast Offshore Wind	wind	Offshore	not built, planned	120[36]
Total			54.5	323

Table 3. Maximum rated output of electric power production by potential renewable energy generators in the area.

Even in an unlikely hypothetical scenario where solar is installed on every roof in Humboldt County, rooftop solar could provide less than a third of Humboldt's electricity needs.[37] However, distributed generation across the grid is a key aspect of energy resilience. RCEA also plans to develop a network of community microgrids and renewable energy back-up power systems to be installed at all critical facilities across the county by 2030. These distributed energy systems will help reduce GHG emissions, provide energy resiliency, and emergency energy supply.

Public Safety Power Shutoffs (PSPS) affected communities throughout California since 2019, and the risk of PSPS events in future years remains high. Small-scale, localized energy generation through solar, paired with energy storage technology, can greatly increase community resilience during power shutoffs. Residences will be able to keep their food fresh for longer, and vulnerable populations who rely on power

[36] 2019 EDP Renewables analysis of average generation data.

[37] Lehman, Peter. Quoted in a 2019, Times-Standard Article. Solar can't power all of Humboldt County, HSU researchers say. https://www.times-standard.com/2020/01/11/solar-cant-power-all-of-humboldt-county-hsu-researchers-say/

to keep medications cold or medical assistance devices powered will be more equipped to sustain grid outages. Businesses will be more able to save perishable products, and vital community gathering places can keep the lights on for community members during emergencies.

Strategy 4.1: Renewable Energy Workforce Development

Any efforts to reduce local GHG emissions or adapt to a changing climate rely on skilled workers. To meet our climate goals, we will need electricians who can retrofit buildings and install EV charging stations, scientists who can restore streams and wildlands and engineers upgrade our streets to make them safe for bicyclists and pedestrians.

Future development in Humboldt County may increase the need for workers in the clean energy sector beyond the current local supply. The offshore wind industry alone could create more than 17,500 jobs in California by 2045,[38] requiring a highly skilled and trained workforce in planning, building, construction, maritime trades and more.

Local governments, non-profits and educational institutions all have a role to play in expanding the green workforce in Humboldt County. Existing local programs, such as Cal Poly Humboldt's Environmental Resources Engineering program and College of the Redwoods' Solar Photovoltaic Technician Program, already contribute to training candidates for green jobs. With this CAP objective, Humboldt County's local governments commit to working with stakeholders to support the expansion of these programs and the development of similar programs. To ensure living wages and job security for this growing workforce, the County will work with labor unions and other stakeholders to establish the practice of developing Community Benefits Agreements for renewable energy projects.

Implementation Actions

- Collaborate with stakeholders, including tribes, labor unions, workforce development boards, State agencies, colleges, universities, industry and community organizations to increase local workforce development and explore certification pathways for trades
- Work with stakeholder groups to identify workforce gaps along project timelines and finance, design and develop training programs.
- Work with unions to develop apprenticeship programs and community benefits /project labor agreements.

Strategy 4.2: Incorporate Vehicle to Grid Services in the Energy Grid

Vehicle to grid services enable energy to be pushed back to the power grid from the battery of an electric car. With electric vehicle-to-grid technology—also known as car-to-grid—a car battery can be charged and discharged based on different signals to balance variations in energy production and consumption.

[38] American Jobs Project. 2019. The California Offshore Wind Project: A Vision for Industry Growth. http://americanjobsproject.us/wp/wp-content/uploads/2019/02/The-California-Offshore-Wind-Project.pdf

Increased renewable energy use inevitably makes our energy system more volatile, requiring new ways to balance and store energy to be used, and vehicle to grid services may be a part of the solution.

Jurisdictions can support RCEA's efforts to incorporate vehicle to grid services into the local energy grid to implement this strategy.

STRATEGY 4.3: DEVELOP UTILITY-SCALE RENEWABLE ELECTRICITY GENERATION

The most promising local utility-scale generation resources are offshore wind, solar, biomass, and small run-of-the-river hydroelectric. Offshore wind is of special interest as wind speeds off the North Coast are among the highest in the nation. Humboldt Bay is also the only deep-water port in California north of San Francisco Bay and has substantial, underutilized port facilities and infrastructure which could support offshore wind energy development, possibly allowing Humboldt to serve as a hub for a broader west coast offshore wind industry.

Objective 4.3.1: Amend Zoning Regulations to Facilitate Renewable Energy Development

Amendments to local zoning codes can help facilitate renewable energy development. Identification and pre-zoning of promising locations for utility-scale solar, hydropower and wind projects will further help encourage the development of renewable energy infrastructure.

Implementation Measure 4.3.1.1: Support Countywide Development of Solar and Wind Overlay Zones

2030 TARGET: COMPLETION OF OVERLAY ZONES

Implementation Actions

- Work with RCEA and the Schatz Energy Research Center to identify locations throughout the county that are suitable for utility-scale solar, hydropower and wind energy.
- Adopt zoning code amendments to principally permit wind and solar projects in certain areas under certain conditions.
- Develop a wind energy overlay zone or other appropriate ordinances.

Objective 4.3.2: Support Offshore Wind Development

RCEA and Schatz Energy Research Center (SERC) are leading the extensive planning and research process required for what could be California's first floating offshore wind project. Project goals include increasing local economic opportunity, providing competitively priced renewable energy to electricity ratepayers, prioritizing stakeholder engagement, pursuing environmentally-sound development and maximizing investment in local infrastructure to develop Humboldt Bay into an industry hub. As of summer 2021, RCEA is conducting conversations with stakeholders—including local fishermen, tribes, environmentalists, labor unions and government partners—about the project.

The Redwood Coast Offshore Wind Project, if awarded a lease by the Bureau of Ocean Energy Management, would generate 100-150 megawatts (MW) of energy. RCEA plans to procure 40 MW of that power, with the remaining power sold to buyers outside of Humboldt. Five to fifteen turbines would be located approximately 25 miles west of Eureka, anchored 600-1000 meters deep. Cables would connect the turbines, and an export cable would extend to the shore with an connection proposed at the Humboldt Bay Generating Station[39].

Implementation Measure 4.3.2.1: Promote the Development of Offshore Wind

2030 TARGET: >120 MW OF OFFSHORE WIND CAPACITY DEVELOPED BY 2030

Implementation Actions

- Work with RCEA, the Harbor District and permitting agencies to help develop the Redwood Coast Offshore Wind Project.

Objective 4.3.3: Support Renewable Energy Workforce Development

Implementation Measure 4.3.3.1: Promote Local Renewable Energy Workforce Development Programs

2030 TARGET: EXISTENCE OF RENEWABLE ENERGY WORKFORCE DEVELOPMENT PROGRAMS

STRATEGY 4.4: DISTRIBUTED RENEWABLE ELECTRICITY GENERATION

RCEA's RePower Humboldt Plan defines strategies to support the development of behind-the-meter, grid-connected renewable energy and storage systems in customers' homes and businesses.

Objective 4.4.1: Promote Distributed Energy Systems Development

The California Public Utilities Commission Self-Generation Incentive Program (SGIP) provides incentives to support existing, new, and emerging distributed energy resources. SGIP provides rebates for qualifying distributed energy systems installed on the customer's side of the utility meter. Funding for the SGIP is limited, necessitating local commitment to sustaining the build-out of distributed energy generation.

Implementation Actions

- Streamline permitting of small-scale wind, waste-to-heat power and biogas systems, as appropriate.

[39] RCEA. 2020. Offshore Wind Energy. https://redwoodenergy.org/community-choice-energy/about-community-choice/power-sources/offshore-wind-energy/

- Assist RCEA with outreach to qualifying customers.

Implementation Measure 4.4.1.1: Support RCEA's Feed-In Tariff (FIT) Program

2030 TARGET: SUPPORT THE EXISTING FEED-IN TARIFF PROGRAM MANAGED BY RCEA

The purpose of the FIT program is to incentivize the installation of local small-scale distributed renewable generation resources. Eligible technologies include biomass, biodiesel, fuel cells using renewable fuels, digester gas, landfill gas, municipal solid waste, ocean wave, ocean thermal, tidal current, solar photovoltaic, small hydroelectric, solar thermal, wind and geothermal.

Implementation Actions

- Meet with RCEA and developers to specify parameters for successful projects
- Participate in efforts, as needed, to increase feeder capacity
- Screen potential small run-of-the-river hydroelectric projects for power potential and environmental context to inform potential developers of the potential power generation, financial expectations, and risks.
- Share data with RCEA and developers to expedite infrastructure planning

Implementation Measure 4.4.1.2: Community Scale Renewable Energy Promotion

2030 TARGET: REGULARLY PROMOTE THE BENEFITS OF RENEWABLE ENERGY GENERATION. CONTINUE CURRENT INCENTIVE PROGRAMS

Implementation Measure 4.4.1.3: Streamline Solar Permitting

Implementation Measure 4.4.1.4: Support RePower Residential Solar Installation Goals

2030 TARGET: SUPPORT REPOWER RESIDENTIAL SOLAR INSTALLATION GOALS

RCEA intends to facilitate the installation of one solar electric system each day within the county between 2020 and 2030. RCEA assumes 90% of solar arrays will be installed on residences and 10% on commercial buildings. This results in an average annual target of 328 residential solar installations and 37 commercial installations over the next decade.

Currently, an average of 222 solar electric arrays are installed per year in the County.[40] This number is trending upward, assuming historic installation rates continue. There are State targets for rooftop solar as well: beginning in 2020, the State Building Energy Efficiency Standards required all new homes to install solar panels, and future building codes will likely extend this requirement to nonresidential construction. However, due in part to Humboldt County's limited projected population growth and old building stock

[40] California Distributed Generation Statistics. https://www.californiadgstats.ca.gov/charts/

relative to the rest of California, new construction will make up only a small fraction of countywide GHG emissions from building energy consumption over the next decade.

In addition to supporting RCEA, local governments can act to help reach solar installation goals by complying with State law[41] and removing local regulatory burdens to rooftop solar installation.

For the years 2020-2026, the solar goals set by RCEA for behind-the-meter, customer-sited solar will be met via Title 24 requirements for new residential buildings and retrofits and projected upward installation trends.

Implementation Actions:

- Meet with RCEA and developers to specify parameters for successful projects.
- Participate in efforts, as needed, to increase feeder capacity.
- Share information with RCEA and developers to expedite infrastructure planning.
- Support community solar (a joint investment in solar in which participants either own or lease a part of a front-of-the-meter solar system or purchase renewable energy from it).
- Support solar installation on residential and commercial buildings.
- Regularly promote the benefits of renewable generation, current and future incentive programs[42] [43] including RCEA's Net Energy Metering program, the federal Investment Tax Credit, the California Solar Initiative's Single-Family Affordable Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH) Programs.
- Work with jurisdictions and contractors to standardize and streamline permitting processes across the county.
- Conduct a comprehensive review of local solar permitting process based on the Governor's Office of Planning and Research's Solar Permitting Guidebook, identifying any existing barriers to solar installation.
- Collaborate with other jurisdictions and RCEA to develop common promotional materials.
- Develop an online solar permitting process.
- Explore renewable energy permit fee waiver.
- Adopt goal that supports RCEA initiative to facilitate the installation of one solar electric system each day within the county between 2020 and 2030.

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[41] Muratsuchi, 2014. AB 2188. Solar Energy: Permits. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB2188

[42] RCEA's Net Energy Metering (NEM) and Feed-In Tariff programs are the primary incentives available as of the writing of this report; some sources deduce that NEM provides a greater incentive than the Federal ITC.

- Adopt a reach code ordinance with requirements for solar installation that go beyond 2019 State requirements. This ordinance would apply to:
    - Homes that undergo major additions/alterations (project value is > 50% of the value of existing improvements)
    - New commercial construction
- Adopt an ordinance requiring new commercial developments to either have solar or be solar-ready.

Implementation Measure 4.4.1.5: Support RCEA's Commercial Solar Installation Goals

2030 Target: Support RCEA's commercial solar installation goals

RCEA intends to facilitate the installation of one solar electric system each day within the county between 2020 and 2030. RCEA assumes 90% of solar arrays will be installed on residences and 10% on commercial buildings. This results in an average annual target of 328 residential solar installations and 37 commercial installations over the next decade.

Currently, an average of 222 solar electric arrays are installed per year in the County.[43] This number is trending upward, assuming historic installation rates continue. There are State targets for rooftop solar as well: beginning in 2020, the State Building Energy Efficiency Standards will require all new homes to install solar panels, and future building codes will likely extend this requirement to nonresidential construction. However, due in part to Humboldt County's limited projected population growth and old building stock relative to the rest of California, new construction will make up only a small fraction of countywide GHG emissions from building energy consumption over the next decade.

In addition to supporting RCEA, local governments can act to help reach solar installation goals by complying with State law[44] and removing local regulatory burdens to rooftop solar installation.

For the years 2020-2026, the solar goals set by RCEA for behind-the-meter, customer-sited solar will be met via Title 24 requirements for new residential buildings and retrofits and projected upward installation trends.

[43] California Distributed Generation Statistics. https://www.californiadgstats.ca.gov/charts/

[44] Muratsuchi, 2014. AB 2188. Solar Energy: Permits. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB2188

Implementation Actions:

- Meet with RCEA and developers to specify parameters for successful projects.
- Participate in efforts, as needed, to increase feeder capacity.
- Share information with RCEA and developers to expedite infrastructure planning.
- Support community solar (a joint investment in solar in which participants either own or lease a part of a front-of-the-meter solar system or purchase renewable energy from it).
- Support solar installation on residential and commercial buildings.
- Regularly promote the benefits of renewable generation, current and future incentive programs45 including RCEA's Net Energy Metering program, the federal Investment Tax Credit, the California Solar Initiative's Single-Family Affordable Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH) Programs.
- Work with jurisdictions and contractors to standardize and streamline permitting processes across the county.
- Conduct a comprehensive review of local solar permitting process based on the Governor's Office of Planning and Research's Solar Permitting Guidebook, identifying any existing barriers to solar installation.
- Collaborate with other jurisdictions and RCEA to develop common promotional materials.
- Develop an online solar permitting process.
- Explore renewable energy permit fee waiver.
- Adopt goal that supports RCEA initiative to facilitate the installation of one solar electric system each day within the county between 2020 and 2030.
- Adopt a reach code ordinance with requirements for solar installation that go beyond 2019 State requirements. This ordinance would apply to:
    - Homes that undergo major additions/alterations (project value is > 50% of the value of existing improvements)
    - New commercial construction
    - Adopt an ordinance requiring new commercial developments to either have solar or be solar-ready.

[45] RCEA's Net Energy Metering (NEM) and Feed-In Tariff programs are the primary incentives available as of the writing of this report; some sources deduce that NEM provides a greater incentive than the Federal ITC.

STRATEGY 4.5 ELECTRICITY STORAGE

Objective 4.5.1: Support RCEA in Reaching Energy Storage Targets

RCEA has set targets for behind the meter solar, battery storage, long-duration storage technologies, and demand response programs. With this objective, cities and the County commit to supporting RCEA's goals and activities related to energy storage.

Implementation Measure 4.5.1.1 Support Battery Storage Targets

Implementation actions:

- Coordinate with RCEA to support RePower Humboldt goals and activities.
- Expedite and streamline permitting for energy storage facilities.
- Support RCEA efforts to integrate automated demand response technology.
- Participate in RCEA demand response programs.

Implementation Measure 4.5.1.2: Replace Diesel Generators

2030 TARGET: 10,600 GALLONS OF DIESEL OFFSET BY STORAGE IN 2030

Municipal facilities often have backup generators powered by diesel. Rooftop solar paired with battery storage can fulfill these key facilities' need for backup generation The City of Rio Dell has used battery systems paired with solar to replace diesel generators at key facilities.

Implementation actions:

- Replace diesel generators with solar paired with behind-the-meter storage in key municipal facilities.

STRATEGY 4.6: PURSUE A TIME-COINCIDENT CLEAN PROCUREMENT STRATEGY (A.K.A. "24/7 CLEAN AND RENEWABLE PORTFOLIO")

As mentioned previously throughout the document, RCEA has set goals for 100% clean and renewable energy procurement by 2025, and 100% renewable and local energy procurement by 2030. Currently, common practice among utilities to achieve the State's Renewables Portfolio Standard is to purchase sufficient renewable energy to meet the targeted portion of their customers' electricity consumption on an annual basis, not an hourly basis. However, *when* that electricity is generated is important to decarbonizing the grid.

The carbon intensity of any utility's electricity mix varies by the hour. The grid typically experiences peak demand during the hours of 4-9pm. Solar, wind, and other renewables that are not paired with storage in the utility's portfolio often don't produce sufficient energy to match its customer demand during these

peak hours. For this reason, utilities often rely on unspecified system power to fill in the gaps when demand is at its peak. Unspecified system power cannot be traced to any one source. It has a higher carbon intensity because it is fed by the larger power grid which uses non-renewable energy sources. More specifically, unspecified system power procured through the California Independent System Operator can be assumed to consist largely of natural gas and large hydro generation.

For this reason, even though RCEA's power purchases will amount to 100% clean and renewable in 2025, the lack of a time-coincident procurement strategy will require unspecified system power to supplement specified generation during certain hours of each day, resulting in carbon emissions. To approximate the emissions of its forecasted portfolio inclusive of system power reliance and other system-level impacts, RCEA used the CPUC's 2020 Integrated Resource Planning Clean System Power Calculator[46]. The following table shows the resultant annual average GHG emission factors per unit energy delivered through 2030.

Year	lbs CO_2/MWh
2020	315
2021	406
2022	230
2023	179
2024	225
2025	225
2026	199
2027	199
2028	199
2029	199
2030	242

As with other clean energy goals, a time-coincident clean portfolio can be pursued through both supply-side strategies such as contracting for utility-scale energy storage, and demand-side strategies including aggregated demand response and distributed energy resources.

A 24/7 clean and renewable portfolio will require substantial planning, analysis and investment to achieve. At least one other California Community Choice Aggregation (CCA), Peninsula Clean Energy, has formally adopted a goal of a time-coincident clean portfolio. Financial analysis by RCEA staff and consultants would help the RCEA Board of Directors make an informed choice on whether to pursue such a strategy. In any case, it is possible that State-level regulatory changes in the coming years will compel RCEA and other load-serving entities to pursue 24/7 clean and renewable power procurement, to maintain grid reliability while still meeting the State's grid decarbonization goals.

Implementation Actions

[46] https://redwoodenergy.org/integrated-resource-plan/

- Cities and the County, via their RCEA Board representative, encourage RCEA to pursue a time-coincident procurement strategy through a Board resolution.
- Cities and the County adopt demand-side strategies such as energy efficiency, automated demand response and distributed energy storage that are deployed to better match load with supply hour by hour and reduce demand during peak periods.

Objective 4.6.1: Support a Time-Coincident Procurement Policy with Demand-side Strategies

Implementation Measure 4.6.1.1: Jurisdictions, Via Their RCEA Board Representative, Encourage RCEA to Pursue a Time-Coincident Procurement Strategy

2030 TARGET: JURISDICTIONS, VIA THEIR RCEA BOARD REPRESENTATIVE, ENCOURAGE RCEA TO PURSUE A TIME-COINCIDENT PROCUREMENT STRATEGY THROUGH A BOARD RESOLUTION.

Implementation Measure 4.6.1.2: Jurisdictions Adopt Demand-side Strategies for the Community such as Energy Efficiency, Automated Demand-side Management, etc.

STRATEGY 4.7: JURISDICTIONS LEAD BY EXAMPLE AND SWITCH TO CLEAN ENERGY

Objective 4.7.1: Implement Energy Efficiency, Fuel Switching, and Clean Energy Initiatives in Municipal Facilities.

Cities and the County can have a direct impact on emissions by reducing building energy emissions in their own facilities.

One implementation action presented here is for cities and the County to "opt up" to RCEA's Repower+ service. For customers who opt up, RCEA procures 100% renewable energy to meet their electricity demand. Choosing Repower+ for some or all of their facilities allows jurisdictions to directly cut their emissions and lead by example. Furthermore, it helps jurisdictions to educate the public about the RePower+ program.

Implementation Measure 4.7.1.1: Cities and the County "Opt Up" to RePower+

2030 TARGET: CITIES AND THE COUNTY OPT-UP TO REPOWER+

Implementation Actions

- Convert propane and natural gas appliances in facilities to electric.
- Develop an allowance program for special-purpose appliances for which an electric replacement is not available.

- Conduct efficiency upgrades on all buildings.
- Opt up some or all municipal facilities to RePower+.

GOAL 5: MINIMIZE WASTE

Waste reduction can help us conserve valuable materials. The City of Arcata's website has this language about its zero-waste program: "The goal is to ensure that nothing is sent to a landfill or incinerator by ensuring that resources we take from the earth continue to be used efficiently without waste and excess burden on the environment."

Many Humboldt County residents take pride in using materials efficiently. The county is home to Zero Waste Humboldt, an organization specializing in waste reduction solutions. Cal Poly Humboldt's Waste Reduction Resource Awareness Program hosts an annual zero-waste conference. Neighboring Del Norte County is one of California's many Zero Waste Communities

Solid waste accounts for 4% of total countywide emissions. The solid waste portion of the inventory accounts for GHGs from decomposition. Emissions associated with the transport of waste are embedded in the transportation sector of the Humboldt County GHG Inventory. Emissions from decomposition of solid waste can be minimized— practices like material reuse, recycling and composting can divert waste from landfills and subsequently reduce emissions.

Even though waste materials still decompose and release gases when composted, composting can result in less GHG emissions compared to landfilling. This is because composted organics, which tend to decompose aerobically, produce less methane than landfilled organics, which tend to decompose anaerobically. Furthermore, compost used to amend soil can offset GHG emissions associated with chemical fertilizers.

STRATEGY 5.1: ORGANIC WASTE

Organic waste accounts for more than a third of the material in California's waste stream.[47] Organic wastes can be made into useable products such as compost, fertilizer, or biofuel. SB 1383 Short-Lived Climate Pollutants, adopted in 2016 by the State Legislature, establishes a target to divert 75 percent more waste from landfills by 2025.

Humboldt is currently lacking in facilities to accept diverted organics. There are currently no facilities for composting food waste, and green waste is currently accepted only by the Mad River Compost Facility in Arcata.

Green waste includes yard trimmings, grass clippings, pallets and unpainted or untreated wood. In 2016, between self-haul and curbside programs, 4,000 tons of green waste was received at the Hawthorne Street Transfer Station in Eureka.[48] Most of this material was composted at Mad River Compost Facility in Arcata. Up until recently, some material in Humboldt County was burned at the Scotia biomass power plant.

[47] CalRecycle. 2020. Organic Materials Management. https://www.calrecycle.ca.gov/organics

[48] HWMA. Greenwaste. http://www.hwma.net/disposal-services/greenwaste

Curbside green waste pickup is currently only available in Rio Dell, Ferndale, Fortuna, Arcata, Unincorporated areas of the Eel River Valley and Eureka.[49]. As noted above, currently only the Northcoast Co-op in Arcata accepts food waste drop-off for composting. Backyard composting is encouraged by the Cities of Arcata and Eureka

Construction and demolition activities generate approximately 28% of total solid waste in California. Wood waste makes up the majority of the C&D waste stream.[50] Other waste byproducts from C&D activities are lumber, drywall, metals, masonry (brick, concrete, etc.) and carpet. Metals are the most recycled material on this list, while lumber is most often landfilled.[51]

Many jurisdictions have adopted C&D diversion ordinances, and CalRecycle provides a model C&D diversion ordinance on its website.

Objective 5.1.1: Establish Diversion and Compost Programs

Implementation Measure 5.1.1.1 Adopt Ordinance Requiring 75% Lumber Waste Diversion to Green Waste Facilities

2030 TARGET: 8,269 ANNUAL TONS LUMBER WASTE DIVERTED

Implementation Measure 5.1.1.2: Coordinate with HWMA to Expand Yard Waste Service and Explore Residential Composting

2030 TARGET: 75% OF ORGANIC WASTE (14,848 ANNUAL METRIC TONS) COMPOSTED

Implementation Actions

- Develop an ordinance requiring that 75% of lumber waste from new construction and renovation is diverted to green waste.
- Require new residential and commercial projects to submit a waste management plan to divert, recycle or salvage at least 50% of non-hazardous construction materials.
- Coordinate with HWMA to expand yard waste service and explore residential compost pickup.

[49] Recology. https://www.recology.com/recology-humboldt-county/

[50] Calrecycle. 2020. Urban Wood Waste. https://www.calrecycle.ca.gov/condemo/wood

[51] CalRecycle. 2020. Construction and Demolition Debris Recycling. https://www.calrecycle.ca.gov/ConDemo/

- Coordinate with HWMA to expand composting facilities and explore the development of infrastructure to compost/digest food waste.

STRATEGY 5.2: RECYCLING AND RE-USE

Local governments can reduce waste by requiring reuse and recycling via permits and ordinances. Ideally, these local policies can target the waste streams that contribute the most to landfills overall. Large events such as concerts and festivals create waste and often require local permits. Waste from events can include food, packaging, utensils, beverage containers, and other items, much of which can be reduced, reused, recycled or composted.

Objective 5.2.1 Expand Recycling and Reuse Programs

Implementation Measure 5.2.1.1: Require New Residential and Commercial Projects to Submit a Waste Management Plan for New Construction or Major Retrofits

2030 TARGET: 17,051 ANNUAL METRIC TONS CONSTRUCTION WASTE DIVERTED

Implementation Measure 5.2.1.2: Major Event Recycling and Waste Diversion Plan

2030 TARGET: DIVERT 70 ANNUAL METRIC TONS SOLID WASTE FROM EVENTS. 50% OF RECYCLABLES ARE RECYCLED AND 75% OF ORGANICS ARE COMPOSTED

This measure is modeled after Arcata's Major Event Recycling and Waste Diversion Plan. The Plan includes the following measures and requirements:

- Request vendors look at packing and serving materials to reduce waste.
- Encourage vendors to purchase compostable, reusable, recycled content and easy-to-recycle products whenever possible.
- Use City provided containers for public recycling of glass, plastic & aluminum bottles and cans.
- Utilize recycling services provided by the Arcata Garbage Co. or Arcata Resource Recovery Center to recycle glass, plastic, aluminum, cardboard, chipboard, tin cans and paper.
- Provide periodic service to vendor booths to pick up cardboard, plastic, chipboard, tin cans, paper and recyclable beverage containers.
- Require booth staff to bring cardboard, plastic, chipboard, tin cans, paper and recyclable beverage containers to designated recycling collection areas.
- Divert other materials.

Implementation actions

- Direct staff to develop a waste management permit form for event managers. Require event managers to submit a waste management permit prior to events.
- Monitor events for compliance.

Implementation Measure 5.2.1.3: Enhance Regional Coordination on Waste Mitigation

This measure requires that jurisdictions coordinate with HWMA, waste haulers, Zero Waste Humboldt and other municipalities to promote and disseminate information on waste reduction and diversion. This is an unquantified supporting measure.

Implementation actions

- Jurisdictions direct staff to devote hours to coordinate with HWMA.

Minimizing Waste – Community Co-benefit Outcomes

Implementing measures that address solid waste has other benefits which are outside the focus of the CAP. Limiting emission of hydrogen sulfide, methane, dust, odor, and other pollutants improves air quality. Limiting the contact of harmful waste with our bodies of water and soil can allow for more stable pH and fewer contacts with potentially harmful toxins, increasing quality of life for plants and wildlife[52].

Goal 6 Reduce Emissions from Construction

The emissions reductions in Goal 9 are meant to help support a project-level GHG emissions analysis. There are no 2030 targets for these measures.

Strategy 6.1: Project-Level Construction Emissions

Objective 6.1.1: Reduce Diesel Consumption

Implementation Measure 6.1.1.1 Use Renewable Diesel in Construction Equipment

2030 Target: 5,000 gallons of renewable diesel used in construction equipment

Implementation Measure 6.1.1.2 Use Electric and Hybrid Construction Equipment

[52] Waste Management through Composting: Challenges and Potentials Modupe Stella Ayilara 1, Oluwaseyi Samuel Olanrewaju 1, Olubukola Oluranti Babalola 1, * and Olu Odeyemi

[70] Pratt, Greg. Personal Communication with Colin Fiske

[72]Pratt, Greg. Personal Communication with Connor McGuigan

Implementation Measure 6.1.1.3 Limit Construction Equipment Idling beyond Regulation Requirements

Implementation Measure 6.1.1.4 Recycle Construction Waste Above 50% Requirement

Implementation Measure 6.1.1.5 Divert Lumber Waste Above 75% Requirement

Implementation Measure 6.1.1.6 Replace Diesel Generators with Battery Storage

5 Carbon Sequestration in Forests, Agricultural Lands, and Wetlands

Biological carbon sequestration is the process of removing carbon dioxide from the atmosphere and storing it as carbon in vegetation and soil, thereby reducing atmospheric carbon. This terrestrial, or biological, sequestration occurs on agricultural lands (including cropland and grazing land); in forests and wetlands, and other non-agricultural rural lands; and in urban forests.

Forests, grasslands, shrublands, and wetlands can store large amounts of carbon for decades. When disturbed through human activities or natural disturbances, stored carbon can be released to the atmosphere. Conversely, natural and working lands can be protected and managed in ways that actually increase carbon sequestration. Carbon storage is complex and subject to many influences. Some changes to carbon storage and flux can be quantified, such as changes resulting from timber harvest, but unless a rigorous life cycle analysis is done, the effects on climate are indeterminate. Also, many influences cannot be reliably predicted. For example, future wildfire locations, timing, and severity are all unpredictable influences.

The measures in this Chapter call on the CAP's implementing entities to continue to take steps to identify how human activities impact biological carbon emissions, and support land management and conservation practices that reduce emissions and increase biological carbon sequestration. Many of these measures are focused on contributing to forest, farm, and watershed health and resilience to climate change, as health and resilience are necessary for continued and increased carbon storage. The measures are grouped by land type: forests, urban lands, agricultural lands, and wetlands. Various measures in each of these four sections also apply to other land types (e.g., grasslands and shrublands). A list of probable lead entities for each measure is included in Appendix E.

Measures to increase carbon sequestration are advisory and not quantified

Quantifying the contributions of carbon sequestration measures is beyond the scope of this CAP, so GHG emissions reductions from actions in this section of the CAP are not used to achieve overall GHG emission reduction goals at this time. In future updates to the CAP, carbon sequestration as part of a GHG reduction strategy may be used if measures or actions increase the amount of carbon stocks relative to a dynamic baseline, defined at "Business as Usual", which is what would occur without the measure. More discussion of this topic is in Appendix C.

The current degree of practice of the following measures is not known or broadly monitored across the many land ownerships in the County. Baseline carbon sequestration data for Humboldt's natural and working lands has not been collected for this CAP, although available estimates of standing carbon storage by land type and forest carbon in offset reserves are given in Appendix C, indicating that land use contributions are large and significant, even if the incremental effects of the following carbon sequestration measures are not presently quantifiable.

Preparing a sequestration inventory is included as an implementation goal of this CAP, with the hope that future updates can include an analysis and tracking of carbon sequestration effects of future land use and land management changes over time.

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MEASURES TO INCREASE CARBON SEQUESTRATION ARE ADVISORY AND NOT QUANTIFIED

Quantifying the contributions of carbon sequestration measures is beyond the scope of this CAP, so GHG emissions reductions from actions in this section of the CAP are not used to achieve overall GHG emission reduction goals at this time. In future updates to the CAP, carbon sequestration as part of a GHG reduction strategy may be used if measures or actions increase the amount of carbon stocks relative to a dynamic baseline, defined at "Business as Usual", which is what would occur without the measure. More discussion of this topic is in Appendix C.

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5.1 Forest Lands

Goal7: Manage resilient, biodiverse forests that effectively sequester carbon

Humboldt County forests store large and significant amounts of carbon, the most of any county in California. Forests sequester carbon through photosynthesis and growth. Forests can be managed to contribute to carbon gain, or can cause carbon emissions. Forests lose carbon when they are converted to other purposes such as agriculture and urban development, when they burn, are impacted by pests and disease, or harvested unsustainably. The following measures are high level actions to increase forest carbon sequestration and resilience.

Forested Areas Conservation and Growth

Conserved forests can sequester large amounts of carbon long-term, as well as benefit the environment as species refugia for adaptation, anchoring the persistence and recovery of key populations of animals and plants. Conserved forests also provide myriad other ecosystem services.

Maintain forests as forests to the greatest extent possible

Forests are among the most significant and effective methods of storing carbon in the long term, and are a major source of carbon storage in Humboldt County, with an estimated 3.8 billion tons of CO_2e stored long-term. The largest potential loss of this important ecosystem service is the conversion of forests to agricultural use (which sequesters far less carbon) or urban/suburban development (which sequesters little to no carbon). Measures that incentivize keeping forests as forests can be the most effective measure to maintain and increase carbon storage in Humboldt County forests. Restoring oak woodland and prairie communities from conifer encroachment may lead to a decrease in carbon sequestration; however, this restoration is important for other reasons including climate resilience. [53]

Reduce landscape fragmentation

Fragmented habitats are a primary cause of biodiversity loss and reduced productivity through exposure to disturbances, obstruction of potential migration pathways, and overall lowered resistance and resilience. Avoiding and reducing fragmentation requires an intentional effort that benefits from partnerships, agreements, and other mechanisms for land protection and management across ownership boundaries. Strategic acquisitions of high-priority conservation areas with fee acquisitions, conservation easements, and other efforts to increase the size and connectivity of forest ecosystems will foster a landscape-scale response to resist the effects of climate change.

[53] Tim Bailey, personal communication. 7-30-21

EXPAND COMMUNITY FORESTS NEAR TOWNS

Community forests that are managed for multiple ecosystem services, such as forest health, recreation, timber harvest, and wildlife have been established in Arcata and the Eureka area and have been initiated for McKinleyville. Community forests provide multiple benefits to municipalities and communities including species refugia, recreation opportunities, and demonstration of low impact forestry and working landscapes.

FOREST MANAGEMENT

Good forest management is good forest carbon management. Healthy, productive forests are ideal for accruing and storing carbon and thereby reducing GHGs in the atmosphere. Keeping forests healthy by protecting soils and soil productivity, tending stands where feasible for productivity and wildfire resilience, practicing sound silviculture according to clear objectives, and ensuring healthy levels of forest stocking can secure the large and important sequestration capacity and storage of the County's forested lands. The following are forest management measures that can maintain and increase carbon stocks and sequestration capacity and improve forest resilience to climate change.

RETAIN AND REGENERATE OLDER TREES TO INCREASE FOREST RESISTANCE TO LOSS OF CARBON STOCKS

Old trees with large boles and abundant heartwood are ideal for long-term carbon sequestration. Landowners can retain older trees to ensure genetic continuity and resist fire. Thinning older forests to reduce fire vulnerability, protecting and supporting regeneration, and enhancing the cultivation and persistence of large, old, and primary trees are all actions that benefit carbon storage of forests.

REDUCE ADVERSE EFFECTS TO LONG-TERM SOIL PRODUCTIVITY AND NUTRIENT CYCLING

Modifying forest operations and using suitable equipment that can minimize soil compaction, rutting, or other impacts are measures that protect long-term forest productivity. Retaining woody debris to maintain moisture, soil quality, and nutrient cycling are also important for forest health. Restricting recreational access in areas that show signs of excessive impacts to allow for revegetation and soil stabilization may be a useful tool in some areas as well.

RETAIN BIOLOGICAL LEGACIES ACROSS THE LANDSCAPE

Maintaining biological diversity at the population and species level can help enhance forest resilience. During forest management activities, measures could include retaining the oldest and largest trees with good vigor, and retaining survivors of pest or disease outbreaks, droughts, windthrow events, or other disturbances during salvage or sanitation operations. Retaining individual trees of a variety of uncommon species to maintain their presence on the landscape can also help enhance forest resilience.

RESTORE AND FAVOR NATIVE TREE SPECIES THAT ARE ANTICIPATED TO BE ADAPTED TO FUTURE CONDITIONS

Species composition in most forest ecosystems is expected to change as species adapt to new climatic conditions. Maintaining overall ecosystem function and health by assisting adaptive transitions of species

and communities to appropriate habitats is one way forest management can play a role. This can result in different species assemblages than those present in the current community, or an altogether different community in future decades as climate warming proceeds.

MAINTAIN AND ENHANCE DIVERSE FOREST STRUCTURE AND COMPOSITION

Maintaining and improving species, age-class and structural diversity in forests can improve forest health and resilience. Vegetation and associated habitat diversity supports more diverse wildlife and help all species to persist as the climate changes, allowing systems to more quickly adjust and respond to new conditions.

INCREASE RESISTANCE AND RESILIENCE OF FOREST TREES TO INVASIVE INSECTS

Development and implementation of integrated pest management strategies can prevent and reduce the negative impacts of invasive insects on the productivity of the region's forests and grasslands and their ability to sequester carbon in the future with warming temperatures. Effectively addressing invasive insects in the long term includes identifying and monitoring invasive insects that are not currently present in the region but may appear in the future under warmer conditions. This measure can be implemented in part through support of existing efforts by County agricultural programs[54], the Humboldt UC Cooperative Extension[55], and the CAL-IPC Weed Management Area[56].

PRACTICE ECOSYSTEM-BASED MANAGEMENT

Ecosystem management is a concept of wildland management that was defined for national forest lands in the 1980s and 90s (Franklin et al. 2018[57]). Sound ecosystem-based management maintains high stocks of carbon in forests. Important principles of ecosystem management include, but are not limited to:

1. Avoiding irreversible effects.
2. Applying treatments at relevant ecological timescales.
3. Managing for structural heterogeneity across landscapes.
4. Understanding historic disturbance processes.
5. Maintaining ecological processes and functions.
6. Recognizing and protecting unique ecological and cultural values and services.
7. Managing for long-term benefits at large scales.

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[54] "The Agricultural Commissioner is charged with the responsibility of managing nuisance pests of agriculture and human health. Many of these pests are recently introduced species that have become established despite the best efforts of the commissioners to keep them out." County of Humboldt. https://humboldtgov.org/2302/Agricultural-Program-Information

[55] UC Cooperative Extension. https://humboldtgov.org/614/UC-Cooperative-Extension

[56] CAL-IPC. 2021. "What We Do." https://www.cal-ipc.org/about/mission/

[57] Franklin, Jerry F., K. Norman Johnson, and Debora L. Johnson. *Ecological forest management*. Waveland Press, 2018

8. Embracing biological complexity.
9. Designing with nature.

Work across ownerships and jurisdictions at larger scales

At large-scales, carbon sequestration can be best achieved if actions and planning are coordinated across ownerships and jurisdictions where possible. Specific planning actions include:

1. Aligning priorities for programs of work with neighboring lands.
2. Communicating about projects adjacent to other lands, and coordinating on-the-ground
3. Working across boundaries to preserve roads, trails, and access.
4. Granting rights-of-way to adjacent owners where this can preclude the need for new roads.

Fuels Management Fires can be intense in densified forest stands where fire has previously been suppressed. Severe fires can burn organic material that would otherwise decompose and release carbon into the soil. Such fires can also destabilize soils, break off carbon-based organic matter from minerals, and kill bacteria and fungi. As a result, fuel management actions that reduce the risk of severe fires can have a positive impact on long-term carbon sequestration.

Decrease Tree Density in Densified Forest Stands

Strategic thinning of densely grown forests can reduce the risk of severe fires and the consumption of forest carbon. It can also promote forest age-class and structural diversity.

Encourage Wildfire to Play a Natural and Beneficial Role

Healthy forests in Humboldt County benefit from periodic wildfire. Ideally, such fires are more frequent and lower-intensity to clear understory and ladder fuels, rather than infrequent and high-intensity in densified forest stands. Using “let burn” (Fire Use) authorities in suitable situations, allowing wildfires to burn under conditions where they will be of low-to-moderate severity, can accomplish large areas of fuel treatment during wildfire incidents.

Encourage Prescribed Burning

The spread and severity of wildfires can be mitigated and risks reduced by reducing fuel loading. Clearing of fuels can be achieved through prescribed burning, mechanical and hand thinning, prescribed herbivory, mastication, etc. Prescribed burning is often a good solution, since it restores a more frequent and natural regime of small fires, helping to prevent the build-up of fuels; other forms of fuels treatments might be helpful to prepare an area in advance of a prescribed burn. Prescribed or “controlled” burning is inexpensive, poses some small but consequential risks of fire escape, adds air pollution as smoke, and often requires open road systems for crew and emergency access. Strongly encouraging prescribed burning by collaboratives and multiple stakeholders can help to overcome barriers and mitigate risks to decisionmakers. Frequent, low-intensity prescribed burns result in significantly less long-term emissions from wildfire, as fire behavior, fire suppression, and burn severity are moderated by the reduction in fuels.

Reduce and manage fuels in the WUI (Wildland Urban Interface) and other strategic locations to reduce wildfire spread and severity

The WUI is the highest priority for fuel management work because of the values at stake and the priority of fire suppression resources devoted to structures during wildfire.

Several groups and programs exist in Humboldt County to help reduce fuel loading in the WUI and more broadly. A few of these include:

1. The Fire-adapted Landscapes & Safe Homes Program, or "FLASH", is designed to assist property owners with reducing their risk to wildfire by thinning flammable vegetation around their homes and along key access routes.[58]
2. The Humboldt Resource Conservation District's forest health/fire resilience programs also have fuels reduction components.[59]
3. 3. Among other things, the Humboldt County Fire Safe Council supports beneficial fire such as prescribed and cultural burning60.

Research

Support and conduct "Life Cycle Analyses" to understand actual effects of Forest Management on climate

To quantify carbon sequestration in a way that can be useful to counter GHG emissions, it is crucial to conduct life cycle analyses (LCA) to assess and quantify how various measures affect actual GHG emissions when all carbon fates and pathways are included. In our complex systems, most actions are interrelated, and measures usually have multiple effects.

Practice adaptive management on public forests to learn how to Improve Carbon Sequestration and promote resilience

Public forests and experimental research sites can make valuable contributions to understanding carbon sequestration dynamics, climate change impacts, and ways to adapt to rapidly changing climates and maintain forest and watershed resilience. National forests encompass large, relatively undisturbed areas, and often comprise headwater areas where water supplies and aquatic ecosystems are intact and function as refugia. These areas provide a favorable environment for assessing the ecological effects of climate change. On public lands, scientists and managers can work together to gain better understanding of carbon sequestration, ecosystems and climate processes, evaluate management options, test solutions, and transfer knowledge to stakeholders.

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[58] County of Humboldt. "FLASH."https://humboldtgov.org/690/Fire-Adapted-Landscapes-Safe-Homes

[59] Humboldt Resource Conservation District. Forest Health/Fire Resiliency. http://humboldtrcd.org/projects/forest_healthfire_resiliency

[60] County of Humboldt. Fire Safe Council. https://humboldtgov.org/FireSafeCouncil

CONTINUE RESEARCH ON ALTERNATIVES TO BIOMASS BURNING TO SEQUESTER THE CARBON IN LUMBERMILL RESIDUES AND IN-FOREST THINNING RESIDUES. CONDUCT LIFE CYCLE ANALYSES TO UNDERSTAND THE BENEFITS OF BIOMASS POWER GENERATION AND ALTERNATIVE USES.

The Humboldt County timber industry generates a large amount of forest residuals (material that is generally left in the forest or pile-burned) and mill waste as trees are manufactured into lumber for market. Approximately 400,000 tons of forest residuals are generated per year.[61] Recent research at the Schatz Energy Research Center characterizes GHG emissions from forest residuals used to generate electricity across the State.[62]

Much of the material used in existing Humboldt County biomass plants is a byproduct of milling. Sawmill waste consists of sawdust, cutoffs, and miscellaneous small pieces that result from milling. This waste has insufficient quality for current product manufacture. Much of this material is burned in biomass electricity generating plants, locally and in the upper Sacramento Valley. Biomass power is expensive, but can be continuously generated if sufficient feed material is available, and the carbon is non-fossil, within the Earth's carbon cycle. Biomass burning, in any form, generates both air pollution and GHG emissions. RCEA and others are currently planning to conduct a comprehensive analysis of the value of biomass electricity generation compared with other fates and uses, such as biochar, compost, and nanocellulose that could sequester this carbon.

MARKET OPTIONS

CONTINUE TO INCREASE FORESTS USED AS CARBON RESERVES IN THE CALIFORNIA CAP-AND-TRADE AND VOLUNTARY CARBON OFFSET MARKETS

California's Cap-and-Trade system and voluntary carbon offset markets allow the purchase of carbon offsets to compensate for GHG emissions. This gives monetary value (carbon offset credit) to carbon storage and emissions avoidance measures, providing a means of generating revenue from efforts to increase forest carbon sequestration. In California, a protocol has been established to quantify, verify, and certify forest offset credits for sale in the Cap-and-Trade system, and also in the voluntary, non-compliance market.[63]. Humboldt County has 12 conserved "carbon forests" in the State Cap-and-Trade compliance system; a summary of these carbon reserve projects is given in Appendix D. The amount of Humboldt County forestland used for forest offset credits is small relative to the potential amount.

[61] Furniss, Michael J. 2019. Biomass Power in Humboldt County. https://redwoodenergy.org/wp-content/uploads/2019/11/Biomass-Humboldt-Board-Final-MJF.pdf

[62] Carman, Fingerman et al. 2021. Minimizing Emissions from Forest Residues. https://schatzcenter.org/cbrec/

[63] California Air Resources Board, 2020

5.2 Urban lands

Goal 8: Protect and Enhance Urban Forests and Greenways

Urban forests are the trees, plants, and associated ecosystems anywhere where people are – for instance, along streets and roads, and in yards and parks. Urban greenways are the vegetated open space corridors that run through urban areas, often including wetlands, watercourses, and riparian habitat. While the overall contributions of the urban areas of the County to biological carbon sequestration may be relatively minor compared to the County's rural lands, the social, environmental, and economic co-benefits of protecting and enhancing urban forests, greenways, and natural areas are significant. The following measures are high-level actions to increase carbon sequestration and resilience in urban areas.

Increase urban tree planting and urban forests to increase carbon sequestration other ecosystem services

Urban forests and other "trees outside of forests" contribute to carbon sequestration and myriad ecosystem services that help adapt to warming conditions, reducing the urban heat-island effect, enhancing water quality, increasing biodiversity, and promoting human health.

Maintain or restore riparian areas in urban areas

Much of the forest cover in urban areas are in riparian areas. Forests within riparian areas serve important functions, such as decreasing soil erosion, filtering runoff, storing and recycling organic matter and nutrients, providing shade to moderate stream temperatures, and storing carbon in wood. Forested riparian areas also often serve as corridors for wildlife and plant species migrating across fragmented landscapes. The use of guidelines, such as best management practices and riparian management zones, can help to secure the long-term benefits of urban forests in riparian areas.

5.3 Agricultural lands

Goal9: Develop agricultural systems that more effectively sequester carbon

The following measures are high level actions to increase carbon sequestration and resilience on agricultural lands and rangelands, where most carbon is stored in the soil.

Soil Management

Reduce soil erosion and sediment export from farms

Erosion is expected to increase as climate change alters soil moisture regimes and runoff. Increasing frequency and severity of drought will increase the susceptibility of soil to wind and water erosion, while increased heavy rain frequency and durations will drive erosion processes. Sites currently prone to erosion

will have increased risks of sediment losses in a changing climate, especially sites with sparse cover, steeper slopes, and impervious surfaces. Excessive sedimentation and deposition of fine materials can degrade watershed hydrology and flow paths, water quality, and the potential survival and regeneration of plants, aquatic, and terrestrial wildlife. Soil erosion seriously degrades the ability of soils to store carbon, decreasing their long-term sequestration capacity. The use and monitoring of best management practices is key to reducing soil erosion and protecting sites from the challenges presented by increased extreme events, seasonal fluctuations in soil moisture, and increased frequency of overland flow.

INCREASE LONG-TERM SOIL CARBON STORAGE USING REGENERATIVE AGRICULTURE PRACTICES

Soils can hold large amounts of carbon as humus, roots, litter, and other organic matter. A significant proportion of humus is long-lived and can persist in soil for decades. Regenerative agricultural practices focus on increasing and maintaining organic matter in soils to maintain soil fertility, drought tolerance, and increase the stocks of sequestered carbon. Such practices include; no-till or reduced-till cultivation, use of cover crops to promote soil organic matter and soil health, and reduction or elimination of the burning of crop residues.

USE THE MINIMUM NITROGEN FERTILIZER AND FERTILIZER THAT IS SLOW-RELEASE

Nitrogen fertilizer in inorganic forms often results in significant release of NO_x to the atmosphere, which is a highly potent and long-lived GHG and a serious air pollutant. Excess amounts of nitrogen fertilizer can also pollute surface and ground waters. Minimizing nitrogen fertilizer, using slow-release organic forms of nitrogen fertilizer and maintaining abundant soil organic matter can limit these emissions and discharges.

PEST MANAGEMENT

INCREASE THE RESISTANCE AND RESILIENCE OF FARMS AND CROPS TO INVASIVE INSECTS AND PATHOGENS

Weeds, pests, and pathogens may become more prevalent and harder to control in a warmer world. Supporting and coordinating existing efforts to develop climate-resilient integrated pest management and existing County agricultural programs will increase the resistance and resilience of farms and crops to invasive insects and pathogens.[64]

PREVENT THE INTRODUCTION AND ESTABLISHMENT OF INVASIVE PLANTS AND REMOVE EXISTING INVASIVE PLANT SPECIES

[64] "The Agricultural Commissioner is charged with the responsibility of managing nuisance pests of agriculture and human health. Many of these pests are recently introduced species that have become established despite the best efforts of the commissioners to keep them out." County of Humboldt. https://humboldtgov.org/2302/Agricultural-Program-Information

Climate change may increase the rate of spread of invasive plant species. Early detection and rapid response will be crucial as the risks of new invaders increase. Urban areas are especially susceptible to the introduction and spread of invasive plants because of use of ornamental species in landscaping, nutrient loading, high levels of disturbance, and moderated microclimates.

BIODIVERSITY

ESTABLISH AND MAINTAIN TREES AND SHRUBS ON FARMS.

Adding crop or non-crop trees to agricultural fields, known as agro-forestry or permaculture, can add biodiversity, act as natural pest control and can increase soil carbon storage. Leaving portions of farms as natural ecosystems to enhance biodiversity and resistance to insects can increase overall farm resilience to climate change.

LIVESTOCK

REDUCE ENTERIC FERMENTATION AND IMPROVE MANURE MANAGEMENT

Enteric fermentation takes place in the digestive systems of animals, particularly ruminant animals such as cattle. Methane, a potent GHG, is produced in the rumen by bacteria as a by-product of the fermentation process. This methane is exhaled or belched by the animal and accounts for most emissions from ruminants.

Enteric methane emissions can be substantially reduced by adding a small amount of certain types of seaweed to cattle feed.[65] Researchers are investigating ways to deliver seaweed additives to pastured animals,[66] and commercialization will likely be possible by 2025 or earlier.[67]

[65] **Red seaweed *(Asparagopsis taxiformis)* supplementation reduces enteric methane by over 80 percent in beef steers** Roque BM, Venegas M, Kinley RD, de Nys R, Duarte TL, et al. (2021) Red seaweed *(Asparagopsis taxiformis)* supplementation reduces enteric methane by over 80 percent in beef steers. PLOS ONE 16(3): e0247820. https://doi.org/10.1371/journal.pone.0247820

[66] Kebreab, Ermias. 2021. Personal communication. May 6, 2021.

[67] Ermias Kebreab and Breanna Roque. 2021. EcoWatch. https://www.ecowatch.com/cow seaweed-methane-2651130438.html

Incentives & Support

Support Local agriculture to reduce transportation emissions

Local governments can support local agriculture and enhanced processing facilities for local agricultural products, particularly when this results in a significant savings in transportation costs and emissions.

Encourage innovation to increase soil carbon storage on farms and adaptive responses to climate changes.

Farmers usually know best how to increase soil carbon, overall farm productivity, and the best ways to adapt to changing climates. Programs and incentives that encourage, reward, and communicate innovations should be implemented. Carbon offset credits for soil carbon increases on farms are under consideration by the California Climate Action Reserve.

5.4 Wetlands

Goal 10: Enhance and Restore Wetlands

Wetlands fix large amounts of carbon, as organic matter accrues faster than the slow oxidation occurring in saturated low-oxygen environments. Only wetlands store more carbon per acre than forests in Humboldt County. Carbon sequestration in coastal wetlands, such as those adjacent to Humboldt Bay, have large and ongoing carbon storage.[68] Over time, the buildup of peat materials can be very large and comprises important long-term carbon storage. Restoration of drained tidal wetlands to reestablish mudflats and salt marshes can increase carbon storage, while conversion of wetlands to other uses reduces carbon storage potential. The following measures are high level actions to increase wetland carbon sequestration and resilience.

Restoration

Increase wetland carbon sequestration through restoration of tidal marshes

Wetland restoration and enhancement projects such as those in the sloughs around Humboldt Bay[69] are highly effective in sequestering additional carbon over time and holding it out of the atmosphere for long

[68] Owers, Christopher J., Kerrylee Rogers, Debashish Mazumder, and Colin D. Woodroffe. "Temperate coastal wetland near-surface carbon storage: Spatial patterns and variability." *Estuarine, Coastal and Shelf Science* 235 (2020): 106584.

[69] Montanio, Patricia A. "Targeted supplemental environmental assessment for the City of Arcata McDaniel Slough Expansion Project." (2010).

periods. These measures also achieve large improvements in aquatic diversity and ecosystem health and productivity and increase the resilience of these biologically rich systems to climate warming and sea level rise.

ADAPTATION

AS SEA LEVELS RISE, ALLOW FORMER WETLAND AREAS TO RE-ESTABLISH

Rising sea levels in Humboldt Bay will cause dikes to fail and flood areas of the Bay that were formerly tidal wetlands. Adding or enlarging dikes to temporarily block flooding is a common "solution" but only perpetuates the losses and risks and is expensive and temporary. A better solution in many places may be to allow some areas to flood and become tidal wetlands again, increasing carbon storage, and adding diverse and highly productive habitats, rich biodiversity, and overall system resilience. Compensation for landowners in the form of conservation easements or fee acquisitions could help incentivize this outcome; rather than adding or expanding expensive dikes that will become inadequate as seas continue to rise and as coastal groundwater and soils salinize and become unsuitable for agriculture.

6 IMPLEMENTATION, MONITORING, AND EVALUATION

Implementation of the CAP will require coordinated action between local jurisdictions, agencies, businesses, and the public in the coming years. To ensure accountability, progress must be regularly measured and reported. To work together effectively, everyone must have clear roles. Many CAP programs call for widespread public participation recognizing their overall success depends on the public being engaged and supporting these efforts by providing education and resources.

This section presents a high-level overview of the following:

1. Administration and staffing
2. Community outreach and engagement
3. Financing and budgeting
4. Timelines for measure implementation
5. Monitoring, reporting, and adaptive management
6. Next steps

6.1 ADMINISTRATION AND STAFFING

Local government staff and a dedicated CAP coordinator will work with stakeholders to implement CAP measures. City and County staff will support the CAP as they approve projects, develop ordinances and policies, and enforce codes. Other climate actions related to the CAP will be administered by the federal government, the State, and other local agencies. For instance, the RCEA may use the State CALeVIP program to expand local electric vehicle charging infrastructure; the role of local governments in this case would be to provide permits and any other documentation necessary for new chargers. Responsible entities and key partners are listed in Appendix E: Implementation and Monitoring Table.

Cities and the County will also need to commit staff hours and other resources toward implementation, outreach, securing outside funding, monitoring, reporting, adaptive management, and CAP updates. Estimated staff level of effort (high, medium, low; Table 5) can be found in the Implementation and Monitoring Table for each measure. Estimates include work performed by the aforementioned regional CAP coordinator.

Level of effort	Staff Hours	Funding	Coordination and outreach	Existing Policies vs. New Policies and Programs
Low	Negligible additional full time equivalent (FTE) staff hours (less than 40).	No cost or funding needs negligible.	Only minor coordination with the public or stakeholder groups.	Can be performed with existing programs or using minor modifications to existing programs
Medium	Requires more than 40 FTE hours, but less than 160.	Funding or financing can be re-allocated from existing sources or programs.	Engagement with stakeholders, other organizations, and the public is necessary.	New programs or policies must be developed, but they are limited in scope and can lean heavily on existing planning.
High	Requires FTE staff hours greater than 160.	Will require jurisdictions and agencies to work together to secure external funding or financing.	Implementation requires widespread public buy-in. Outreach and education needs are extensive.	Completely new policies or programs must be developed; these have a broad scope. Little existing planning in place.

Table 5. Staff level of effort was estimated for each measure.

A regional CAP coordinator position will be created to support local government staff and facilitate CAP implementation. A list of possible duties for the CAP coordinator are given in the following sections.

Implementation of CAP Policies

1. Coordinate the implementation of the Climate Action Plan. Work with staff from multiple jurisdictions and agencies to implement GHG emissions reduction projects.
2. Implement discrete projects in support of the Climate Action Plan. "Implementation" includes convening working groups, creating programs, managing projects, etc.
3. Assist City and County departments, residents, and local businesses in implementing climate programs and practices to achieve CAP goals.

Funding and Budgeting

Implement funding strategy. Analyze emerging or additional funding sources; identify and seek grants, financing programs, public/private partnerships, and other funding sources. Track, facilitate and administer funds as needed and in coordination with jurisdictions and agencies.

Support jurisdiction and agency funding efforts.

Participate in the preparation and administration of budgets as needed, including estimating funding requirements and future expenditures.

Reporting

Develop implementation status reports and presentations for the Board of Supervisors, City Councils, and others.

Prepare a GHG emissions inventory on a regular basis in coordination with local government and agency staff and their consultants. Ensure that the report is disseminated to relevant decision-makers and the public.

Prepare a sequestration inventory in coordination with local government staff and their consultants.

Evaluate CAP progress.

Adaptive Management

Research new models and strategies and develop new tools and reports as needed.

Attend classes, workshops, and committee meetings regularly to stay abreast of changing legislation and requirements. Prepare CAP updates in accordance with CARB guidance on meeting the State's 2045 carbon neutrality target.

Coordinate adaptive management activities in response to GHG emissions inventories and implementation reporting. If targets are not being met, recommend, develop, and implement new strategies to achieve target GHG reductions and other CAP goals. Develop these new policies and procedures in compliance with federal, State, and local requirements for the CAP.

Outreach

Share lessons learned and best practices with others, including Humboldt County jurisdictions and agencies.

Conduct primary and secondary research and compile best practices on GHG reduction and climate change resilience practices.

Develop, implement, and coordinate public education for climate-oriented programs and projects, including messaging and materials such as press releases, website content, flyers, public meetings, and other forms of communication.

Organize and participate in multi-stakeholder events and working groups.

Conduct outreach activities to support CAP policies.

Communicate project success through website updates, reports and presentations to city councils, the Board of Supervisors, County staff, and members of the public. Publicize CAP and related projects.

Serve as climate action plan liaison to the public, City and County departments, regional organizations, civic groups, other government agencies, and business organizations.

Assist with coordination and collaboration across climate mitigation and climate adaptation efforts.

6.2 COMMUNITY OUTREACH

Programs in this CAP and subsequent updates will impact nearly every individual, household, workplace, and business in the County. Thus, community engagement is crucial to the success of the CAP.

Educational programs will be created to inform the public about rebates, incentives, and other advantages of participating in CAP programs. The CAP coordinator and staff will also need to keep the community informed about the benefits of overall CAP goals and policies to gain buy-in for local measures. For instance, educational programs should highlight the importance of climate action and the public health benefits of eliminating fossil fuel use. Educational programs can be conducted via in person meetings, a public website, interviews, newspaper articles, tabling at events, and other methods.

As implementation progresses, focused meetings with stakeholders or the public may be necessary in addition to more generalized community education. Stakeholder engagement will also be necessary as implementation actions are refined and/or if adaptive management becomes necessary.

This CAP was developed with substantial input from the community. However, the COVID-19 pandemic inadvertently caused delays in outreach work. Prior to the next update of the CAP, an equity working group will be formed from representatives of community organizations representing Humboldt County low-income communities and communities of color. Funding will be provided to compensate representatives of these groups for their time. Recommendations from the Equity Working Group will be incorporated into the CAP update's vision, equity commitments, actions, equity objectives, equity implementation guide, and climate equity metrics.

At regular intervals, reports will be given by the CAP coordinator or city/county staff at city council meetings, Board of Supervisors' meetings, and other public forums. These reports will present status inventory results and updates on plan implementation.

6.3 FUNDING AND BUDGETING

Action to reduce climate pollution will not only benefit the global climate in the long-term, but will result in immediate local benefits including public health benefits adding up to an overwhelming savings to local communities.

Although not quantified in this plan, direct cost savings will result from some CAP measures. For instance, all-electric new buildings are expected to have lower construction costs, and increases in active transit will likely reduce the costs associated with car ownership. Other measures will require a substantial capital investment, and some will add additional operation and maintenance costs. The equitable distribution of cost and savings should be considered and every possible effort must be made to minimize or eliminate costs to the public, particularly low- or middle-income residents. Financing strategies such as grant programs have been identified to offset these costs; many of these programs can bring money into the community from State and federal sources (see Appendix E, CAP Funding Matrix). The Regional CAP Coordinator and local government staff will build upon this draft funding matrix as they implement CAP policies and advocate for the community.

The regional nature of the CAP should allow local governments and agencies to more effectively pursue and secure funding. Local governments may need to refine cost estimates for projects and integrate CAP measures into their budgets and capital improvement programs. In addition to pursuing outside funding, local governments can allocate existing funding to the CAP or make changes to fees to raise funds.

6.4 TIMELINE

An implementation timeline was developed according to the following principles:

- Rapidly enact ordinances and codes to target new development in the near term.
- Create educational programs, community engagement programs, working groups, committees, and other organizations in the near term to support public participation in future CAP actions and direct mid- and long-term actions.
- Focus actions in the near and midterms on deploying technologies that are currently feasible to implement at scale.

Preventing or discouraging investment in fossil fuel infrastructure is one of the most cost-effective ways to reduce GHG emissions; thus, it makes financial sense to rapidly enact ordinances and codes to decarbonize buildings and reduce vehicle emissions. Other near-term actions can utilize existing planning and research, such as studies conducted by the RCEA to guide electric vehicle deployment, or they can involve the continuation of previous and current programs, such as the RCEA's e-bike incentive. Programs that will involve substantial public engagement, such as the electrification of existing homes, will be drafted in the near term along with associated educational and promotional materials. Near-term actions will also be prioritized based on cost-effectiveness and ease of implementation. Some of these more cost-effective measures include rapidly creating bike and pedestrian networks and providing transit at no cost. Near term actions will occur in the first three years after CAP adoption.

Mid-term actions will focus on the deployment of technologies that are currently feasible to implement at scale but require more investment and planning than near term actions. These include expansion of charging station networks, continued decarbonization of existing homes and businesses, and creation of solid waste infrastructure, such as a composting facility, to handle expanded organic waste collection. Decarbonization of local electricity, facilitated by the RCEA, is necessary to ensure the success of building and transportation electrification efforts. Midterm actions will occur in the first six years after CAP adoption.

Long-term actions are those that require additional technological developments or inputs from near and midterm actions. These include strategies and programs developed or refined in working groups; electrification of the heavy-duty and off-road mobile combustion sectors; and possibly decommissioning of some natural gas infrastructure in coordination with utilities. These long-term actions, which occur before 2030, set the stage for the next phase of efforts to reach carbon neutrality by 2045.

The implementation timeline is provided in an implementation and monitoring table (Appendix E).

6.5 MONITORING AND REPORTING

A monitoring and reporting program will create accountability, inform adaptive management efforts, and demonstrate compliance with CEQA. Implementation reports will show progress on each measure-- for instance, the number of e-bike incentives given to community members-- while an emissions inventory will track the effectiveness of these programs at reducing emissions.

Implementation Monitoring and Reporting

Monitoring of implementation progress will occur continuously; reporting on implementation and CAP measure completion will occur at least annually. An annual, written implementation report will be prepared by the CAP coordinator and jurisdiction staff. Implementation progress will also be promoted in local print and digital media. Ideally, reports will be accessible through the County and RCEA's websites.

Local climate programs will also need to be responsive to changes occurring at state and federal levels, including new laws, plans, and funding sources. The CAP coordinator will work with local government and agency staff to monitor the status of state and federal programs and adapt accordingly.

Inventory

A comprehensive GHG inventory will be completed at least every 5 years, with more frequent interim inventory updates for the most carbon-intensive sectors (i.e., mobile combustion, electricity consumption, and stationary).

Inventory updates will be completed by the CAP coordinator, in collaboration with jurisdiction staff or their consultants. Future inventories will include quantification of carbon sequestration for natural and working lands. This will allow future CAP updates to include quantified GHG reduction measures in these sectors.

6.6 Adaptive Management

Adaptive management will occur if 1) implementation falls short of targets or 2) inventories do not show required progress toward GHG reduction goals, or 3) specific studies find that the effectiveness of measures can be improved by modifying them, substituting others, or dropping them.

6.7 Updates

A CAP update may be triggered if GHG inventories are not demonstrating expected progress toward jurisdiction reduction targets. "Expected progress" is defined as GHG levels showing a linear decrease from the baseline year to the 2030 target, as shown by the GHG emissions inventory. The CAP update will occur after 8 years have passed if expected progress is being made.

6.8 CAP Consistency Checklist for New Development

The CAP Consistency Checklist in Appendix F will be used to guide new development. The checklist is part of the CAP implementation and monitoring plan, and progress reported therein will be tracked as part of overall CAP progress. If a project design is consistent with all required elements of the checklist, the project can show that it is consistent with the climate action plan and thus the emissions it generates are not cumulatively considerable. The checklist can be found in Appendix F: CAP Consistency Checklist.

6.9 Next Steps

To reach the State's 2045 carbon neutrality target, Humboldt County will need to accelerate climate action from 2030 to 2045. That means making deep cuts in emissions from buildings, transportation, and waste while also developing strategies to reduce emissions from agriculture, refrigerants, and other sectors not addressed in this CAP. After an inventory has been completed in the natural and working lands sector, the measures that are currently unquantified can be adapted into quantified measures that count toward

jurisdiction reduction targets. Local governments could also work with the local air board to develop measures pertaining to point sources not regulated by CARB under the CAP-and-Trade program. Local government staff and the CAP coordinator will monitor State planning for updates, particularly CARB rulemaking regarding the State's 2045 GHG carbon neutrality target.

Staff and the CAP coordinator will also look for opportunities to exceed emissions reductions targets whenever possible. For instance, agencies and local governments should strive to reduce countywide VMT by 25% by 2030 in accordance with RCEA planning even though the modeling associated with the Climate Action Plan shows a lower VMT reduction as a result of implementation of CAP measures.

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APPENDICES

Appendix A: Calculation of GHG Emission Reductions of Measures in the Climate Action Plan

Appendix B. GHG Reduction Measures Spreadsheet

Appendix C: Forest Carbon Storage in Humboldt County

Appendix D: Forest Carbon Reserves under California Cap-and-Trade program

Appendix E: Implementation and Monitoring Table & Funding Matrix

Appendix F: CAP Consistency Checklist

Appendix G: County-Wide 2015 GHG Emissions Inventory Report

APPENDIX A CALCULATION OF GHG EMISSION REDUCTIONS OF MEASURES IN THE CLIMATE ACTION PLAN

GHG emission reduction impacts of CAP measures were calculated by EIAS, local consultants with expertise in climate action planning. Calculation methodologies are captured in a spreadsheet that is incorporated into this Climate Action Plan by reference. The majority of calculation methods are derived from guidance by the California Air Pollution Control Officers Association in their document, "Quantifying Greenhouse Gas Mitigation Measures". Impacts take into account State and local emissions reduction legislation.

The list of measures was developed through a review of common measures in other climate action plans, then augmented with measures specific to Humboldt County along with jurisdiction, public and stakeholder suggestions. The recommended set of measures and commitment targets were designed to enable jurisdictions to defensibly achieve compliance with SB32 GHG reduction targets.

Jurisdictions interacted with the "Measure Targets" tab of the spreadsheet shown below to identify realistic goals for each area that would be evaluated in the environmental document for the CAP. The GHG reduction of each commitment is reflected in the "Impact Summary" and "Pie Chart" tabs of the spreadsheet. The orange-colored tabs show how the calculations are performed, and the green "Resources" tab shows the referenced data.

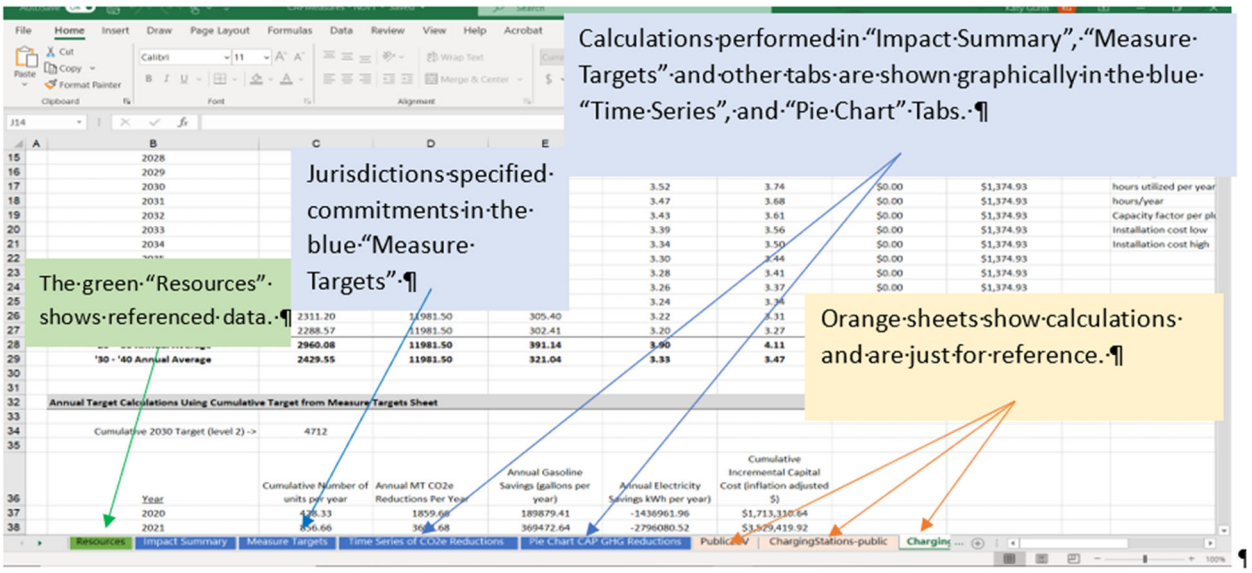

Figure 25. GHG emission reductions spreadsheet

A slide deck explaining the spreadsheet in additional detail may be found here: https://drive.google.com/file/d/1ODRyebyR9LcLg_TWHg-w0K2tpch8WEep/view?usp=sharing

APPENDIX B. GHG REDUCTION MEASURES SPREADSHEET

This spreadsheet is included as a separate file.

APPENDIX C: FOREST CARBON STORAGE IN HUMBOLDT COUNTY

C.1 OVERVIEW OF CARBON CYCLES

As with most systems, a forest has a stock or pool of carbon and fluxes: carbon that comes and goes from storage. Forest carbon can be likened to a bathtub: The bathtub can contain water (the stock), has a faucet (input) and a drain (output). The tap and the drain are in continuous action -- the faucet is always on, and the drain is leaky -- and so a forest gains and loses carbon continuously.

CARBON POOLS

Forest carbon is stored in five pools within and around vegetation

1. **Above-ground biomass**:
   Stems, bark, leaves, needles, etc.
2. **Below-ground biomass**:
   Roots of all sizes
3. **Dead wood** or dead
   organic matter in dead wood
4. **Litter** or dead organic matter in
   litter
5. **Soil organic carbon** (SOC) consisting of humus, microbial biomass, and other organic materials

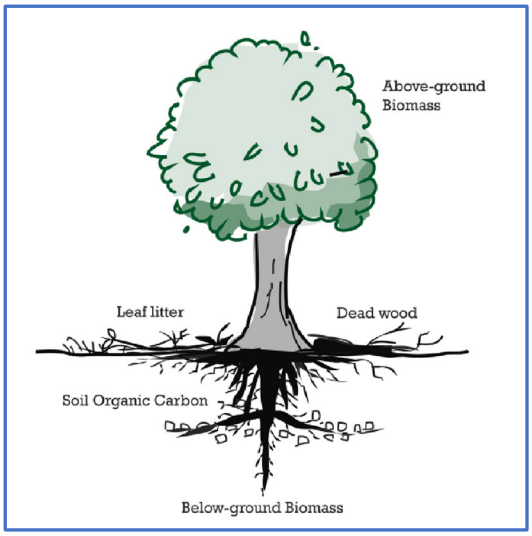

Figure 17. Pools of forest carbon storage. Image source: Vickers, B. et al. 2012. Community guidelines for accessing forestry voluntary carbon markets Chapter 1 Forests and Climate Change FAO Regional Office for Asia and the Pacific. http://www.fao.org/docrep/016/i3033e/i3033e01.pdf

Total carbon storage is greatest in forests, grasslands, and shrublands[124]. Humboldt County forests store large and significant amounts of carbon, the most of any county in California, and has the highest above-ground forest carbon densities in the world[124] (Van Pelt, pers comm.). An excellent recent analysis of

carbon stocks in a 10-county area for northwest California is available that has sound and credible estimates of carbon storage (expressed as CO2 equivalents)[70].

This analysis indicates that stocks in Humboldt County, in metric tons of CO_2 (MT) equivalent are: 3,828,968,564 MT in forests, 183,901,833 MT in grasslands, 193,066,775 MT shrublands, and 7,410 MT in wetlands. Wetlands and forests store the most carbon per acre (see Appendix C for details).

At large scales, such as at the scale of forestland in Humboldt County and larger scales, changes in the carbon pool from wildfires, timber harvest, pathogens and so on are well distributed in time and space. They tend to even out and approach the land-climate system's inherent capacity to fix (sequester) carbon in biogenic materials (see Figure 18).

CARBON FLUX IN WILDLANDS

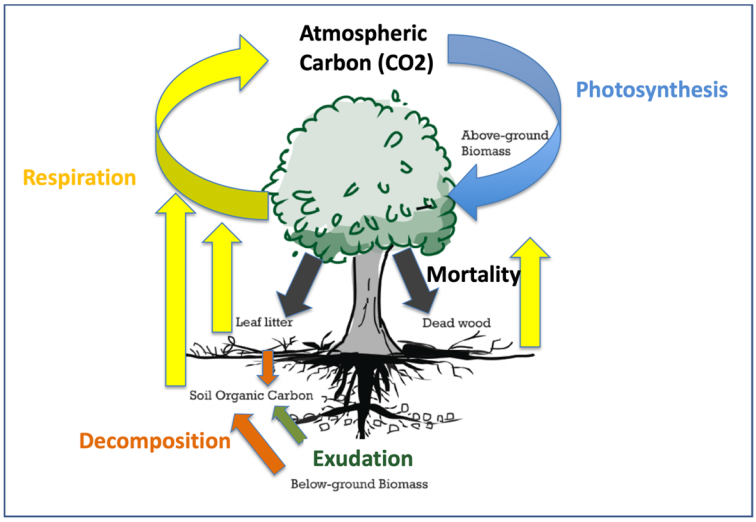

Figure 18. Forest carbon flux (quantitative movement from one form to another) Image modified from: Vickers, B. et al. 2012. Community guidelines for accessing forestry voluntary carbon markets Chapter 1 Forests and Climate Change FAO Regional Office for Asia and the Pacific. http://www.fao.org/docrep/016/i3033e/i3033e01.pdf

HUMBOLDT COUNTY FORESTS ARE BOTH A CARBON SINK AND EMISSION SOURCE.

Forests sequester carbon through photosynthesis and growth. Forests lose carbon when they are converted to other purposes such as agriculture and urban development, when they burn, are impacted by pests and disease, or harvested unsustainably.

[70] Nickerson 2017, Carbon Inventory Estimates for the North Coast Resource Partnership)

FORESTS ARE DIVERSE AND DYNAMIC

Forest carbon storage differs from ecosystem to ecosystem as a function of species, local climate, soil fertility, age, tree density, tree condition, competition, and historic and current management.

There are three general climate strategies for forests:

Keep what you have. "*Keep forests as forests*". Avoid conversion to non-forest uses; avoid deforestation and forest fragmentation.

Improve carbon stocking within existing stands. Many stands are degraded; they are below natural carrying capacity. Improve productivity: Restore more natural tree densities and spacing; number of stems/acres. Put growth on fewer, larger trees; allow longer rotations between timber harvests.

Reforestation: Restock originally-forested stands, such as abandoned cannabis grows with appropriate species mix.

Concluding High-Level Actions Measures to increase carbon storage and to adapt to changing climates in forests and agricultural lands are often the same or similar. That is, measures that increase carbon storage usually contribute to forest, farm, and watershed health and resilience to climate change, enabling forested lands to contribute to both climate mitigation and adaptation. The measures given here are thus not separated by mitigation and adaptation, as most contribute to both needs.

C.2 FORESTS

Gains of carbon in forests occur when growth rates exceed respiration, decay, harvest, and other losses. Growth is usually greatest at well-stocked but not overly stocked stands, as overstocking can cause stress. Many factors affect growth, including climate-- particularly climate variability and climate change, soil quality, slope aspect, and disturbances such as drought, flooding, windstorms, and insect infestation.

FACTORS AFFECTING CARBON STORAGE

GROWTH IS INCREASED BY AIR POLLUTION

CO_2 fertilization from anthropogenic emissions increases plant growth and plant water-use efficiency. However, moisture and nutrients usually quickly become limiting, and increased growth ceases. Nitrogen, in moderated amounts, is necessary for healthy plant growth. Nitrogen in air pollution results in a fertilizing effect in some forests, which may be harmful or beneficial depending on the ecology and physiology of the trees. There are two primary sources of excess nitrogen in Humboldt County: over-application of nitrogen fertilizer in agricultural applications and nitrogen oxide generated from internal combustion engine emissions.

GROWTH CAN BE INCREASED AND MAINTAINED BY ACTIVE FOREST MANAGEMENT

Actively managing forests for optimal stocking via thinning (both commercial and non-commercial) and prescribed burning where possible increases overall forest growth rates over time and can accelerate forests in reaching their full potential for carbon sequestration. Other silvicultural methods that promote healthy and climate-resilient forests, include management of species composition, age-class distribution, and shade, implementation of best management practices to protect soils, insects, pathogens, and invasive

plants. These measures can increase forest growth and ensure that sites meet their potential to sequester carbon.

LAND USE

Large areas of forest are converted and lost to other uses each year in California. This is not as big a factor in Humboldt County where the expansion of agriculture and residential development into forest areas has been relatively minor. In fact, most jurisdictions intend to further mitigate the potential sprawl of residential development into forested areas through integrating infill and dense housing developments as part of their individual CAPs. Conversion of forests into cannabis farms has been an issue in Humboldt County, but wildland cannabis farming appears to be declining with previously converted lands reforesting either via planting or natural regeneration. This is largely a result of County cannabis policy, which prohibits conversion from timberland, incentivizes removal of cultivation from marginal wildlands to less problematic areas, and limits permitting for existing cultivation sites located in forestlands to applicants who applied prior to a 2016 deadline.[71]

WILDFIRE

Wildfire is emerging as the biggest threat to California's forests and the North Coast is not immune to this disturbance agent. After a 100+ years of fire suppression, the natural consumption of competing vegetation has been eliminated and stands have densified and carry high-fuel loads. This leads to the increased likelihood of higher severity fire conditions and large-scale impacts The black carbon emissions from wildfire are extremely bad for human health and the extent of high-severity wildfires over the last decade have reversed much of California's emission goals. Wildfire generally kills trees but does not consume them. Wildfire severity is nearly always a matrix of low, moderate, and high severity. For most burned areas, more than half the initial forest carbon remains after wildfires, however, the killed trees can decompose quickly. GHG emissions from wildfire can be very large. The California Climate Action Reserve recently calculated wildfire emissions in California, and the summary results are shown in Figure 19. While significant, these wildfire emissions are relatively small compared to total GHG emissions in California.

[71] Lazar, Steven. 2020. Personal Communication.

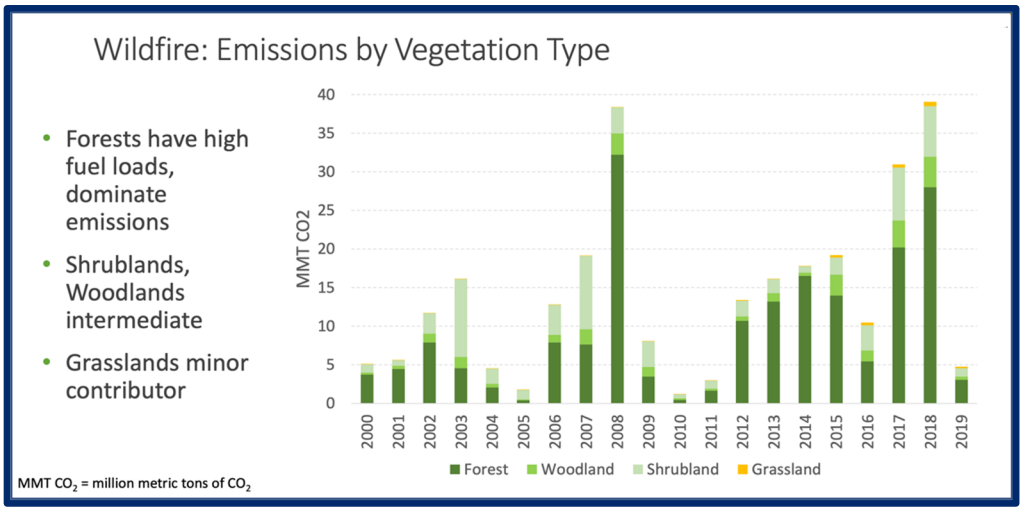

Figure 19. CO2 emissions from wildfire in California. Source: California Air Resources Board. Online presentation. December 2020

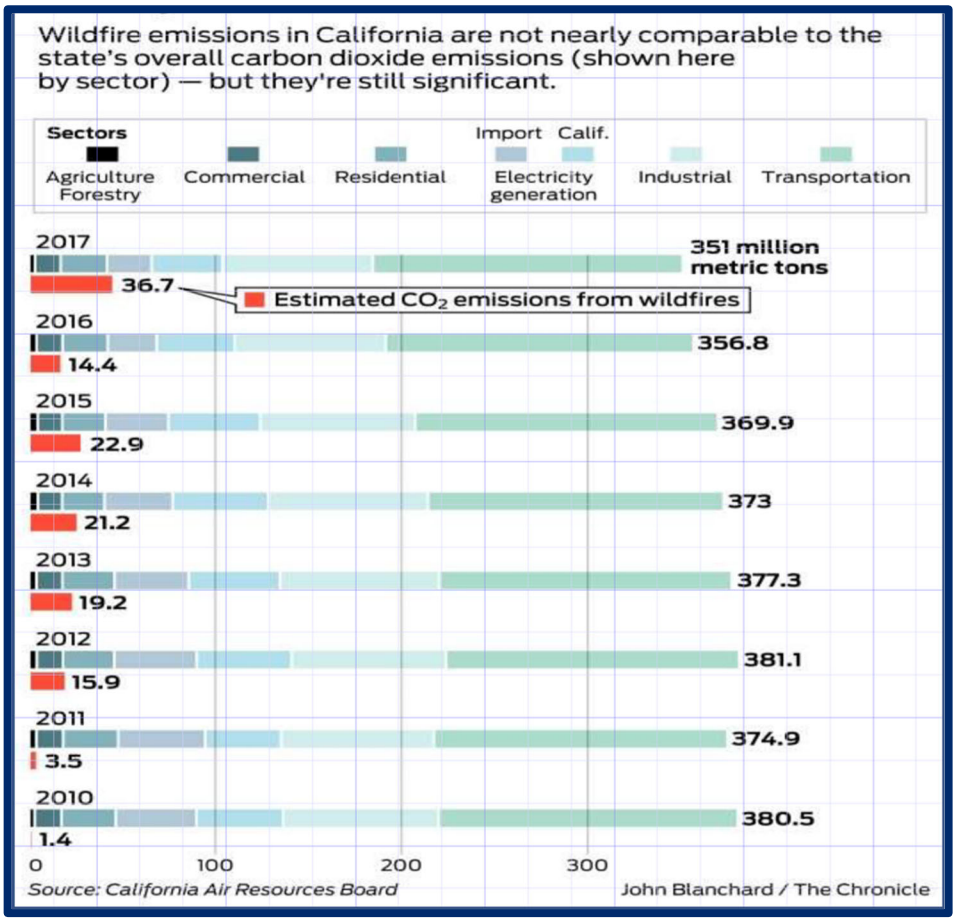

Figure 20. Wildfire co2 emissions appear to be high but are relatively small compared to other sources of emissions in California. Note: wildfire co2 emissions were higher in 2018-2020, but the general relation still holds.

DROUGHT AND INSECT INFESTATION

During a drought, trees compete for water and nutrients. Weakened trees have less resource to ward off beetle attacks and other pathogens. Climate change results in more frequent and more severe droughts, which reduces the growth of forests. The intensity and frequency of droughts are expected to increase as average temperatures rise, but the degree of this increase is uncertain.

Some forest types are better adapted to prolonged droughts such as deep-rooted oak trees. Other tree species are more vulnerable. Forest management can help ameliorate some of this competition for resources and help increase stand resilience to drought or other disturbances.

TIMBER HARVESTING

Timber harvest temporally reduces carbon stocks in proportion to the amount of tree removal. Roughly half of the harvested tree carbon is lost to the atmosphere in harvests via manufacturing and slash disposal, and about half is conserved in forest products [72].

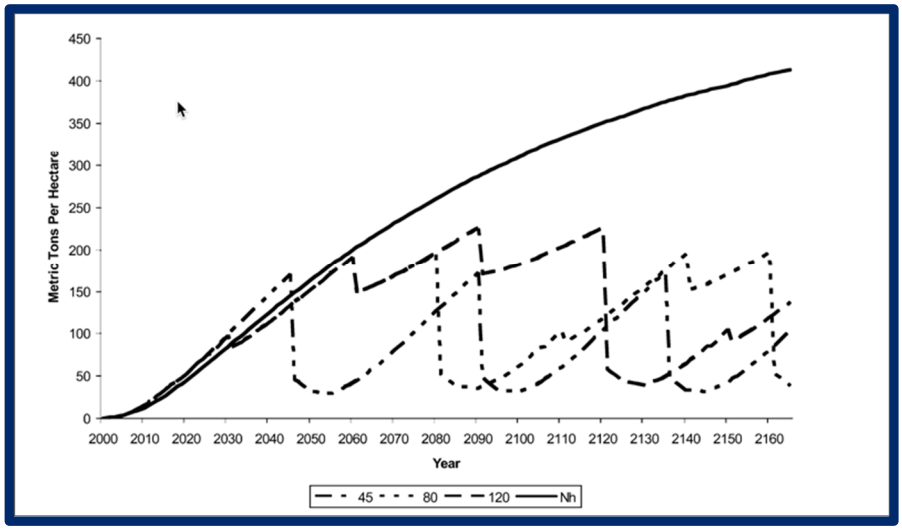

Figure 21. Forest carbon pools differ depending on rotation length. After harvest, forest stands fix carbon and recover their carbon-sequestration according to their inherent capacity and the time between harvests. "Rotation" means the growth period between forest harvests.[73]

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[72] Davis, Sarah C., et al. "Forest carbon sequestration changes in response to timber harvest." *Forest Ecology and Management* 258.9 (2009): 2101-2109.

Perez-Garcia, John, et al. "An assessment of carbon pools, storage, and wood products market substitution using life-cycle analysis results." Wood and Fiber Science 37 (2007): 140-148.

[73]

Some forest products, such as tissue paper, are ephemeral, but most harvested timber is used for lumber, which typically has a long life and stores carbon for decades to more than a century.

THE VALUE OF WOOD-BASED CONSTRUCTION

Building with wood requires significantly less energy and embodied GHG emissions than building with concrete and steel. Substituting wood for concrete and steel results in significant reductions in emissions. New "mass timber" materials such as cross-laminated timber are capable of replacing steel and concrete in many applications, even in high-rise buildings.

FOREST OFFSET CREDITS

A reduction in emissions through carbon offsets compensates for the emissions made by other sources. Carbon offsets are considered a "bridging" strategy until GHG emissions reduction technologies and a low-carbon economy are in place.

California has established a "Cap and Trade" system for pricing carbon emissions and providing financial incentives to reduce emissions and sequester carbon. The goal is to steadily reduce GHG emissions statewide in a cost-effective, market-based system.

The Cap

Each large-scale emitter (greater than 1 ton per year) is subject to a regulatory limit on the amount of GHG that it may emit. The emitter must have an "emissions permit" for every ton of carbon dioxide it releases to the atmosphere. These permits set an enforceable limit, or cap, on the amount of GHGs that the entity may emit. Over time, the limits become stricter -- the cap is reduced -- allowing less and less pollution, until the final reduction goal is met. This system is similar to the cap-and-trade system enacted by the Clean Air Act of 1990, which capped the sulfur emissions that cause acid rain. This previous cap-and-trade system met its goals at a much lower cost than industry or government expected.

The Trade

It will be less expensive or easier for some companies to reduce their emissions below their cap than others. The more efficient companies who emit less than their allowance can sell their extra permits to emitters that are not able to make reductions as easily. This creates a system that ensures a set level of overall reductions, while rewarding the most efficient companies and ensuring that the cap can be met at the lowest cost to the economy.

California auctions the emissions permits to the companies that are required to reduce their emissions, creating a large revenue stream. These financial resources are used to achieve critical objectives for climate change mitigation and economic development.

Offsets

Emitting entities (those emitting 25,000 metric tons of CO2e or more per year) may compensate for up to 8% of excess emissions by purchasing offset credits, which are carbon storage or emissions avoidance measures. The number of allowable offsets changes in accordance with the law. One of the available offset credit categories in California is forest offset credits.

A protocol has been established to quantify, verify, and certify forest credits for sale in the Cap-and-Trade system, and also in the voluntary, non-compliance market[74].

This cap-and-trade system provides a means of generating revenue from forests by leaving them standing, and puts a price on carbon emissions, which is widely advocated as essential to climate mitigation.

Humboldt County has 12 "carbon reserves" projects where a baseline of forest carbon storage is promised for 100 years. The total carbon currently verified in these reserves is 7,439,123 metric tons. This is a relatively small amount relative to the potential in Humboldt County but additional reserves are in progress and more are expected to be established. Market prices and conditions are trending upward.

[74] California Air Resources Board, 2020

A Valid Offset Requires Establishing Six Parameters

Baseline: What the atmosphere sees now under Business-as-Usual activity, without the measure.

Additionality: Most registries or markets for carbon offset credits including California's cap-and-trade system require demonstration of "additionality". A measure or action has additionality if it increases the amount of carbon stocks relative to a dynamic baseline, defined at "Business as Usual", which is what would occur without the measure. For example, conversion of a fully stocked forest to an intensively managed forest is almost inevitably going to reduce the amount of carbon stocks for a significant period of time. Converting an intensively managed system to a low-intensity management scheme would result in increased carbon stocks and be "additional". Additionality must be above regulatory requirements.

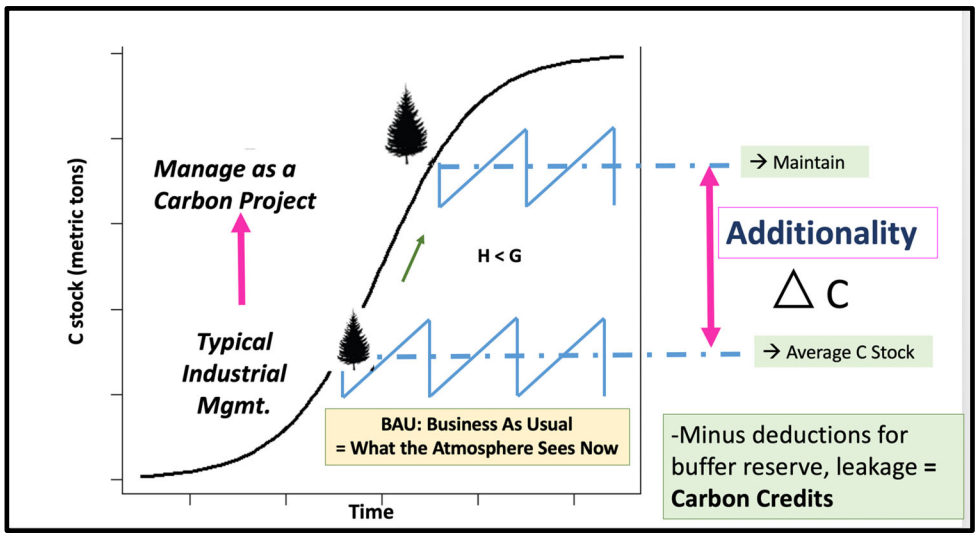

Figure 22. An illustration of additionality in forest management, necessary for valid carbon offset credits. Illustration from Andrea Tuttle. H="harvest" and G="Growth"

Leakage: The gains of a measure are not lost elsewhere through leakage. Leakage refers to the activity moving elsewhere as a result of implementing an emissions reduction measure.

Permanence: Ensure net CO_2 remains stored over time. The offset must be permanent. For forest carbon offsets in California, "permanent" is defined as 100-years or more.

Verification: Third party, independent verification of data and procedures is required.

Monitoring and Enforcement: A monitoring and enforcement process must be included as well with sanctions for not meeting offset commitments.

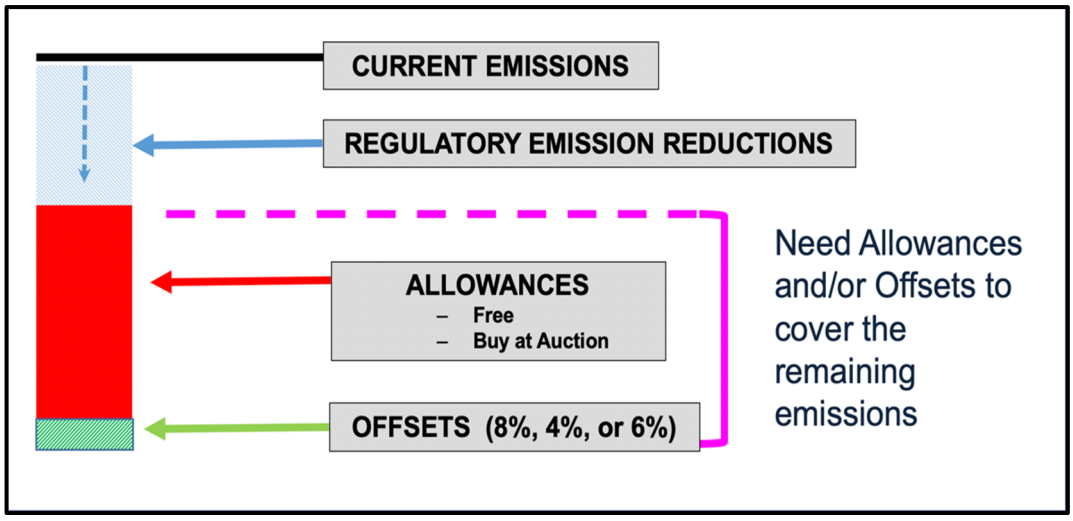

Figure 23. An illustration of how an emitting entity can comply with the California regulations.

The effect of scale on carbon accounting

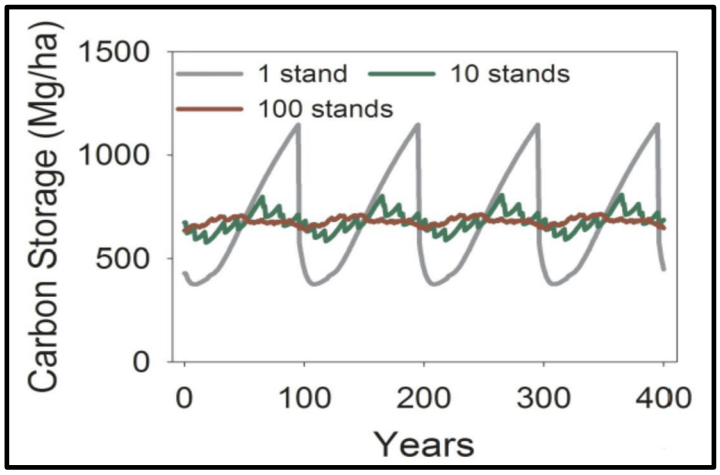

Figure 24. Carbon storage tends to average out over a landscape as forest harvest, wildfire, and other disturbances are distributed in time and space. If disturbance frequency is decreased, the average carbon stock goes up. If disturbance frequency is increased, the average carbon stock goes down.

HOW MUCH CARBON IS SEQUESTERED ON HUMBOLDT COUNTY LANDS?

There are nine distinct landcover classes identified in the Dogwood Springs Forestry report. As shown below, the vast majority of sequestration value in our region is contained in the "forest" landcover class.

Values given are CO2-equivalent.

Stocks of carbon in Humboldt Region by landcover type

Landcover Class	Total Acres	Total CO2	CO2 per acre
Barren	441,668	15,116,227	209
Forest	8,655,696	3,828,968,564	2701
Grassland	1,418,495	183,901,833	792
Orchard	88	11,013	766
Row Crop	199,765	12,264,442	375
Shrubland	1,433,943	193,066,775	822
Urban	204,787	25,122,384	749
Vineyard	65,849	4,257,492	395
Wetland	12	7,410	3913

Table 6. Carbon Inventory Estimates for the North Coast Resource Partnership Derived from: Nickerson 2017. Dogwood Springs Forestry[75]

Landcover Class	Landcover Subclass	Landcover Type	Abovegro und CO2e	Soil CO2e	Area (acres)
Barren	Barren	Barren	37,768	620,035	1,988.7
Barren	Barren	Mediterranean California Sparsely Vegetated Systems	23,048	334,107	687.2
Barren	Barren	North Pacific Sparsely Vegetated Systems	369	5,204	11.0
Barren	Barren	Quarries-Strip Mines-Gravel Pits	0	2,342	3.9
Barren	Roads	Developed-Roads	0	1,821,272	3,718.5
Barren	Water	Open Water	0	0	3,611.9
Forest	Coniferous Forest	California Coastal Redwood Forest	174,031,671	96,609,794	67,942.2
Forest	Coniferous Forest	California Lower Montane Foothill Pine Woodland and Savanna	185,847	162,588	139.0
Forest	Coniferous Forest	California Montane Jeffrey Pine (-Ponderosa Pine) Woodland	1,307,907	851,790	851.5
Forest	Coniferous Forest	Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland	1,606,571	394,007	664.6
Forest	Coniferous Forest	Klamath-Siskiyou Upper Montane Serpentine Mixed Conifer Woodland	2,388,289	632,339	1,157.0
Forest	Coniferous Forest	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	34,651,271	10,474,050	15,335.8

[75] Nickerson 2017. ***Carbon Inventory Estimates for the North Coast Resource Partnership.*** Dogwood Springs Forestry

Landcover Class	Landcover Subclass	Landcover Type	Aboveground CO2e	Soil CO2e	Area (acres)
Forest	Coniferous Forest	Mediterranean California Lower Montane Conifer Forest and Woodland	3,187,006	1,272,886	1,504.6
Forest	Coniferous Forest	Mediterranean California Mesic Mixed Conifer Forest and Woodland	52,051,684	13,267,815	21,139.5
Forest	Coniferous Forest	Mediterranean California Mixed Evergreen Forest	428,059,046	199,852,821	171,548.6
Forest	Coniferous Forest	Mediterranean California Red Fir Forest	4,783,124	756,832	2,141.2
Forest	Coniferous Forest	Mediterranean California Subalpine Woodland	6,865	1,955	5.9
Forest	Coniferous Forest	North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	4,115,447	2,335,720	1,877.7
Forest	Coniferous Forest	Northern California Mesic Subalpine Woodland	116,585	17,136	60.8
Forest	Coniferous Forest	Pinus sabiniana Woodland Alliance	1,089,727	765,288	632.1
Forest	Woodlands	California Coastal Closed-Cone Conifer Forest and Woodland	210,382	24,549	123.0
Forest	Woodlands	California Lower Montane Blue Oak Forest and Woodland	11,270	11,781	9.2
Forest	Woodlands	California Lower Montane Blue Oak-Foothill Pine Forest and Woodland	13,642	17,388	10.7
Forest	Woodlands	California Montane Riparian Systems	11,299,722	5,580,591	5,416.9
Forest	Woodlands	California Montane Woodland and Chaparral	7,517,457	10,240,276	8,871.3
Forest	Woodlands	Mediterranean California Lower Montane Black Oak - Conifer Forest and Woodland	189,528	103,321	109.6
Forest	Woodlands	Mediterranean California Lower Montane Black Oak Forest and Woodland	124,384	69,270	78.7
Forest	Woodlands	Mediterranean California Mixed Oak Woodland	2,770,865	1,928,928	1,854.5
Forest	Woodlands	North Pacific Oak Woodland	4,139,947	5,002,347	3,735.1
Forest	Woodlands	Quercus garryana Woodland Alliance	2,722	2,103	2.0
Grassland	Grassland	California Annual Grassland	1,166,192	27,679,215	18,742.6
Grassland	Grassland	California Mesic Serpentine Grassland	13,199	200,881	211.9
Grassland	Grassland	California Northern Coastal Grassland	5,888	97,602	89.9
Grassland	Grassland	Introduced Upland Vegetation-Perennial Grassland and Forbland	232,096	5,378,225	3,575.1
Grassland	Grassland	North Pacific Montane Grassland	716,286	13,573,617	12,437.2
Grassland	Grassland	Pacific Coastal Marsh Systems	38,319	778,537	654.9
Grassland	Grassland	Western Cool Temperate Pasture and Hayland	6,210	4,166,370	2,740.2

Landcover Class	Landcover Subclass	Landcover Type	Aboveground CO2e	Soil CO2e	Area (acres)
Grassland	Grassland	Western Cool Temperate Wheat	1	411	0.3
Grassland	Grassland	Western Warm Temperate Pasture and Hayland	107	70,374	47.3
Grassland	Grassland	Western Warm Temperate Wheat	10	4,722	4.6
Grassland	Ruderal Grassland	Western Cool Temperate Developed Ruderal Grassland	8,069	5,880,190	3,560.7
Grassland	Ruderal Grassland	Western Cool Temperate Undeveloped Ruderal Grassland	51	2,754	22.3
Grassland	Ruderal Grassland	Western Warm Temperate Developed Ruderal Grassland	356	129,654	157.3
Orchard	Orchard	Western Cool Temperate Orchard	195	133	0.5
Orchard	Orchard	Western Warm Temperate Orchard	133	178	0.5
Row Crop	Agroforestry	Western Cool Temperate Undeveloped Ruderal Deciduous Forest	0	0	0.0
Row Crop	Agroforestry	Western Cool Temperate Undeveloped Ruderal Evergreen Forest	0	35	0.1
Row Crop	Agroforestry	Western Cool Temperate Undeveloped Ruderal Mixed Forest	0	26	0.1
Row Crop	Agroforestry	Western Warm Temperate Developed Ruderal Deciduous Forest	0	491	0.9
Row Crop	Agroforestry	Western Warm Temperate Developed Ruderal Evergreen Forest	0	1,288	2.4
Row Crop	Agroforestry	Western Warm Temperate Developed Ruderal Mixed Forest	0	1,343	2.4
Row Crop	Row Crop	Western Cool Temperate Close Grown Crop	0	2,538	6.2
Row Crop	Row Crop	Western Cool Temperate Fallow/Idle Cropland	0	232	1.2
Row Crop	Row Crop	Western Cool Temperate Row Crop	0	208	0.4
Row Crop	Row Crop	Western Warm Temperate Close Grown Crop	0	13,917	32.1
Row Crop	Row Crop	Western Warm Temperate Fallow/Idle Cropland	0	1,514	3.6
Row Crop	Row Crop	Western Warm Temperate Row Crop	0	28	0.1
Shrubland	Shrubland	California Mesic Chaparral	6,287,714	13,331,447	9,096.2
Shrubland	Shrubland	California Xeric Serpentine Chaparral	6	210	0.1
Shrubland	Shrubland	Klamath-Siskiyou Xeromorphic Serpentine Savanna and Chaparral	405,760	665,916	388.3
Shrubland	Shrubland	Northern and Central California Dry-Mesic Chaparral	30,532	75,136	51.2
Shrubland	Shrubland	Northern California Coastal Scrub	38,039	3,274,985	2,003.1
Shrubland	Shrubland	Western Cool Temperate Undeveloped Ruderal Shrubland	258	2,937	3.5
Shrubland	Shrubland	Western Warm Temperate Developed Ruderal Shrubland	1,448	14,441	17.4

Landcover Class	Landcover Subclass	Landcover Type	Abovegro und CO2e	Soil CO2e	Area (acres)
Urban	Barren	Urban_Barren	116	0	0.7
Urban	Barren	Urban_Mediterranean California Sparsely Vegetated Systems	372	1,149	2.2
Urban	Barren	Urban_Quarries-Strip Mines-Gravel Pits	6	0	0.0
Urban	Coniferou s Forest	Urban_California Coastal Redwood Forest	1,575	24,217	9.4
Urban	Coniferou s Forest	Urban_Mediterranean California Mixed Evergreen Forest	781	11,842	4.7
Urban	Grassland	Urban_California Annual Grassland	2,356	10,172	14.1
Urban	Grassland	Urban_North Pacific Montane Grassland	1,740	7,838	10.4
Urban	Grassland	Urban_Pacific Coastal Marsh Systems	2,063	11,687	12.3
Urban	Grassland	Urban_Western Cool Temperate Pasture and Hayland	79	0	0.5
Urban	Low Intensity	Developed-Low Intensity	0	176,299	350.0
Urban	Low Intensity	Urban_Developed-Low Intensity	81,012	200,544	483.6
Urban	Other Urban	Developed-High Intensity	0	7,184	13.2
Urban	Other Urban	Developed-Medium Intensity	0	58,622	103.4
Urban	Other Urban	Urban_Developed-High Intensity	8,893	23,683	53.1
Urban	Other Urban	Urban_Developed-Medium Intensity	82,434	214,437	492.1
Urban	Other Urban Forest	Urban_Western Cool Temperate Developed Ruderal Deciduous Forest	6	0	0.0
Urban	Other Urban Forest	Urban_Western Cool Temperate Developed Ruderal Evergreen Forest	6	0	0.0
Urban	Other Urban Forest	Urban_Western Cool Temperate Developed Ruderal Mixed Forest	6	0	0.0
Urban	Other Urban Forest	Urban_Western Cool Temperate Urban Deciduous Forest	8,826	41,421	52.7
Urban	Other Urban Forest	Urban_Western Cool Temperate Urban Evergreen Forest	5,994	24,374	35.8
Urban	Other Urban Forest	Urban_Western Cool Temperate Urban Mixed Forest	11,378	42,531	67.9
Urban	Other Urban Forest	Urban_Western Warm Temperate Urban Deciduous Forest	1,453	6,554	8.7

Landcover Class	Landcover Subclass	Landcover Type	Abovegro und CO2e	Soil CO2e	Area (acres)
Urban	Other Urban Forest	Urban_Western Warm Temperate Urban Evergreen Forest	586	1,778	3.5
Urban	Other Urban Forest	Urban_Western Warm Temperate Urban Mixed Forest	903	3,247	5.4
Urban	Other Urban Forest	Western Cool Temperate Developed Ruderal Deciduous Forest	2,200	14,493	8.8
Urban	Other Urban Forest	Western Cool Temperate Developed Ruderal Evergreen Forest	6,083	38,971	22.9
Urban	Other Urban Forest	Western Cool Temperate Developed Ruderal Mixed Forest	6,659	29,651	21.5
Urban	Other Urban Forest	Western Cool Temperate Urban Deciduous Forest	55,114	350,353	281.5
Urban	Other Urban Forest	Western Cool Temperate Urban Evergreen Forest	105,198	559,527	537.3
Urban	Other Urban Forest	Western Cool Temperate Urban Mixed Forest	43,634	228,168	222.9
Urban	Other Urban Forest	Western Warm Temperate Urban Deciduous Forest	39,033	210,981	199.3
Urban	Other Urban Forest	Western Warm Temperate Urban Evergreen Forest	52,595	266,734	268.6
Urban	Other Urban Forest	Western Warm Temperate Urban Mixed Forest	21,817	103,590	111.4
Urban	Other Urban Grassland	Urban_Western Cool Temperate Urban Herbaceous	60,368	665,736	360.4
Urban	Other Urban Grassland	Urban_Western Warm Temperate Urban Herbaceous	6,165	29,826	36.8
Urban	Other Urban Grassland	Western Cool Temperate Urban Herbaceous	2,259	831,780	498.4
Urban	Other Urban Grassland	Western Warm Temperate Urban Herbaceous	780	205,292	172.2
Urban	Other Urban Shrubland	Urban_Western Cool Temperate Developed Ruderal Shrubland	98	237	0.6

Landcover Class	Landcover Subclass	Landcover Type	Abovegro und CO2e	Soil CO2e	Area (acres)
Urban	Other Urban Shrubland	Urban_Western Cool Temperate Urban Shrubland	40,121	186,833	239.5
Urban	Other Urban Shrubland	Urban_Western Warm Temperate Urban Shrubland	1,697	6,853	10.1
Urban	Other Urban Shrubland	Western Cool Temperate Developed Ruderal Shrubland	8,679	115,981	104.7
Urban	Other Urban Shrubland	Western Cool Temperate Urban Shrubland	21,244	354,938	325.5
Urban	Other Urban Shrubland	Western Warm Temperate Urban Shrubland	11,075	164,299	169.7
Urban	Roads	Urban_Developed-Roads	172,088	40,528	1,027.3
Urban	Ruderal Grassland	Urban_Western Cool Temperate Developed Ruderal Grassland	3,278	7,902	19.6
Urban	Ruderal Grassland	Urban_Western Warm Temperate Developed Ruderal Grassland	201	0	1.2
Urban	Shrubland	Urban_California Mesic Chaparral	79	322	0.5
Urban	Shrubland	Urban_California Montane Woodland and Chaparral	2,564	14,539	15.3
Urban	Shrubland	Urban_Klamath-Siskiyou Xeromorphic Serpentine Savanna and Chaparral	4,895	52,394	29.2
Urban	Shrubland	Urban_Northern California Coastal Scrub	2,460	34,885	14.7
Urban	Vineyard	Urban_Cropscape Vineyards 2012	12	25	0.1
Urban	Water	Urban_Open Water	4,181	0	25.0
Urban	Woodland s	Urban_California Montane Riparian Systems	439	5,856	2.6
Urban	Woodland s	Urban_North Pacific Oak Woodland	208	1,172	1.2
Vineyard	Vineyard	Cropscape Vineyards 2012	3,266	31,167	75.1
Vineyard	Vineyard	Western Cool Temperate Vineyard	98	1,509	2.3
Vineyard	Vineyard	Western Warm Temperate Vineyard	114	1,357	2.6

Table 7. Detail of carbon stocks in Humboldt County by landcover subclass

APPENDIX D: FOREST CARBON RESERVES UNDER CALIFORNIA'S CAP-AND-TRADE PROGRAM

From: (from Climate Action Reserve) Accessed November 24, 2020

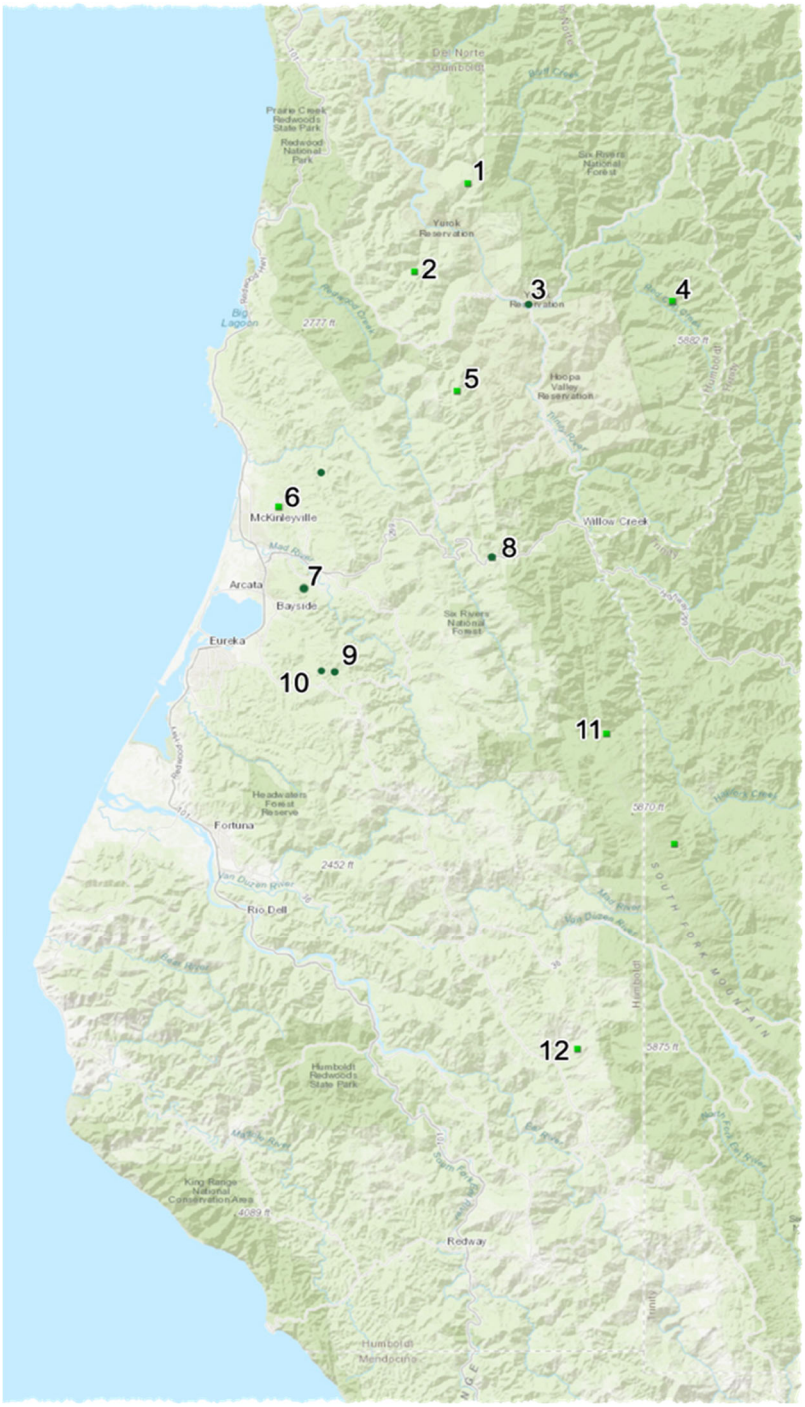

Figure 26. Approximate locations of forest carbon reserves in Humboldt County. See table below for attributes. Credit numbers may not be totally accurate or up to date

Map	Project Name	Project Developer	Project Owner	Credits Issued (MT)	Credits retired (used) or cancelled (MT)
1	Phase 1 Sustainable Forest Project	Yurok Tribe	Yurok Tribe	81,6381	710,434
2	Humboldt Mixed Forest Improvement Project	Peak Carbon LLC	Peak Carbon LLC	2,895,502	0
3	Yurok Tribe Sustainable Forest Project	Yurok Tribe	Yurok Tribe	1,336,270	0
4	Yurok Tribe/Forest Carbon Partners	Yurok Tribe	Yurok Tribe	983,755	983,755
5	Pine Creek Improved Forest Management Project	California Timberlands 2 LLC	California Timberlands 2 LLC	494,904	0
6	Van Eck Forest	Fred M Van Eck Forest Foundation for Purdue University	Fred M Van Eck Forest Foundation for Purdue University	10,433	10,433
7	Arcata Sunnybrae Tract	City of Arcata	City of Arcata	42,716	27,256
8	Finite Carbon - Berry Summit	Berry Summit, LLC	Berry Summit, LLC	239,205	239,205
9	Arcata City Forest Lucchesi Tract	City of Arcata	City of Arcata	19,053	16,878
10	Arcata City Forest Barnum Tract	City of Arcata	City of Arcata	39,748	32,483
11	Forest Carbon Partners - Gabrych Ranch	Forest Carbon Partners, L.P.	Forest Carbon Partners, L.P.	287,077	287,077
12	Forest Carbon Partners -- Glass Ranch	Forest Carbon Partners, L.P.	Forest Carbon Partners, L.P.	274,079	274,079

Table 8. Forest carbon reserves under California cap-and-trade program. From: (from Climate Action Reserve) Accessed November 24, 2020

APPENDIX E: IMPLEMENTATION AND MONITORING TABLE & FUNDING MATRIX

The Implementation and Monitoring Table and Funding Matrix are included as separate files.

APPENDIX F: CAP CONSISTENCY CHECKLIST

Senate Bill 97, which was passed in 2007, required the analysis of GHG emissions as a part of the CEQA process. In response to SB 97, the Governor's Office of Planning and Research developed, and the California Natural Resources Agency adopted, amendments to the CEQA Guidelines addressing the analysis and mitigation of GHG emissions. Those amendments became effective on March 18, 2010. Amendments were finalized in 2018.[76]

Lead agencies may analyze and mitigate the significant effects of GHG emissions at a programmatic level, such as in a general plan, a long-range development plan, or a separate plan to reduce GHG emissions, such as a Climate Action Plan. Project-specific environmental documents may tier from and/or incorporate by reference that existing programmatic review, provided that the plan fulfills the requirements established in Section 15183.5.[77]

Because this CAP was developed in accordance with the requirements in Section 15183.5, project consistency with the CAP is adequate to demonstrate that GHG emissions at the project level are not cumulatively significant under CEQA. The CAP consistency checklist is a tool for developers to show that projects are consistent with the Climate Action Plan. This checklist is part of the CAP implementation and monitoring plan, and progress reported herein will be tracked as part of overall CAP progress. If a project design is consistent with all required elements of the checklist, the project can show that it is consistent with the climate action plan and thus the emissions it generates are not cumulatively considerable. If the project design does not include all required elements of the checklist, the project is not consistent with the climate action plan and thus the emissions it generates are cumulatively considerable. This checklist is part of the CAP implementation and monitoring plan and progress reported will be tracked as part of overall CAP progress.

The CAP consistency checklist will require updating as new CAP goals, strategies, objectives, and implementation actions are adopted. The Checklist may also need updating as other local, state, and federal policies take effect.

This checklist is included as a separate file. [CAP Consistency Checklist.xlsx]

[76] Governor's Office of Planning and Research. 2021. "CEQA and Climate Change." https://opr.ca.gov/ceqa/climate-change.html Accessed 3-8-21.

[77] California Code of Regulations. 2010. § 15183.5. Tiering and Streamlining the Analysis of Greenhouse Gas Emissions.

APPENDIX G: COUNTY-WIDE 2015 EMISSIONS INVENTORY REPORT

INTRODUCTION

GHG emissions inventories are vital to any climate action plan for two key reasons: State law and regulations require climate action plans to select GHG emissions targets that are a set reduction against a given inventory baseline and identifying the sources of emissions is integral to effectively selecting the most effective suite of GHG emissions reductions measures.

The State has established its own GHG reduction goals: 20% below 1990 levels by 2020, 40% below 1990 levels by 2030, and net-zero emissions by 2045. Local governments who develop climate action plans are not required to choose a 1990 baseline; in fact, professional guidance discourages the use of 1990 baselines due to the limited availability of data and the questionable integrity of 1990 data that does exist (ICLEI, personal communication).

Humboldt County has established a goal of reducing GHG emissions by 40% from 2015 by 2030. This target is recommended to keep pace with guidance from the International Panel on Climate Change and the State of California's aggressive carbon neutrality goals. Additionally, this target is non-inclusive of industrial point sources. In other words, the 1990 and 2015 inventories used for target-setting include all County-Wide emissions besides those coming from industrial point sources. Humboldt County jurisdictions do not have the authority or ability to control industrial point sources; instead, permitting and regulating industrial point source emissions is within the State and Air Quality Management Districts' purview. The Climate Action Plan only represents actions that can be adopted, implemented, and therefore controlled by Humboldt County local governments.

HUMBOLDT COUNTY 2015 GHG INVENTORY METHODOLOGY

As mentioned previously, the first step toward achieving tangible GHG emissions reductions requires identifying baseline emissions levels, sources, and activities generating emissions in the community. The Humboldt County 2015 inventory, also referred to as the "County-wide inventory" represents the sum of inventoried emissions from each Humboldt County jurisdiction: City of Arcata, the City of Blue Lake, City of Eureka, City of Ferndale, City of Fortuna, City of Rio Dell, City of Trinidad, and the County of Humboldt (a.k.a. unincorporated Humboldt County). A full inventory was completed for each jurisdiction and is available online. A separate government operations inventory was not completed for each of the jurisdictions; however, government operations emissions are a subset of the comprehensive community inventoried emissions.

As local governments have continued to join the climate action movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the Community GHG Emissions Protocol ("Community Protocol").

COMMUNITY EMISSIONS PROTOCOL

Version 1.0 of the Community Protocol was released by ICLEI in October 2012 and represented a national standard in guidance to help U.S. local governments develop effective community GHG emissions inventories. Version 1.1 was released in 2013, and Version 1.2--the most recent version-- was released in

2019. This protocol establishes 1) reporting requirements for all community GHG emissions inventories; 2) provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities; 3) provides a number of optional reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities. The State of California Governor's Office of Planning and Research recommends that California local governments follow the Community Protocol when undertaking their GHG emissions inventories. The 2015 inventories were calculated using Version 1.2 of the Community Protocol.

Overview of Emissions Sources and Activities

Communities contribute to GHG emissions in many ways. Two categorizations of emissions are used in the community inventory:

1) GHG emissions that are produced by "sources" located within the community boundary, and

2) GHG emissions produced as a consequence of community "activities".

Emissions sources and activities are color-coded as shown in the following table.

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

By reporting on both GHG emissions "sources" and "activities", local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. A purely source-based emissions inventory could be summed to estimate total emissions released within the community's jurisdictional boundary.

In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary. The division of emissions into sources and activities replaces the "scopes framework" used in government operations inventories, which does not have a clear definition for application to community inventories.

Community Emissions Inventory Results

Emissions from Sources and Activities Under Significant Local Government Influence

This framework emphasizes policy relevance, highlighting a set of emission sources and activities that Humboldt County has the greatest opportunity to address. This includes the five Basic Emissions Generating Activities required by the Community Protocol, plus additional sources and activities:

- Electricity Consumption
- Stationary Combustion
- Mobile Combustion
- Solid Waste Generation
- Wastewater Treatment
- Potable Water Consumption
- Refrigerant Leakage

- Industrial Point Sources

The total 2015 emissions from all these sectors are estimated at 1,524,254 metric tons of CO_2e and are summarized in Figure 27. Details regarding each sector are provided in the following sections.

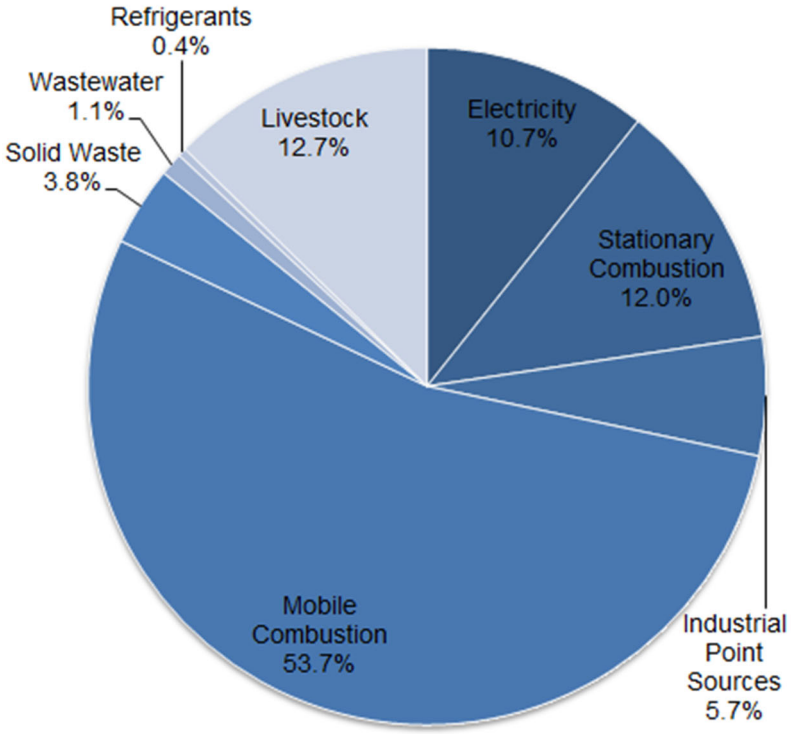

Figure 27. County-Wide 2015 emissions breakdown by various sectors (Source: RCEA 2015 Humboldt County GHG Emissions Inventory)

ACTIVITY: ELECTRICITY CONSUMPTION

Electricity consumption contributes to GHG emissions indirectly, although it is considered within significant local government influence. Emissions are generated at generation plants, usually through the combustion of fuels which generate heat that is then used to drive steam engines. Alternative generation sources, such as hydropower and wind, are also used and are considered to be free of emissions. Emissions factors for the 2015 inventory were sourced from Pacific Gas & Electric (PG&E) and reflect the average mix of electricity generation procured for the inventory year. The results are shown in Table 9. Future GHG inventories will use emissions factors provided by our County's CCE program.

Electricity Consumption				
Activity: Electricity Consumption	Annual Quantity of Electricity (kWh)		Emissions Factor (annual metric tons CO2e / kWh)	Annual Emissions (metric tons CO2e)
Residential	Consumption:	391,314,645	0.0001844	72,152
	T&D Losses:	18,743,971	0.0002588	4,851
	Total:	**410,058,616**	**0.0001878**	**77,003**
Commercial	Consumption:	371,732,425	0.0001844	68,542
	DA:	47,180,798	0.0002588	12,211
	T&D Losses:	20,065,943	0.0002588	5,194
	Total:	**438,979,166**	**0.0001958**	**85,947**
All Sectors	Consumption:	763,047,070	0.0001844	140,694
	DA:	47,180,798	0.0002588	12,211
	T&D Losses:	20,065,943	0.0005006	10,045
	Total:	**830293811.4**	**0.0001963**	**162,950**

Table 9. Annual emissions associated with electricity consumption within Humboldt County.

SOURCE: STATIONARY COMBUSTION

Stationary combustion is associated with the combustion of fuels at a specific location. This includes the combustion of natural gas, propane, firewood, etc. The vast majority of these fuels are combusted for cooking and space heating. Emissions associated with the combustion of these fuels can be considered either a source or an activity since the activity usually occurs at the point of combustion. This inventory considers this sector an emissions source. Table 5 shows the results.

Stationary Combustion - Natural Gas Aligns with CEC Energy Almanac				
Source: Stationary Combustion	Annual Quantity of Fuel Consumed		Emissions Factor (annual metric tons CO2e / unit)	Annual Emissions (metric tons CO2e)
Residential	Natural Gas (therm)	17,460,271	0.0053070	92,662
	Propane (gal.)	4,211,147	0.0056855	23,942
	Fuel Wood (MMBTU)	475,956	0.0099610	4,741
	Total	---	---	**121,346**
Commercial	Natural Gas (therm)	11,473,400	0.0053070	60,890
	Propane (gal.)	0	---	0
	Fuel Wood (MMBTU)	0	---	0
	Total	---	---	**60,890**
All Sectors	Natural Gas (therm)	28,933,671	0.0053070	153,552
	Propane (gal.)	4,211,147	0.0056855	23,942
	Fuel Wood (MMBTU)	475,956	0.0099610	4,741
	Total	---	---	**182,236**

Table 10. Annual stationary combustion-related emissions within Humboldt County

SOURCE: MOBILE COMBUSTION

Mobile emissions are associated with mobile vehicles and equipment. This includes passenger vehicles, freight and service trucks, off-road vehicles, and construction equipment, to name a few. Emissions results are shown in Table 11.

These emissions are considered a source due to the inventory methodology used. Each jurisdiction is assigned mobile emissions based on whether the emissions occur within their respective jurisdictional boundaries. For example, under this method, a resident of Arcata that commutes between Arcata and Fortuna only contributes emissions to the City for the miles traveled within the jurisdictional boundaries. For the County-Wide inventory, each jurisdictions' total emissions were summed.

The emissions factors used are those associated with two computer models created by the California Air Resources Board (CARB): EMFAC2014 and OFFROAD2007. These models use a wide range of emissions that depend on numerous factors such as vehicle age and type, fuel type, temperature, and humidity.

Mobile Combustion

Source: Mobile Combustion	Annual Quantity of Fuel Consumed (gallons)		Emissions Factor	Annual Emissions (metric tons CO2e)
On-Road Passenger Vehicles	Gasoline	45,752,556	0.00848425	388,176
	Diesel	608,186	0.010170464	6,186
	LPG / CNG	Not Modeled	---	---
	Total	---	---	**394,362**
Retail and Commercial Trucks	Gasoline	3,849,767	0.008498958	32,719
	Diesel	24,825,230	0.010171916	252,520
	LPG / CNG	Not Modeled	---	---
	Total	---	---	**285,239**
Off-Road Vehicles and Equipment (excluding marine and air travel)	Gasoline	1,581,672	0.006209207	9,821
	Diesel	11,516,922	0.009984192	114,987
	LPG / CNG	399,683	0.006131472	2,451
	Total	**13,498,277**	---	**127,259**
Airport Ground Support Equipment	Gasoline	6,788	0.026068921	177
	Diesel	7,444	0.025538198	190
	LPG / CNG	939	0.016481395	15
	Total	**15,171**	---	**383**
All Sectors	Gasoline	51,190,783	Combined	430,893
	Diesel	36,957,782	Combined	373,883
	LPG / CNG	400,622	Combined	2,466
	Total	---	---	**807,242**

Table 11. Annual mobile combustion emissions in Humboldt County.

Additional details regarding the primary contributors to on-road vehicle emissions are shown in Figure 28. Results are disaggregated by vehicle type and fuel. This demonstrates that gasoline-fueled passenger vehicles and light-duty trucks are the primary contributors to emissions in this sector. Note, however, that this is not the case for the off-road vehicle sector where diesel is the dominant fuel.

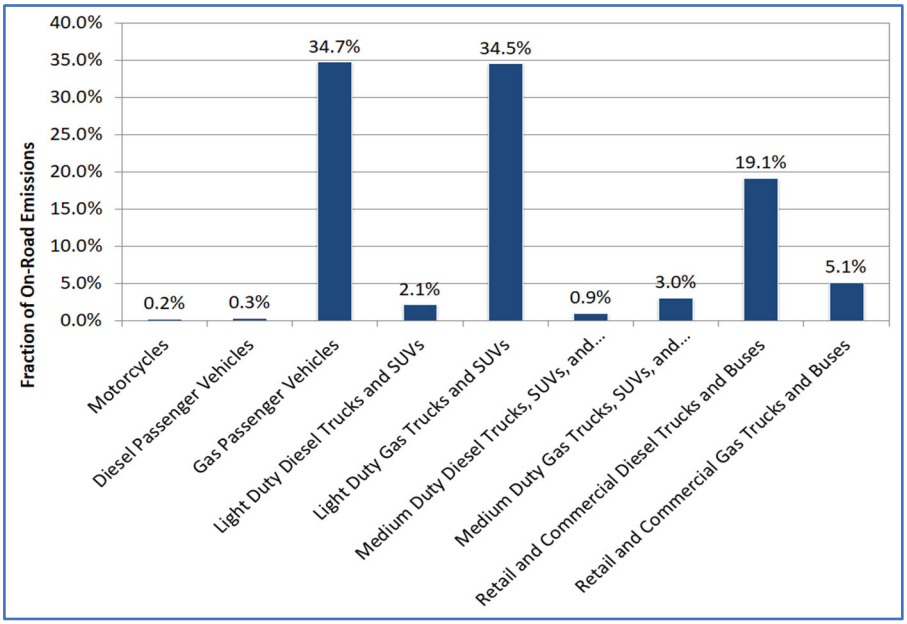

Figure 28. Total metric tons Of CO_2e by vehicle lass and fuel type

Activity: Solid Waste Generation

Emissions are generated by the transportation, processing, and decomposition of solid waste. This inventory estimates the emissions associated with all three.

Emissions from the transportation of waste out of the County from the Humboldt Waste Management Authority (HWMA) distribution center are included as an information item as they should be reasonably modeled within the Mobile Combustion sector (see Section 3.2.3). Note that emissions from self-hauling and from trash trucks are also assumed to be reasonably modeled within the Mobile Combustion sector but are not estimated separately due to lack of information.

Waste processing emissions associated with onsite landfill operations are also included as an information item. Different emissions factors are used based on whether the onsite equipment is fueled by either diesel or compressed natural gas (CNG). All landfills that are used by HWMA utilize diesel equipment with the exception of the Altamont Landfill in Livermore, CA. Only a small fraction of waste is trucked to this site and therefore the large majority of process emissions are associated with diesel equipment.

Emissions from the decomposition of waste are associated with paper, food, plant, animal, wood, and textile wastes. Appropriate emissions factors are used for each type of waste. Results of all emissions are shown in Table 12.

Solid Waste Generation

	Activity: Solid Waste Generation	Quantity of Waste Generated (wet short ton)		Emissions Factor (metric tons CO2e / short ton)	Emissions (metric tons CO2e)
	Paper Waste	Waste Decomposition	19,395	Numerous. Refer to Methodology Report.	13,284
	Food Waste		20,965		10,302
	Plant Waste		13,115		3,624
	Wood / Textile Waste		8,774		3,376
	Other Waste		30,108		0
	All Sectors	Waste Decomposition	92,356	Numerous. Refer to Methodology Report.	30,586
Info Item	Additional Emissions Sources	Landfill Process Equipment	92,356	Numerous. Refer to Methodology Report.	1,514
		On-Road Transportation of Waste	92,356		5,914

Table12. Annual emissions associated with the transportation, processing, and decomposition of solid waste.

Source and Activity: Wastewater Treatment

GHGs are emitted from processing as well as the energy consumed for processing. Both the central treatment plant and septic systems are considered. Process emissions are considered an emissions source from the central plant.

Central treatment plant process emissions are associated with methane release from anaerobic activity and the creation of nitrous oxide during the conversion of ammonia. Septic system process emissions are associated with methane release from anaerobic conditions. Central treatment plant energy consumption Emissions results are shown in Table 13.

Wastewater Treatment

Source: Wastewater Treatment	Indicators		Emissions Factor (metric tons CO2e / unit)	Emissions (metric tons CO2e)
Central Treatment Process Emissions	Average influent BOD5 (kg / day)	#VALUE!	Numerous. Refer to Methodology Report.	12,385
	Average daily volume of wastewater (gallons)	18,690,116		
	Population served	92,717		
Fugitive Emissions From Septic	Estimated population served	36,031	0.108 metric tons CO2e per person per year	4,378
	Estimated number of permitted septic systems	16,500		
All Sectors	---	---	---	16,762

Table 13. Annual emissions associated with the processing of wastewater from both the central treatment plant and septic systems within the County.

Source and Activity: Wastewater Treatment

The Community Protocol requires reporting of emissions associated with potable water consumption. This sector is highlighted to emphasize the impact that water saving measures can have on reducing a community's emissions. Results of the estimated emissions associated with pumping and treatment of potable water are shown in Table 14.

This emissions source is already accounted for in the Electricity Consumption and Stationary Combustion sectors, so should not be added to these sectors. Instead, this emissions activity should be considered as an information item to guide policy decisions.

Potable Water

	Activity: Potable Water Consumption	Indicators		Emissions Factor (metric tons CO2e / million gallons)	Emissions (metric tons CO2e)
Info Item	Pumping and Treatment Energy Consumption	Population served	131,557	0.1710	641
		Gallons of water consumed (MG)	3,752		
		Energy Intensity (MWh/MG)	0.8486		

Table 14. Annual emissions associated with pumping and treatment of potable water served to the City of Arcata.

Source: Fugitive Leakage of Refrigerants

Leaked refrigerants can be a significant source of GHGs as many refrigerants have extremely large global warming potential factors. Even though the quantity of leaked refrigerants is generally small, their large global warming potential makes their relative impact significant. This inventory estimates the emissions associated with stationary and mobile refrigeration equipment operated within industrial and commercial sectors. Vehicle air conditioning units are not tracked given the difficulty of the task and the lack of local government influence over the emissions source. The estimated emissions associated with leaked refrigerants are shown in Table 15.

Refrigerant Emissions

Source: Fugitive Refrigerant Emissions	Number of Refrigeration Units		Emissions Factor (metric tons CO2e / refrigeration unit)	Emissions (metric tons CO2e)
Stationary Refrigeration Equipment	Size 50 - 200 lbs	137	13.97	1,914
	Size 200 - 2000 lbs	59	55.88	3,297
	Size >2000 lbs	0	---	0
	Total	**196**	**---**	**5,211**
Transport Refrigeration Units	3 lbs	650	1.511	982
Mobile A/C Units	Not Estimated	---	---	Not Estimated
All Sectors	**All Sizes**	**846**	**Various**	**6,193**

Table 15. Estimated annual emissions associated with the leakage of refrigerants from commercial and industrial stationary and mobile equipment.

Data on stationary refrigeration units are obtained from the North Coast Unified Air Quality Management District (NCUAQMD). The size and leakage rate of these units is roughly approximated.

Transportation units refer to mobile refrigeration units such as those carried by food delivery trucks. This emissions sector is a rough estimate modeled by the OFFROAD2007 emissions model created by the California Air Resources Board (CARB).

SOURCE: INDUSTRIAL POINT SOURCES

As required by the State, industrial point sources are tracked by the NCUAQMD given their large contribution to overall emissions. Estimated emissions from all industrial sources within the County are included. In addition, criteria pollutants associated with environmental and health concerns are also included for information purposes. The results are shown in Table 16.

Industrial Point Sources

Source: Industrial Point Sources	Quantity of GHGs and Other Criteria Pollutants (metric tons)		Emissions Factor (metric tons CO2e / unit)	Emissions (metric tons CO2e)
Sources Tracked by the NCUAQMD	CO2	81,930	1	81,930
	CH4	14	28	405
	N2O	2	265	473
	CO	0	---	---
	NOx	0	---	---
	SOx	0	---	---
	PM	0	---	---
	TOG	0	---	---
	Total CO2 + CH4 + N2O	---	---	**82,808**

Table 16. GHG and criteria pollutant emissions estimates from industrial point sources.

ACTIVITY: AIR TRAVEL

Emissions associated with commercial and private airplane flights are estimated using total fuel sales data obtained from the County Public Works Department of Aviation/Airports. This department tracks all fuels sales for all airports within the County. There was no ridership data at the time the 2015 inventory was calculated.

Table 17: Estimated emissions from fuel purchased for air travel in Humboldt County.

Air Travel

Activity: Air Travel Emissions	Quantity of Fuel Consumed Countywide (gallons)		Emissions Factor (metric tons CO2e / gallon)	Fraction Allocated To Jurisdiction	Emissions (metric tons CO2e)
Commercial and Private Jets	Jet Fuel	309,326	0.0096370	100.00%	2,981
Other Private Small Airplanes	AVGAS (100LL)	154,813	0.0083682	100.00%	1,296

SOURCE: MARINE VESSELS

This source includes emissions associated with marine freight and passenger vessels. Freight carrying vessels may include ships, barges, tugboats, towboats, fishing vessels, patrol boats, and industrial boats (such as drilling boats and dredges). Passenger carrying vessels, in Humboldt County's case, consist of recreational boats. This source is only likely to be significant if an operating port exists within the community (ICLEI Community Protocol)

Marine vessel activity is largely beyond the direct control of a community, especially international cargo, which is part of a long-distance supply chain driven by national and international economic activity. A community may, however, be able to influence marine vessel emissions by working with the port to

implement strategies such as ship hoteling (providing electric power while in port so that the ship's engines do not need to run) or implementing reduced-speed zones in waters adjacent to the community. These types of strategies are typically implemented to reduce air pollution, but they can have GHG benefits as well. Some marine vessels may be owned or regulated by a local agency and improvements such as purchase of newer, cleaner vessels may be implemented directly (ICLEI Community Protocol).

Table 18: Estimated emissions from marine vessel Countywide fuel consumption.

Marine Vessels

Source: Marine Vessel Emissions	Quantity of Fuel Consumed Countywide (gallons)		Emissions Factor (metric tons CO2e / gallon)	Emissions (metric tons CO2e)
Pleasure Craft	Gasoline	308,662	0.0077557	2,394
	Diesel	11	0.0098595	0.11
	Total	**308,673**		**2,394**
Commercial and Harbor Vessels	Diesel	Unknown	OFFROAD2007	2,727
Barges and Dredges	Diesel	Unknown	OFFROAD2007	2,572
All Sectors	**Gasoline and Diesel**	**Unknown**	---	**7,694**

Upstream: Marine Vessel Emissions	Quantity of Fuel Consumed (gallons)		Emissions Factor (metric tons CO2e / gallon)	Emissions (metric tons CO2e)
All Vessels	Gasoline	277,796	0.0020870	580
	Ethanol	30,866	0.0058550	181
	Diesel	Unknown	---	Unknown

SOURCE: LIVESTOCK

An estimate of emissions from livestock was made by considering both emissions of methane and nitrous oxide from live animals and from the decomposition of manure.

Table 19. Estimated emissions from livestock and manure within the County.

Livestock

Source: Livestock	Number of Animals and Amount of Manure		Emissions Factor (metric tons CO2e / unit)	Emissions (metric tons CO2e)
Methane and Nitrous Oxide Emissions From Animals	Number of Beef Cattle + Calves	54,000	2.4259473	131,001
	Number of Dairy Cows + Calves	14,248	3.2386893	46,145
	Number of Sheep + Lamb	3,000	0.3160891	948
	Total	**71,248**	**2.4996388**	**178,094**
Methane and Nitrous Oxide Emissions From Manure	Metric Tons of Manure from Beef Cattle + Calves	68,968	0.1513300	14,825
	Metric Tons of Manure from Dairy Cows + Calves	28,960		
	Metric Tons of Manure from Sheep + Lamb	39		
All Sectors	**Beef Cattle, Dairy Cows, Calves, Sheep, Lamb**	**---**	**---**	**192,920**

SOURCE: LANDFILLS

GHG emissions are associated with the decomposition of solid waste under anaerobic conditions, releasing methane gas into the atmosphere. The Cummins Road Landfill was slated for closure in 2000 and has received any solid waste since 2005. A proposal for post-closure processes (including capping) was approved in 2012. Although no longer active, the waste in this landfill is still decomposing and releasing methane.

Landfills

Source: Landfills	Quantity of Landfill Gas Produced		Emissions Factor (metric tons CO2e / unit)	Emissions (metric tons CO2e)
Cummins Road Landfill	Metric Tons of Methane Produced	967.1071429	CO2e value from ghgdata.epa.gov	27,079

Table 20. Emissions from decomposition of Cummins Road Landfill