Humboldt Regional Climate Action Plan

Greenhouse Gas Emissions Measure Reduction Quantification and Substantial Evidence Report

prepared for

County of Humboldt

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August7, 2025

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1 Introduction

This technical report presents the quantification and substantial evidence that supports the greenhouse gas (GHG) emissions reduction potential of Humboldt's **Regional Climate Action Plan** (RCAP). This report also supports the RCAP's classification as a qualified GHG reduction plan. The RCAP is the region's plan to reduce GHG emissions and address climate change. It includes **Measures** with numeric targets to reduce GHG emissions and **Actions** under each Measure that the region will implement through 2045 to reduce GHG emissions.

Section 15183.5(b)(1) of the California Environmental Quality Act (CEQA) guidelines establishes several criteria which a plan must meet to be considered a qualified GHG reduction plan and allow for programmatic CEQA streamlining of project GHG emissions. This report details the evidence substantiating the GHG emissions reductions associated with the RCAP measures pursuant to Subsection (D) which requires measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified GHG emissions level. This report demonstrates the Measures in the RCAP provide the GHG emission reductions necessary to meet the region's 2030 GHG emission reduction target, which aligns with the State's GHG emission reduction goal established by Senate Bill (SB) 32 and make substantial progress towards the region's 2045 target which aligns with the State's goal established Assembly Bill (AB) 1279.

Mechanisms to monitor the implementation of the RCAP and progress toward achieving the region's GHG emission reduction targets are included in the RCAP, as required in CEQA Guidelines Section 15183.5(b)(e). If, based on the tracking of community GHG emissions, the region is not on track to reach the 2030 GHG emission reductions specified in this report, the RCAP as a whole or specific Measures and Actions will be amended. Based on these amendments, a RCAP Update will be prepared that includes altered or additional Measures and Actions, with evidence that with implementation can achieve the region's 2030 GHG emission reduction target and make substantial progress towards the region's 2045 target.

1.1 GHG Emission Reduction Targets

The Humboldt Regional GHG emission reduction targets align with California's goal to reduce GHG emissions 40 percent below 1990 levels by 2030 (SB 32) and California's goal to achieve carbon neutrality by 2045 (AB 1279), defined as reducing GHG emissions at least 85 percent below 1990 levels and removing or sequestering the remaining GHG emissions.

Humboldt's regional short- and long-term GHG emission reduction targets are:

- Reduce GHG emissions 40 percent below 1990 levels by 2030; and
- Achieve carbon neutrality by 2045.

1.2 Measures and Actions Organization

As part of the RCAP process, the Humbolt region (i.e., the County and all incorporated jurisdictions) has developed a comprehensive set of Measures and Actions to reduce communitywide GHG emissions to achieve the region's 2030 GHG emission reduction target and make substantial progress towards the region's 2045 target. The Measures are organized around a set of six

mitigation Strategies to reduce GHG emissions. Each Measure is then supported by a set of Actions. The structure of the mitigation Strategies, Measures, and Actions are as follows:

- **Strategies**: Strategies describe an overall approach for reducing GHG emissions within a given sector.
- **Measures**: Measures are long-range policies that the Humboldt region has established to ultimately reduce GHG emissions in line with the State.
    - Some Measures will be further defined as "***urban"*** or "***rural"*** where different goals and approaches were necessary given the characteristics of the communities targeted with the Measure. Generally, ***"urban"*** is used to define the more densely developed areas in the region with greater access to energy and transportation infrastructure while ***"rural"*** generally represents the dispersed communities in the region with limited access to energy and transportation infrastructure. See each sector Strategy summary for the definition applied in that Strategy.
- **Actions:** Actions are the discrete steps that the region will take to achieve the established Measures.

The Measures and Actions can be either quantitative or supportive, defined as follows:

- **Quantitative:** Quantitative Measures result in direct and measurable GHG emissions reductions when their Actions, backed by substantial evidence, are implemented. GHG emissions reductions from these Measures and Actions are justified by case studies, scientific articles, calculations, and other third-party substantial evidence that establish the effectiveness of the reduction Actions. Quantitative Measures can be summed to quantify how the region will meet its 2030 GHG emission reduction target and demonstrate progress towards the 2045 target.
- **Supportive:** Supportive Measures may also be quantifiable and have substantial evidence to support their overall contribution to GHG emission reductions. However, due to one of several factors – including a low GHG emission reduction benefit, indirect GHG emission reduction benefit, or potential for double-counting– they have not been quantified and do not contribute directly to achieving and making progress towards the region's GHG emission reduction targets. Despite not being quantified, supportive Measures are nevertheless critical to the overall success of the RCAP and provide support so that the quantitative Measures will be successfully implemented.

This report identifies both the quantitative and supportive Measures and provides a complete description of their contribution to achieving the Humboldt region's 2030 GHG emission reduction target and making substantial progress towards region's 2045 target. This report, however, only details the quantitative Actions that enable each Measure. The supportive Actions are excluded from this report because they do not quantitatively contribute to achieving and making progress towards the region's GHG emission reduction targets. These supportive Actions are nevertheless critical to the overall success of each Measure. Detail on these supportive Actions can be found in the RCAP.

1.3 GHG Emissions Reductions

The primary focus of RCAP measures is to determine the actions needed to achieve the region's 2030 GHG reductions target, while the RCAP is anticipated to be revised in future iterations to address 2045 targets for longer term planning. Table 1 summarizes the mitigation Measures and the

GHG emission reductions they would achieve in 2030, and estimated for 2045, upon the implementation of their Actions.

Table 1 Regional RCAP GHG Emission Reduction Summary by Measure

Measure ID	Measure Text	2030 GHG Emission Reduction Potential (MT CO2e)	2045 GHG Emission Reduction Potential (MT CO2e)
Strategy C: Cornerstone			
Measure C-1	Establish a Regional Climate Committee comprised of elected officials from each jurisdiction, HTA, HCAOG, HWMA, and RCEA to be administered by the County.	Supportive/Critical	Supportive/Critical
Strategy BE: Building Energy			
Measure BE-1	By 2030, source 90% of grid-supplied electricity from renewable and carbon-free sources.	15,403	0
Measure BE-2	Increase the development of micro-grids and storage across the region to support RCEA's RePower Humboldt goals of enhancing grid capacity and facilitating the electrification of buildings and transportation.	Supportive	Supportive
Measure BE-3 Urban	Reduce existing residential building natural gas consumption by 4% by 2030 and 74% by 2045.	2,603	55,866
Measure BE-3 Rural	Reduce existing residential fossil-fuel consumption in households not connected to natural gas infrastructure by 2% by 2030.	Supportive	Supportive
Measure BE-4	Reduce existing nonresidential building natural gas consumption by 5% by 2030 and 79% by 2045.	3,821	42,887
Measure BE-5	Decarbonize 95% of new residential building construction by 2027.	2,252	13,907
Measure BE-6	Decarbonize 95% of new nonresidential building construction by 2027.	1,374	8,492
Measure BE-7	Decarbonize 30% municipal buildings and facilities by 2030.	Supportive	Supportive
Measure BE-8	Advocate for Offshore Wind developers and PG&E to build electrical infrastructure to supply Humboldt with energy produced by the future offshore wind project which will increase regional supply and resilience	Supportive	Supportive
Strategy T: Transportation			
Measure T-1 Urban	Implement programs, such as those identified in HCAOG's RTP, to increase the mode share of active transportation in urbanized areas from 9% to 12% by 2030, thereby achieving a regional active transportation mode share of 8%.	1,147	2,594
Measure T-1	Implement programs, such as those identified in	1,080	4,405

Measure ID	Measure Text	2030 GHG Emission Reduction Potential (MT CO2e)	2045 GHG Emission Reduction Potential (MT CO2e)
Rural	HCAOG's RTP, that increase access to safe active transportation, to increase the mode share of active transportation in rural areas from 5% to 6% by 2030 thereby achieving a regional active transportation mode share of 9%.		
Measure T-2 Urban	Expand the public transit network in support of HCAOG's Regional Transportation Plan to increase public transit mode share from 2% to 20% public transit mode share in urbanized areas to achieve a regional 13% public transit mode share by 2030.	18,055	26,482
Measure T-2 Rural	Develop a robust public transit network in support of HCAOG's Regional Transportation Plan to increase public transit mode share from 1% to 10% in rural areas and achieve a regional 13% public transit mode share by 2030.	20,180	29,703
Measure T-3	Reduce regional VMT by increasing promotion of mixed-use development in infill priority areas in alignment with HCAOG's baseline connectivity score included in the RTP.	Supportive	Supportive
Measure T-4	Develop and implement regional mobility hubs and ZEV car-share programs to support mode shift from single occupancy vehicles.	Supportive	Supportive
Measure T-5	Require commercial and industrial employers with 25 employees or more to develop a Transportation Demand Management plan.	Supportive	Supportive
Measure T-6	Decarbonize 15% of passenger vehicle miles traveled by 2030 and 100% by 2045 through increased adoption of low and zero-emission vehicles and development of a regional electric vehicle charging and hydrogen fueling network.	55,726	590,124
Measure T-7	Increase commercial zero-emission vehicle use and adoption to 10% by 2030 and 100% by 2045 through a regional charging network and development of hydrogen hubs.	17,441	279,775
Measure T-8	Electrify or otherwise decarbonize 12% of applicable SORE off-road equipment by 2030 and 100% by 2045 and replace fossil diesel consumption with renewable diesel in 55% of applicable large diesel in alignment with EO N-79-20 by 2030.	49,143	139,645
Measure T-9	Establish Humboldt as a pilot program for the decarbonization of the transportation sector to help drive State and philanthropic investment throughout Humboldt.	Supportive	Supportive

Measure ID	Measure Text	2030 GHG Emission Reduction Potential (MT CO2e)	2045 GHG Emission Reduction Potential (MT CO2e)
Measure T-10	Work with the State and renewable fuel industry to establish a renewable fuel network within Humboldt thereby funding new green industry and job growth to support the decarbonization of the transportation sector.	Supportive	Supportive
Measure T-11	Lead by example and electrify or otherwise decarbonize 50% of the municipal fleet by 2030 in alignment with the State's Advanced Clean Fleet Rule.	Supportive	Supportive
Strategy SW: Solid Waste			
Measure SW-1	Establish a local waste separation facility and organics management to be able to reduce waste sent to landfills by 75% by 2030. Reduce GHG emissions by limiting truck trips required to ship waste out of the County and import compost from out of the County.	29,689	32,568
Strategy WW: Water and Wastewater			
Measure WW-1	Expand regional opportunities for implementation of wastewater decarbonization technologies such as anaerobic digesters to reduce GHG and produce renewable fuel sources.	Supportive	Supportive
Measure WW-2	Reduce per capita potable water consumption by 15% by 2030.	Supportive	Supportive
Strategy CS: Carbon Sequestration			
Measure CS-1	Research and implement feasible carbon sequestration technology opportunities to support growth and expansion of green jobs industry within the region.	Supportive	Supportive
Measure CS-2	Offset fossil-based emissions and increase carbon sequestration in the community by achieving SB 1383 procurement requirements (0.08 tons recovered organic waste per person) by 2030.	1,532	1,681
Measure CS-3	Develop a County-wide Natural and Working Lands GHG Inventory baseline by 2027 to better understand the existing and future GHG sequestration and help obtain resources to protect and increase natural carbon sequestration occurring in the region as well as promote biodiverse forests and wetlands resistant to wildfire.	Supportive	Supportive
Strategy R: Refrigerants			
Measure R-1	Prepare a baseline analysis of the volume of HFCs released into the atmosphere and evaluate whether these releases are being adequately addressed by CARB or whether the County should supplement the work of CARB.	Supportive	Supportive

Measure ID	Measure Text	2030 GHG Emission Reduction Potential (MT CO2e)	2045 GHG Emission Reduction Potential (MT CO2e)
Total		**219,446**	**1,228,128**

Together, the Measures and Actions in in the RCAP provide the Humboldt region with the GHG emission reductions necessary to achieve the region's 2030 GHG emission reduction target (see Section 1.1). Additionally, with full implementation of the RCAP Measures and Actions and assuming complete alignment with State on-road and off-road decarbonization goals, the 2045 GHG emissions reductions quantified in this report demonstrate a potential 85 percent reduction from 1990 levels. However, to meet Humboldts 2045 target of carbon neutrality the rate at which Measures and Actions are implemented would need to be increased, and additional Measure and Actions to increase carbon removal will need to be added. Future RCAP updates will monitor effectiveness of RCAP implementation, address addition of emerging technologies, increase the specificity of measures, review new state regulations, and include new Measures and Actions that Humboldt will implement to continue on the track toward carbon neutrality by 2045.

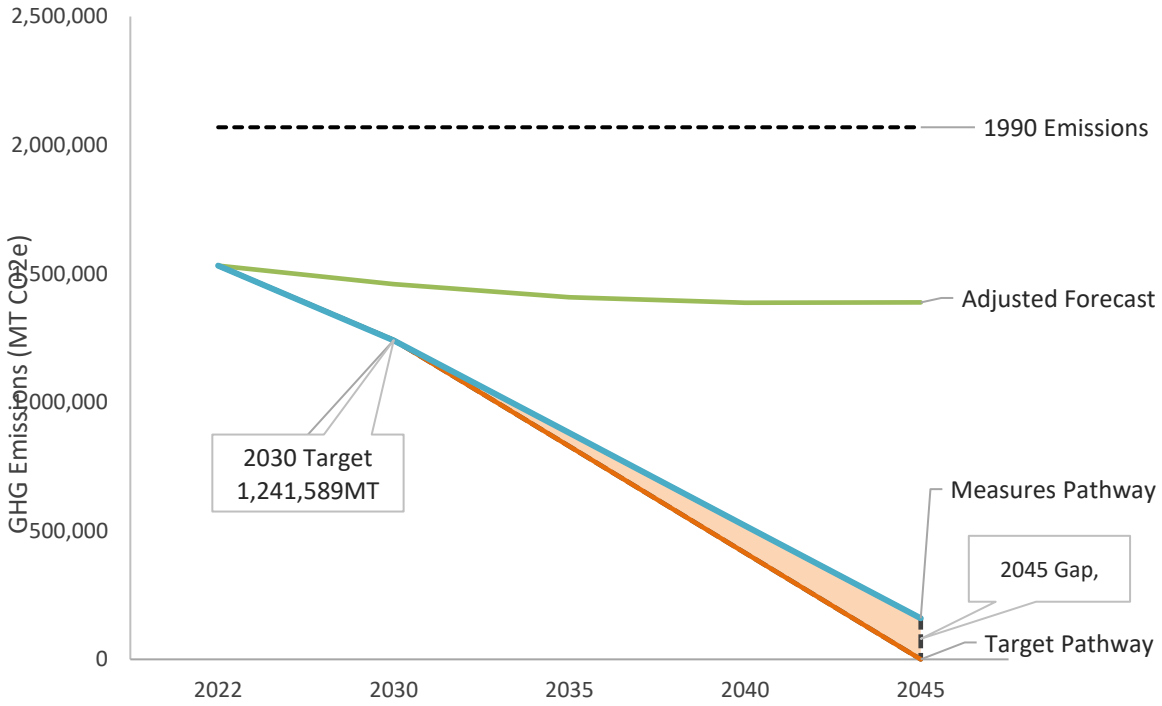
Table 2 Humboldt Region GHG Emissions Reductions Pathway

GHG Emission Forecast or Reduction Target	2030 GHG Emissions (MT CO_2e)	2045 GHG Emissions (MT CO_2e)
Business-as-usual Forecast	1,610,994	1,761,644
Adjusted Forecast	1,459,598	1,387,943
GHG Emissions Reductions (from full implementation of Measures)	219,446	1,228,128
GHG Emissions Remaining (after Measure reductions)	1,240,151	159,815
GHG Emission Reduction Target	1,241,589	0
GHG Emissions Gap (between remaining GHG emissions and target)	-1,438	159,815
Target anticipated to be met?	**Yes**	**No**

Notes: Numeric numbers donated in parathesis represent negative numbers.

Figure 1 shows the the region's GHG emission reduction targets in relation to the Humboldt Regional GHG emissions after implementation of the Mitigation Measures and Actions included in the RCAP. A complete description of each Measure and the quantitative Actions is included in the remainder of the report.

Figure 1 Humboldt Regional GHG Emissions Reductions Pathway



2 Strategy C: Cornerstone

The Humboldt Regional Cornerstone Strategy focuses on fostering collaboration between jurisdictions and key organizations to establish a regional approach to climate-related challenges through coordinated efforts. Given the rural nature of the region and its dispersed population, individual municipalities, even the larger incorporated cities, face significant constraints in their efforts to reduce GHG emissions due to limited resources (e.g. staffing and funding). These constraints can be overcome through a coordinated and collaborative approach to RCAP implementation. Through a collaborative approach the region can more effectively identify and build efficiencies, attract and share resources (e.g., funding, staff time), and undertake regional infrastructure initiatives needed to enhance capacity and interconnectivity in sectors such as solid waste and transportation, thereby reducing GHG emissions as outlined in the RCAP Measures. While this Strategy will not produce quantifiable GHG emission reductions, it is critical to successful implementation of the RCAP Measures where deep GHG reductions can only be achieved through regionally applied efforts. Based on this approach, the RCAP's Cornerstone Strategy consists of the Measure presented in Table 3. The table also indicates the Measure is supportive.

Table 3 Strategy C: Cornerstone GHG Emissions Reduction Summary

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
C-1	Establish a Regional Climate Committee comprised of elected officials from each jurisdiction, HTA, HCAOG, HWMA, and RCEA to be administered by the County.	Supportive/Critical	Supportive/Critical
Total		**0**	**0**

Notes:

Measure C-1: Establish a Regional Climate Committee comprised of elected officials from each jurisdiction, HTA, HCAOG, HWMA, and RCEA to be administered by the County.

Measure C-1 commits the region to establishing a Regional Climate Committee, facilitated by the County, to serve as a regional coalition. This committee is crucial to facilitate implementation of the Measures outlined in the RCAP. The measure emphasizes the six pillars used in each measure of the RCAP to provide proven structure for successful implementation and clearly illustrates the purposes.

- **Structural Change:** Develop and provide models, pilot programs, and template policies or ordinances that enable each jurisdiction in the region to implement uniform changes and facilitating local communities in making the necessary structural adjustments to reduce GHG emissions.
- **Engagement**: Develop and distribute promotional materials and programs across the region to inform the community, gain buy-in, and promote awareness of new and existing programs and opportunities.
- **Equity**: Leverage regional programs to engage and support frontline communities that may experience secondary impacts or not benefit directly from the measures' objectives. Ensure these communities can access regional resources or funding opportunities to mitigate identified impacts and benefit the entire community.
- **Feasibility Studies**: Utilize regional resources to conduct efficient studies that provide a clear understanding of the details, obstacles, and feasibility of proposed programs. This includes necessary analyses to identify the best path forward or the feasibility of implementing specific measures.
- **Funding**: Collaborate regionally to identify and pursue grants and financial backing. Ensure resources and efforts are directed towards securing funds that can be distributed across the region, such as grants or rebates to support measure implementation and adequate program staffing.
- **Partnerships:** Use the collaborative network of local jurisdictions, agencies, and community-based organizations (CBOs) to attract additional internal and external support and expertise. This includes engaging community organizations that are well-positioned to consistently and sustainably advance specific measures.

This committee would include representatives from municipalities across Humboldt County as well as representatives from regonal agencies such as the HTA, HCAOG, HWMA, and RCEA, and other partner organizations. The purpose of this coalition is to foster collaboration and coordination among the region to address climate-related challenges and implement effective climate action strategies. By bringing together key parties from various sectors and jurisdictions, Measure C-1 leverages collective expertise, resources, and efficiencies to tackle climate change at a regional level. The committee would support RCAP implementation through information sharing, coordination of RCAP efforts, development of joint initiatives to reduce GHG emissions, support and pursue funding, and promote sustainable development practices.

It is critical to have such collaboration and coalition-building to implement the RCAP in a rural and dispersed region that is highly constrained by limited resources. As this is the first RCAP for the region, establishing a collaborative approach is necessary to expand and improve upon shared infrastructure development, such as an interconnected energy and transportation system and regional waste management solutions, that is needed to successfully achieve GHG reductions in the

RCAP on both a regional and individual municipality level. Measure implementation will be phased and iterative, which will allow for the strategies to evolve based on ongoing monitoring of the region's GHG emission levels and progress on measure implementation. Regular monitoring allows progress with implementation to be tracked and effectively inform changes in approach. If the region skews from the GHG reduction targets established in the RCAP, the approach will be updated to include additional and more specific measures to focus on sectors that require renewed emphasis. However, long term change first requires foundational regional efforts to address the region's disconnected infrastructure and resource disadvantages.

Coalition building has been referenced by multiple local, state, national, and international organizations as being critical features in the fight against climate change. Evidence supporting the effectiveness of coalitions in climate action can be found in various successful initiatives globally. For instance, the World Resources Institute notes a significant rise in number of coalitions since the 2015 Paris Agreement and highlights over 90 intergovernmental climate initiatives, emphasizing the importance of cooperation across sectors to tackle emissions effectively.[1] The necessity of coalition-building is further endorsed by senior diplomats, who assert that environmental diplomacy and effective climate action require robust coalitions and convening interested parties (UNC Global, 2022).[2] The United Nations Net Zero Coalition exemplifies this approach by bringing together non-state entities such as cities, regional entities, businesses, and investors to accelerate implementation and achieve net-zero emissions by 2050.[3] Additionally, the World Economic Forum showcases numerous alliances and initiatives aimed at addressing the United Nations Sustainable Development Goals, reinforcing the critical role of partnerships in global climate action.[4] EcoAmerica also underscores the need for coalition-building to enhance community engagement and implementation efficiency in climate action.[5]

At the state level, California has emphasized a coalition-based approach, recognizing it as a crucial strategy for achieving climate-related goals. The State's 2022 Scoping Plan for Achieving Carbon Neutrality (2022 Scoping Plan) identifies a number of partnership strategies and opportunities for partnership development to aid in reducing GHG emissions including but not limited to developing partnerships across state and local governments, fostering regional collaboration, and establishing public-private partnerships.[6] As detailed in the 2022 Scoping Plan, the State is investing one billion dollars into regional partnerships and economic diversification to support the creation of new jobs and/or economic transition to a carbon neutral economy. The Community Economic Resilience Fund (CERF) was specifically created to support regional groups in developing comprehensive roadmaps for economic recovery and transition, with a focus on creating accessible, high-quality jobs in

[1] World Resources Institute. 2023. Launching a Climate Coalition? Learn from Existing Ones First. Available at: https://www.wri.org/insights/climate-coalition-cooperation-strategies

[2] The University of North Carolina at Chapel Hill. 2024. Climate change, environmental diplomacy require coalition-building, say senior diplomats. Available at: https://global.unc.edu/news-story/climate-change-environmental-diplomacy-require-coalition-building-say-senior-diplomats/

[3] United Nations. 2023. Net Zero #ItsPossible. Available at: https://www.un.org/en/climatechange/net-zero-coalition

[4] World Economic Forum. 2022. Meet the 100 Coalitions accelerating climate action and sustainable development. Available at: https://widgets.weforum.org/sdg-alliances-initiatives-coalitions/index.html

[5] EcoAmerica. 2023. We need coalitions to stop climate change. Available at: https://ecoamerica.org/we-need-coalitions-to-stop-climate-change/

[6] California Air and Resources Board (CARB). 2022. 2022 Scoping Plan for Achieving Carbon Neutrality. Available at: https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf

sustainable industries. Given the Humboldt region's economic downturn in recent decades due to the decline of industries like logging, and the emerging opportunities for green industry growth such as offshore wind, the region is well-positioned to apply for this type of funding. Through the 2022 Scoping Plan, the State also recognizes the importance of establishing partnerships with tribal leaders to incorporate their priorities, expertise, and knowledge to achieve climate goals. There are several tribes in the Humboldt region that have already engaged in climate action efforts on their own. It will be important for the region to continue to engage with these tribes to gain insight on implementation of measures and actions that may impact tribal cultural resources and/or may benefit from tribal input.

The California Climate Adaptation Strategy, a program mandated by AB 1482, also recognizes the importance of regional collaboration and has recently updated priority strategies to enhance the implementation methods and metrics for establishing effective collaboratives and the successful leveraging of resources.[7] There are several grant funding opportunities available for regional climate adaptation resilience planning and scaling of regional climate solutions through the Integrated Climate Adaptation and Resiliency Program (ICARP).[8] ICARP was formed by the Governor's Office of Planning and Research (OPR) as directed by SB 246 signed in 2015. The most recent round of funding through the Adaptation Planning Grant Program (APGP) prioritized funding communities with capacity and resource constraints such as those in rural communities. Although this round of grant funding for the APGP has closed, the focus on supporting regional-scale climate planning and implementation efforts underscores the emphasis state programs place on addressing climate change through regional coalitions and the added value of such coalitions for rural communities like Humboldt.

An example of a successful coalition within the State includes the San Mateo County Regionally Integrated Climate Action Planning Suite (RICAPS) program that was developed to provide the tools and technical support for climate action planning and implementation to the 21 local jurisdictions in San Mateo County. The program was developed with the recognition that smaller incorporated cities in the region were limited in staff resources and funding to implement climate actions on their own and that a regional approach was necessary to reduce GHG emissions countywide and meet statewide GHG reduction goals. The RICAPS program is funded by grants from the regional air quality district (Bay Area Air Quality Management District) and PG&E.

Similar to San Mateo County, Humboldt's RCAP seeks to address climate change on a regional level and recognizes that the individual jurisdictions face significant constraints to implementation of the RCAP due to staffing and funding availability. Establishing a Regional Climate Committee in Humboldt aligns with state-recommended methods for implementing climate-related initiatives and addresses the constraints faced by individual jurisdictions. By leveraging the region's collective resources, this coalition can increase efficiency, pool resources, and enhance access to funding opportunities for implementing the RCAP measures. Furthermore, a regional approach focuses on increasing the interconnectedness of infrastructure in the region, which is essential for achieving substantial reductions in GHG emissions.

[7] CA.gov. 2024. California Climate Adaptation Strategy. Available at: https://www.climateresilience.ca.gov/

[8] https://opr.ca.gov/climate/icarp/grants/

3 Strategy BE: Building Energy

The Humboldt region's Building Energy Strategy focuses on two approaches developed specifically for the incorporated cities with natural gas infrastructure, termed as "urban" areas and for the unincorporated Humboldt County and smaller jurisdictions without natural gas infrastructure, that are best characterized as "rural". In the larger incorporated cities, the RCAP strategy primarily consists of electrifying and weatherizing residential and nonresidential buildings to leverage the carbon-free and renewable electricity provided by Redwood Coast Energy Authority (RCEA) and increase building energy efficiencies to reduce the load on the local grid. The strategy also focuses on supporting RCEA's buildout of local residential solar installations and community-scale generation and storage of renewable energy.[9] This strategy also aims to collaborate with the Rural Regional Energy Network (RuralREN) administered by RCEA to access funding and develop locally-appropriate programs to enhance energy efficiency in the community and reduce the energy burden in the region. RuralREN formation was approved by the California Public Utilities commission (CPUC) in June of 2023 to expand access of rural communities to energy efficiency services by investing $177 million to underserved rural regions across the state including the North Coast where Humboldt is located. The funding is intended to go towards helping customers with financing options for energy projects, workforce education and training, energy codes and standards training, as well as energy assessments, rebates, and incentives for cleaner energy efficient equipment.[10]

Electrifying the urban areas of the region's building stock consists of transitioning natural gas appliances—the equipment that heats the water we use and heats and cools the spaces we live and work in—to electric alternatives. When coupled with renewable and zero-carbon electricity, all-electric buildings eliminate GHG emissions from natural gas consumption and transition to a zero-emission operational energy footprint. The incorporated jurisdictions will also work to increase the generation and storage of community-scale renewable energy via on-site solar and battery storage to further support the additional electricity demand resulting from building electrification.

Due to the limitations of the energy infrastructure in rural regions, many rural households in Humboldt rely on alternative energy sources such as propane. In recognition of difference in regional characteristics, the RCAP Building Energy Strategy includes efforts to provide direct, decarbonized substitutions for currently used fuels in addition to electrification, weatherization, and on-site generation efforts. Based on these regionally specific approaches, the RCAP's Building Energy Strategy consists of the following Measures presented in Table 4. The table also indicates which Measures are quantitative and which Measures are supportive. The following subsections detail the substantial evidence and calculation methodologies of the quantitative Measures and the role of the supportive Measures.

[9] Community-scale renewable energy provides electricity for community or commercial consumption rather than for a single home as residential rooftop solar does.

[10] https://kymkemp.com/2023/07/11/rcea-to-administer-new-energy-network-serving-rural-california/

Table 4 Strategy BE: Building Energy GHG Emission Reduction Summary

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
Measure BE-1	By 2030, source 90% of grid-supplied electricity from renewable and carbon-free sources.	15,403	0
Measure BE-2	Increase the development of micro-grids and storage across the region to support RCEA's RePower Humboldt goals of enhancing grid capacity and facilitating the electrification of buildings and transportation.	Supportive	Supportive
Measure BE-3 Urban	Reduce existing residential building natural gas consumption by 4% by 2030 and 74% by 2045.	2,603	55,866
Measure BE-3 Rural	Reduce existing residential fossil-fuel consumption in households not connected to natural gas infrastructure by 2% by 2030.	Supportive	Supportive
Measure BE-4	Reduce existing nonresidential building natural gas consumption by 5% by 2030 and 79% by 2045.	3,821	42,887
Measure BE-5	Decarbonize 95% of new residential building construction by 2027.	2,252	13,907
Measure BE-6	Decarbonize 95% of new nonresidential building construction by 2027.	1,374	8,492
Measure BE-7	Decarbonize 30% municipal buildings and facilities by 2030	Supportive	Supportive
Measure BE-8	Advocate for Offshore Wind developers and PG&E to build electrical infrastructure to supply Humboldt with energy produced by the future offshore wind project which will increase regional supply and resilience.	Supportive	Supportive
Total		**25,453**	**121,152**

1. Assumes emissions for electricity will be 0 due to SB 100 requirements that all retail electricity must be generated from renewable, carbon-free sources by 2045.

Measure BE-1: By 2030, source 90% of grid-supplied electricity from renewable and carbon-free sources.

Measure BE-1 aims to increase the share of electricity-supplied to the region that is sourced from renewable and carbon-free sources such that 90 percent of all electricity consumed in the Humboldt region is carbon-free. As RCEA is on track to provide 100 percent renewable electricity to all customers by 2030, this Measure would significantly aid in decarbonizing the region's building energy sector. The primary Actions that enable this Measure are:

- **Action BE-1a,** which supports RCEA in implementation of the RePower Humboldt plan which focuses on the continued procurement of renewable and carbon-free power and administration of decarbonization programs such as continued customer solar installations, electrification support, EV charging infrastructure buildout, and advanced biofuel infrastructure development;
- **Action BE-1b**, which directs the Regional Climate Committee to develop a policy or ordinance that will be adapted and adopted by each jurisdiction that requires new commercial and industrial developments to acquire electricity from renewable and carbon-free sources by either enrolling with RCEA or a comparable program;
- **Action BE-1d**, which involves the development of promotional materials and engagement with the community to inform the community of available incentives and benefits of enrolling in RCEA programs and discourage opting-out,
- **Action BE-1e**, which commits the region to increasing communication and technical assistance to low/moderate income households on the rebate and funding assistance programs available through the California Alternate Rates for Energy (CARE) and Low Income Home Energy Assistance Program (LIHEAP).

Currently, electricity customers in the Humboldt region are automatically enrolled in RCEA's REPower electricity option but may choose to 1) opt-up to the REPower+ option, 2) opt-out to receive electricity directly from PG&E, or 3) opt-out to procure electricity at wholesale directly from electricity generators (i.e., direct access). Automatic enrollment has shown to be an effective method of increasing the use of carbon-free and renewable electricity, with RCEA currently maintaining a 9 percent opt-out rate[11]. Based on electricity data provided by RCEA and region wide electricity use from CEC, RCEA currently supplies 77 percent of all electricity consumed in the region. A majority of the remaining 23 percent is provided by PG&E.

RCEA currently offers electricity options with a GHG emission rate lower than the standard electricity options offered in the region. In 2022, RCEA's REPower electricity option sourced 50 percent of its supply from eligible renewable sources, while the REPower+ option supplied 100 percent from solar, wind, and eligible hydroelectric at a GHG emissions rate of zero.[12] Though RCEA currently provides two renewable rate options, RCEA has established a strategy (RePower Humboldt Plan) and is currently on track to provide all customers with electricity that is sourced from 100 percent net-zero-carbon emission renewable sources by 2030.[13] As such, by maintaining the current enrollment level and opt-out rates, approximately 77 percent of building electricity emissions in the region will be reduced to zero by 2030 as RCEA achieves its goal to procure electricity that is 100

[11] Opt-out rates reported by RCEA via email on March 21, 2024.

[12] California Energy Commission (CEC). 2022 Power Content Label: Redwood Coast Energy Authority. Accessed at: https://www.energy.ca.gov/filebrowser/download/6060.

[13] Redwood Coast Energy Authority (RCEA). 2019. REPower Humboldt (2019 Update). Available at: https://redwoodenergy.org/wp-content/uploads/2020/06/RePower-2019-Update-FINAL-.pdf

percent net-zero-carbon for both REPower and REPower+ customers. This means that to achieve Measure BE-1 goal, an additional 13 percent of electricity supplied to the region will need to be sourced from renewable and carbon-free sources. Through **Action BE-1a** the region will support RCEA in implementing the renewable energy and decarbonization programs, by providing the necessary assessments to plan and implement an effective energy strategy that addresses obstacles to implementation.

To further increase the percent of regional electricity that is supplied by RCEA or a comparable 100% renewable program, jurisdictions in Humboldt will leverage the Regional Climate Committee to develop education initiatives to advertise benefits and financial incentives to increase enrollment in RCEA and minimize opt-out rates through **Action BE-1d.** RCEA and jurisdictions in Humboldt understand cost is often the deciding factor for residents and businesses when making choices about an energy provider.[14] Currently, RCEA has capacity to enroll all Humboldt electricity consumers in their REPower and REPower+ energy packages, though higher procurement costs pose the largest constraint for higher enrollment rates. For this reason, the region will focus educational efforts on, and support RCEA in implementing energy finance programs through **Action BE-1f** and pursuing funding to expand available financial assistance such as the CARE and LIHEAP programs to keep customers enrolled in RCEA's power supply programs. As directed by **Action BE-1e**, expanding the CARE and LIHEAP programs will reduce financial limitations of low income residents in maintaining RCEA enrollment as well as increase access to the REPower+ option at no extra cost. This plan will prevent customers enrolled in these programs from experiencing cost increases that may drive decisions to opt-out of RCEA. Moreover, studies have also shown informational programs can result in up to a 70 percent implementation rate of recommended practices by participants.[15] The jurisdictions will, therefore, include education on the benefits of clean energy for residents and businesses to encourage customers to remain in RCEA programs.

In 2022, RCEA provided 85 percent of residential electricity and 71 percent of non-residential electricity indicating that there is a lower enrollment rate of RCEA by non-residential customers. To increase the percent of non-residential customers receiving renewable and carbon-free electricity, **Action BE-1b** commits jurisdictions to require new commercial and industrial facilities to enroll with a 100 percent renewable energy and carbon free source such as RCEA[16] or PG&E's 100% Solar Choice or Green Saver program.[17] The unincorporated County of Humboldt implemented such a building code[18] for cannabis industries developing in the region which was effective in increasing enrollment in 100 percent renewable energy electricity. This building code serves as an example of implementation that has been proven successful in the region. The template for such a policy or ordinance would be developed by the Regional Climate Committee through **Action BE-1b** to increase efficiencies during policy development, best utilize limited staff resources and time, and to create consistency across the jurisdictions. With actions focused on education and financial

[14] Villasenor, Karen. The City of Rancho Mirage Launches Community Choice Aggregation Program with Low Opt-Out Rate (2018). Accessed at: https://www.civicbusinessjournal.com/city-rancho-mirage-launches-community-choice-aggregation-program-low-opt-rate/

[15] Laquatra, Joseph et al. The Consumer Education Program for Residential Energy Efficiency (2009). Accessed at: https://archives.joe.org/joe/2009december/a6.php.

[16] Note that RCEA REPower and REPower+ enrollment options are both expected to provide 100 percent carbon free renewable energy by 2030.

[17] PG&E offers a varied of rate plans that include 100% renewable and carbon-free rates that can be enrolled in. Available at: https://www.pge.com/en/clean-energy.html

[18] Humboldt County. Section B: Regulations That Apply In All or Several Zones, Part 1: Uses and Activities. Available at: https://humboldt.county.codes/Code/313-55

incentives in conjunction with building code requirements on non-residential land uses it is anticipated that the percent of regional supplied electricity that is sourced from renewable and carbon-free sources will increase to 90 percent by 2030.

Table 5 shows the parameters and data sources that support these clean energy GHG emission reductions and Table 6 shows the calculations as outlined in Equations 1 through 1.1.

RCEA Clean Energy Equations

Equation 1 $CO_2e\ Reduction_{Elec,y,i}=Total\ Elec_{y,i}*Supply\ Rate_i*(EF_{elec,y,i}-EF_{CF,y})$

Equation 1.1 $Total\ Elec_{y,i}=(Elec_{y,i}+Total\ Elec\ Converted_{y,i})*(1+L_{T\&D})$

Table 5 RCEA Clean Energy Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 1				
$CO_2e\ Reduction_{Elec,y,i}$	Electricity GHG emission reductions	See calculation table	MT CO_2e	Calculated
$Total\ Elec_{y,i}$	Total electricity consumption	See calculation table	kWh	Calculated
$Supply\ Rate_i$	Target supply rate community-wide	90%	percentage	Estimated to account for current RCEA enrollment and increased enrollment in RCEA or an alternative Green Rate expected with education and incentive programs via Action BE-1e and required enrollment by nonresidential sector via Action BE-1b.
$EF_{elec,y,i}$	Forecasted electricity emission factor	See calculation table	MT CO_2e/kWh	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$EF_{CF,y}$	Electricity emission factor of carbon-free electricity	0.00	MT CO_2e/kWh	RCEA REPower Plan[1] PG&E 100% Solar or Green Saver Program[2]
y	Year	2030	year	–
i	Subsector	Residential or Nonresidential	N/A	–
Equation 1.1				
$Elec_{y,i}$	Forecasted electricity consumption	See calculation table	kWh	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Elec\ Converted_{y,i}$	Total electricity usage from conversions	See calculation table	kWh	Measures BE-3, BE-4, BE-5, and BE-6
$L_{T\&D}$	Electricity transmission and distribution loss percentage	5.10%	Percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. Redwood Coast Energy Authority (RCEA). REPower Humboldt (2019 Update). Available at: https://redwoodenergy.org/wp-content/uploads/2020/06/RePower-2019-Update-FINAL-.pdf

2. Action BE-1b would require industries to enroll in carbon free electricity program. Beyond RCEA, PG&E a few options for 100% renewable and carbon-free rates that can be enrolled in. Available at: https://www.pge.com/en/clean-energy.html The aPG&E's green saver

Table 6 RCEA Clean Energy GHG Emission Reduction Calculations

Definition	Definition	Units	Sector	2030	2045
Equation 1.1					
$Elec_{y,i}$	Forecasted electricity consumption	kWh	Residential	400,921,013	452,724,827
			Nonresidential	451,198,361	570,590,085
$Elec\ Converted_{y,i}$	Total electricity usage from conversions	kWh	Residential	14,037,798	234,911,282
			Nonresidential	12,889,430	160,324,644
$Total\ Elec_{y,i}$	Total electricity consumption	kWh	Residential	436,121,710	722,705,550
			Nonresidential	487,756,269	768,191,380
Equation 1					
$EF_{elec,y,i}$	Forecasted electricity emission factor	MT CO_2e/kWh	Residential	0.0000183	0.00
			Nonresidential	0.0000187	0.00
$CO_2e\ Reduction_{Elec,y,i}$	**Electricity GHG emission reductions**	**MT CO_2e**	**Residential**	**7,180**	**0**
			Nonresidential	**8,224**	**0**

Measure BE-2: Increase the development of micro-grids and storage across the region to support RCEA's RePower Humboldt goals of enhancing grid capacity and facilitating the electrification of buildings and transportation.

Measure BE-2 calls for the regional enhancement of energy grid capacity by developing micro-grids and energy storage systems, supporting RCEA's goals established in the REPower Humboldt Plan. Micro-grids, which can operate independently from the traditional grid, combined with energy storage, improve grid reliability and resilience by storing excess energy during low demand and supplying it during peak periods. While the GHG emission reductions from this measure are not quantified in this RCAP due to potential overlaps with other measures, these efforts play a crucial role in reducing the strain on the current grid and increase the available renewable energy to source locally. This supports the region's transition to renewable electricity and the electrification of buildings and transportation, as outlined in Measures BE-3 through BE-7, as well as T-6 through T-8.

With their flexibility and resilience, micro-grids serve as a viable method for addressing the capacity constraints that exist throughout the region.[19] Micro-grids and energy storage enhance grid efficiency, reduce reliance on fossil fuel-based plants, and facilitate the integration of renewable energy sources. Micro grids provide for increased resilience against power outages, crucial for climate adaptation. Furthermore, by decentralizing energy production, micro-grids can expand access to renewable energy in rural and isolated areas, thereby promoting greater availability of low-carbon energy solutions.

[19] Redwood Coast Energy Authority (RCEA). 2024. Resilience, Energy Resilience and Emergency Response. Available at: https://redwoodenergy.org/resilience/

Measure BE-3 Urban: Reduce existing residential building natural gas consumption by 4% by 2030 and 74% by 2045.

Measure BE-3 puts the region's urban areas (i.e. all incorporated cities with natural gas infrastructure) on a path to reduce residential natural gas consumption by approximately 4 percent by 2030 and 74 percent by 2045 to reduce GHG emissions. The primary Actions that enable this level of adoption include:

- **Action BE-3a** which calls for the development of an equitable decarbonization plan for urban residences connected to natural gas infrastructure that determine feasibility, cost, and equity concerns of retrofits as well as identifies projects and specific strategies to meet decarbonization targets;
- **Action BE-2b** which commits the Regional Climate Committee to petition PG&E on the region's behalf to help identify priority areas for electric grid expansion to help increase regional grid capacity and islanding capabilities;
- **Action BE-2d** which coordinates a regional effort to pursue and obtain increased funding from sources such as CARB, the Investment Reduction Act, and the Infrastructure Investment and Jobs Act; and
- **Action BE-2e** which commits incorporated jurisdictions to promote and provide information regarding currently available rebates for heat pumps, weatherization, smart appliances, etc. developed by the Regional Climate Committee with support provided by RCEA.

These actions will prepare urban areas with the engagement, resources, and funding assistance needed to reduce natural gas consumption through voluntary replacement. Currently available incentives will help continue the growth in electric space and water heaters seen in California over the past decade. According to Opinion Dynamics' *California Heat Pump Residential Market Characterization and Baseline Study* (2022), electric space heaters have grown from a five percent market share in 2009 to a 20 percent market share in 2019. Likewise, electric water heaters have grown from a six percent market share in 2009 to a 12 percent market share in 2019.[20] This trend is not only expected to continue through 2030 as electric appliances become more efficient and more cost-effective, but also be accelerated when coupled with sufficient funding for community members to replace their space and water heating appliances with electric or heat pump alternatives. While the total amount of funding available will change with sunset dates and budget cycles, the currently available federal (i.e., High Efficiency Electric Home Rebate [HEEHRA], Homeowner Managing Energy Savings [HOMES] Rebate, Inflation Reduction Act), state (i.e., TEHC Clean California), and local (i.e., RCEA's Residential Equipment Rebate Catalog and Heat Pump Rebate Catalog) funding options make it so that low- and middle-income residents in the Humboldt region can install electric space and water heaters at no additional cost compared to gas space and water heaters. In some cases, such customers will even be able to install the heat pump water heaters for free.[21] Though the region is currently limited in its electrification potential largely due to capacity restrictions from PG&E infrastructure, it is anticipated that the significant amount of funding available to Humboldt region residents and businesses combined with RCEA efforts to expand regional capacity (See Measure BE-2) will remove this hinderance to electrification and thereby help drive the voluntary market trend for electric space and water heating appliances

[20] Opinion Dynamics. California Heat Pump Residential Market Characterization and Baseline Study (2022). Accessed at: https://pda.energydataweb.com/#!/documents/2625/view.

[21] Rincon Consultants, Inc. Installation Costs for Zero-NOx Space and Water Heating Appliances (2024).

through 2030. Further, by developing a regional residential decarbonization plan that accounts for infrastructure and cost limitations and identifies strategies for partial electrification, more widespread adoption of residential decarbonization strategies can be anticipated.[22]

Table 7 shows the parameters and data sources that support these electrification programs and incentives for voluntary replacement, and Table 8 shows the GHG emissions reductions as outlined in Equation 2 through 2.4. Though the primary rebate programs specified prioritize heat pump replacements due to their superior efficiency, electric resistance equipment currently make up the majority of the electric technology market, likely due to their overall lower up-front cost. As the Actions employed by the Regional Climate Committee and urban areas would rely largely on voluntary replacement, the quantification of GHG reductions for this Measure assumes alignment with current market penetration of available electric technologies. Studies, such as those conducted by the American Council for an Energy-Efficient Economy (ACEEE) and the California Energy Commission (CEC), indicate that electrification and decarbonization practices are more common in urban areas due to better access to electrical infrastructure and greater policy and regulatory support.[22,23] As such, the GHG reductions associated with this Measure were conservatively applied only to the natural gas consumption in the incorporated cities of Humboldt, which account for approximately 60% of the region's total residential natural gas consumption. Given the substantial funding opportunities and increased awareness regarding the benefits of partial or full electrification available to all residences connected to the natural gas infrastructure in the region, it is anticipated that larger GHG reductions than those presented below are achievable.

Additionally, the emissions associated with natural gas consumption from PG&E are expected to decrease due to Senate Bill 1440, which mandates gas utilities, including PG&E, to replace pipeline-supplied natural gas with renewable natural gas (RNG). In 2022, the California Public Utilities Commission (CPUC) set RNG supply requirements for California utilities, requiring them to increase the amount of RNG in the pipeline supplied to residential and commercial customers by 12% by 2030.[24] RNG is derived from organic waste materials, such as landfill waste, sewer, and agricultural waste through processes like anaerobic digestion. Because organic waste naturally releases biogenic carbon dioxide during decomposition, conversion of organic waste into RNG means that any carbon dioxide released during combustion of RNG is considered part of the natural carbon cycle and does not contribute a net increase in carbon dioxide emissions to the atmosphere like combustion of fossil derived natural gas does. Production and consumption of RNG still releases non-biogenic GHG emissions, but to a lesser extent than extraction and consumption of fossil derived natural gas.[25] The information on SB 1440 provided here is for informational purposes only. The potential GHG emissions reductions associated with SB 1440's RNG procurement requirements are not quantified in this RCAP as it is unclear how extensively SB 1440 might affect emissions linked to natural gas sourced from pipelines.

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[22] American Council for an Energy-Efficient Economy (ACEEE). (2022). Building Electrification: Programs and Best Practices. Available at: https://www.aceee.org/sites/default/files/pdfs/b2201.pdf

[23] California Energy Commission (CEC). 2021. California Building Decarbonization Assessment – Final Commission Report. Available at: file:///C:/Users/elinard/Downloads/TN239311_20210813T140633_California%20Building%20Decarbonization%20Assessment%20-%20Final%20Commission%20Report.pd.pdf

[24] Pacific Gas and Electric Company's (PG&E). (2022) Draft Renewable Gas Procurement Plan in Compliance with Commission Decision 22-02-02. Available at: https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M500/K435/500435651.PDF

[25] U.S. Environmental Protection Agency. (2021). An Overview of Renewable Natural Gas from Biogas. Available at: https://www.epa.gov/sites/default/files/2021-02/documents/lmop_rng_document.pdf

Existing Building Technical Assistance and Incentive Program Equations

Equation 2 $CO_2e\ Reduction_{NG,y,i}=\Sigma((Fuel\ Avoided_{j,y,i}*EF_{NG})+(Fuel\ Avoided_{j,y,i}*(L_{Pipeline}+L_{End\text{-}use})*EF_{NGL}))-(Elec\ Converted_{y,i}*EF_{elec,y,i}*(1+L_{T\&D}))$

Equation 2.1 $Elec\ Convert_{y,i} = \Sigma\ (Fuel\ Avoided_{j,y,i}*CF_{elec}/Eff_{elec,j})$

Equation 2.2 $Fuel\ Avoided_{j,y,i}=Fuel_{y,i}*Prop_{urban}*(EOL_{NG,j,y,i}*Fuel\ Share_{j,i}*MS_{elec,j,y})$

Equation 2.3 $EOL_{NG,j,y,i}=1/LSP_{j,i}*(y\text{-}imp.y_i)$

Equation 2.4 $Eff_{elec,j} = \Sigma\ Eff_{elec,j,k} * Prop_{elec,j,k}$

Table 7 Existing Building Voluntary Replacement Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 2				
$CO2e\ Reduction_{NG,y,i}$	Natural gas GHG emission reductions	See calculation table	MT CO2e	Calculated
$Fuel\ Avoided_{j,y,i}$	Natural gas consumption avoided	See calculation table	therms	Calculated
EF_{NG}	Natural gas emission factor	0.005311	MT CO2e/therm	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
EF_{NGL}	Natural gas leakage emission factor	0.047381	MT CO2e/therm	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Elec\ Converted_{y,i}$	Electricity usage from conversion	See calculation table	kWh	Calculated
$EF_{elec,y,i}$	Forecasted electricity emission factor	See calculation table	MT CO2e/kWh	Forecast
$L_{pipeline}$	Natural gas pipeline leakage percentage	2.3%	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$L_{End\text{-}use}$	Natural gas end-use leakage percentage	0.5%	percentage	See Appendix GHG Inventory, Forecast, and Targets Technical Report
$L_{T\&D}$	Electricity transmission and distribution loss percentage	5.10%	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
y	Year	2030 or 2045	year	—
i	Subsector	Residential or Nonresidential	—	—
j	Electric equipment type	HVAC or water heater	—	—
Equation 2.1				
CF_{elec}	Electricity to therms conversion factor	29.3	kWh/therm	Metric Conversions[1]
$Eff_{elec,j}$	Efficiency factor of electric equipment relative to natural gas equipment	See calculation table	unitless	Calculated
Equation 2.2				
$Prop_{urban}$	Estimated proportion of natural gas attributable to incorporated cities	See calculation table	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Fuel_{y,i}$	Forecasted natural gas consumption after new building electrification	See calculation table	therms	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$EOL_{NG,j,y,i}$	Percent of equipment reaching end of life	See calculation table	percentage	Calculated

Variable	Definition	Value	Unit	Data Source
$Fuel\ Share_{j,i}$	Percent of sector natural gas consumption	—	—	—
$Fuel\ Share_{wh,Res}$	Percent of residential natural gas consumption from water heaters	38%	percentage	Synapse[2]
$Fuel\ Share_{wh,Nonres}$	Percent of nonresidential natural gas consumption from water heaters	28%	percentage	Synapse[2]
$Fuel\ Share_{HVAC,Res}$	Percent of residential natural gas consumption from HVAC units	39%	percentage	Synapse[2]
$Fuel\ Share_{HVAC,Nonres}$	Percent of nonresidential natural gas consumption from HVAC units	42%	percentage	Synapse[2]
$MS_{elec,j,}y$	Market share of electric equipment	—	—	—
$MS_{elec,wh,\ 2030}$	Market share of electric water heaters	12%	percentage	Opinion Dynamics[3]
$MS_{elec,HVAC,2030}$	Market share of electric space heating units	22%	percentage	Opinion Dynamics[4]
$MS_{elec,wh,\ 2045}$	Market share of electric water heaters	100%	percentage	Assuming 100% electric market share by 2045
$MS_{elec,HVAC,2045}$	Market share of electric space heating units	100%	percentage	Assuming 100% electric market share by 2045
Equation 2.3				
$LSP_{i,wh}$	Average water heater lifespan in sector	—	—	—
$LSP_{residential,wh}$	Average residential water heater lifespan	13	years	EIA[5]
$LSP_{nonresidential,wh}$	Average nonresidential water heater lifespan	10	years	EIA[5]
$LSP_{i,HVAC}$	Average HVAC unit lifespan in sector	—	—	—
$LSP_{residential,HVAC}$	Average residential HVAC unit lifespan	21.5	years	EIA[5]
$LSP_{nonresidential,HVAC}$	Average nonresidential HVAC unit lifespan	23	years	EIA[5]
$imp.y_i$	Ordinance implementation year	—	—	—
$imp.y_{residential}$	Ordinance implementation year for residential buildings	2025	year	RCAP adoption
$imp.y_{nonresidential}$	Ordinance implementation year for nonresidential buildings	2025	year	RCAP adoption
Equation 2.4				
$Eff_{elec,HVAC}$	Efficiency factor of HVAC systems relative to natural gas equipment	See calculation table	unitless	—

Variable	Definition	Value	Unit	Data Source
$Eff_{elec,HVAC,HP}$	Efficiency factor of heat pumps	3	unitless	Leonardo Energy[6] and European Copper Institute[8]
$Eff_{elec,HVAC,ER}$	Efficiency factor of electric resistance	1	unitless	Energy.gov[7] and Schnackle Engineering[9]
$Eff_{elec,wh,ER}$	Efficiency factor of water heaters relative to natural gas	1	unitless	Conservative estimate of 1:1 efficiency of gas and electric water heaters[10,11]
$Prop_{elec,HVAC,k}$	Proportion of electric equipment types making up the electric HVAC market	—	—	—
$Prop_{elec,HVAC,HP}$	proportion of heat pump technology for HVAC systems	18%	percentage	Calculated based on the combined market share of heat pumps and electric resistance heaters for space heating[4]
$Prop_{elec,HVAC,ER}$	proportion of electric resistance technology for HVAC systems	82%	percentage	Calculated based on the combined market share of heat pumps and electric resistance heaters for space heating[4]
$Prop_{elec,wh,ER}$	Electric HVAC technology proportion of electric resistance space heaters	100%	percentage	As high efficiency technology (i.e. solar and heat pumps) is 1% of the market, assume all water heaters are electric resistance as a conservative estimation[3]
k	types of options for a given electric equipment system	e.g. heat pumps, electric resistance	—	—

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. Metric Conversions. Therms (US) to Kilowatt-hours. Available at: https://www.metric-conversions.org/energy-and-power/therms-us-to-kilowatt-hours.htm
2. Synapse Energy Economics, Inc. 2018. Decarbonization of Heating Energy Use in California Buildings, Figure 2. Available at: https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf
3. Opinion Dynamics. 2022. California Heat Pump Residential Market Characterization and Baseline Study, Figure 34. Available at: https://pda.energydataweb.com/api/view/2625/OD-CPUC-Heat-Pump-Market-Study-Report_Final.pdf
4. Opinion Dynamics. 2022. California Heat Pump Residential Market Characterization and Baseline Study, Figure 21. Available at: https://pda.energydataweb.com/api/view/2625/OD-CPUC-Heat-Pump-Market-Study-Report_Final.pdf
5. U.A. Energy Information Administration (eia). 2023. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. Available at: https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf
6. Leonardo Energy - Knowledge Base. 2023. How efficient is a heat pump?. Available at: https://help.leonardo-energy.org/hc/en-us/articles/203047881-How-efficient-is-a-heat-pump
7. Energy.gov. Electric Resistance Heating. Available at: https://www.energy.gov/energysaver/electric-resistance-heating#:~:text=Electric%20resistance%20heating%20is%20100,the%20fuel's%20energy%20into%20electricity.
8. European Copper Institute. 2018. Heat Pumps: Integrating technologies to decarbonize heating and cooling. Accessed at: https://www.ehpa.org/wp-content/uploads/2022/10/White_Paper_Heat_pumps-1.pdf
9. Schnackel Engineers. 2023. Electric Heating vs Gas Heating. Available at: https://schnackel.com/blogs/electric-heating-vs-gas-heating#:~:text=One%20of%20the%20significant%20advantages,losses%20during%20the%20combustion%20process.

Variable	Definition	Value	Unit	Data Source

10. Southface Energy Institute. Water Heater Efficiency, Efficiency of Fuel Types and Alternatives for Heating Water. Available at: https://www.ncelec.org/sites/ncelec/files/documents/waterheater_efficiency_041614.pdf
11. Pennsylvania State University. 2023. Energy Efficiency of Water Heaters. Available at: https://www.e-education.psu.edu/egee102/node/2009

Table 8 Existing Residential Voluntary Replacement GHG Emission Reduction Calculations

Definition	Definition	Units	Sector	2030	2045
Equation 2.4					
$Eff_{elec,wh}$	Efficiency factor of water heaters relative to natural gas	unitless	Residential	1.00	1.00
$Eff_{elec,HVAC}$	Efficiency factor of HVAC systems relative to natural gas equipment	unitless	Residential	1.36	1.36
Equation 2.3					
$EOL_{NG,y,i,wh}$	Percent of water heaters reaching end-of-life since ordinance implementation	percentage	Residential	38.46%	100.00%
$EOL_{NG,y,i,HVAC}$	Percent of HVAC units reaching end-of-life since ordinance implementation	percentage	Residential	23.26%	93.02%
$imp.y_i$	Ordinance implementation year	year	Residential	2025	2025
Equation 2.2					
$Prop_{urban}$	Estimated proportion of natural gas attributable to incorporated cities	percentage	Residential	56.57%	56.57%
$Fuel_{y,i}$	Forecasted natural gas consumption after new building electrification	therms	Residential	11,278,225	11,330,156
$Fuel\ Avoided_{wh,y,i}$	Natural gas consumption avoided (water heaters)	therms	Residential	197,803	4,305,459
$Fuel\ Avoided_{HVAC,y,i}$	Natural gas consumption avoided (HVAC)	therms	Residential	225,040	4,110,475
Equation 2.1					
$Elec\ Converted_{wh,i}$	Electricity usage from conversion of water heater systems	kWh	Residential	5,795,620	126,149,953
$Elec\ Converted_{HVAC,i}$	Electricity usage from conversion of HVAC systems	kWh	Residential	4,835,358	88,320,408
Equation 2					
$EF_{elec,y,i}$	Forecasted electricity emission factor	MT CO2e/kWh	Residential	0.0000183	0.0000000
$CO2e\ Reduction_{NG,y,i}$	**Natural gas GHG emission reductions**	**MT CO2e**	**Residential**	**2,603**	**55,866**

Measure BE-3 Rural: Reduce existing residential fossil-fuel consumption in households not connected to natural gas infrastructure by 2% by 2030.

Much of rural Humboldt lies at the edge of PG&E's natural gas infrastructure, and experience reduced electric grid capacity compared to other areas in the County. These households typically rely on other fossil fuels such as, propane or diesel, in place of natural gas. Measure BE-3 Rural aims to reduce fossil fuel usage in residential households not connected to PG&E natural gas infrastructure by 2% by 2030. While this measure's GHG emission reductions are not quantified in the RCAP due to the complexity of accurate measurement and data limitations with regards to rural building decarbonization initiatives, it contributes to the community's broader goals of reducing carbon emissions and transitioning to cleaner energy sources.

Reducing fossil-fuel use in rural areas not only helps decrease GHG emissions but also encourages the adoption of alternative energy sources such as electricity or renewable fuels. This transition supports the overall electrification efforts and aligns with other measures aimed at decarbonizing the regional energy supply. Additionally, like Measure BE-3 Urban, this measure aims to provide rural areas with weatherization assistance that will help reduce consumption rates and provide community benefits such as decreased utility cost. By focusing on these rural households, Measure BE-3 Rural seeks to make the benefits of a low-carbon transition accessible to all segments of the community.

Measure BE-4: Reduce existing nonresidential building natural gas consumption by 5% by 2030 and 79% by 2045.

Measure BE-4 puts the Humboldt region on a path to reduce commercial and mixed-use natural gas consumption by 5 percent by 2030 and 79 percent by 2045 to reduce GHG emissions. The primary Actions that enable this level of adoption include:

- **Action BE-4a** which calls for the inclusion of feasibility assessment, cost analysis and strategy development for decarbonization of nonresidential buildings as part of the decarbonization plan led by the Regional Climate Committee as part of Measure BE-3;
- **Action BE-4c** which establishes streamlined permitting for energy efficiency technology, onsite renewable energy, and battery storage projects in support of RCEA RePower Humboldt goals to offset increased electrical needs associated with electrifying buildings;
- **Action BE-4d** which commits jurisdictions to adopt a decarbonization policy for existing commercial buildings by 2027 that establishes a regulatory mechanism, such as permitting processes, that limits expansion of natural gas infrastructure and incentivizes the decarbonization of appliances upon replacement;
- **Action BE-4e** which directs the Regional Climate Committee to develop and administer an outreach program that promotes building decarbonization, involves targeted outreach to businesses and local contractors, and provides information on funding availability specifically to commercial, industrial, and multifamily building owners for decarbonization efforts.

Similar to Measure BE-3 Urban, these actions will prepare jurisdictions county-wide to facilitate voluntary replacement of equipment in the commercial, mixed use, and multifamily buildings, as well as mandatory replacements for large scale renovations. **Action BE-4d** involves adoption of a decarbonization policy to guide decision-making and administrative actions such as permitting processes. Similarly, **Action BE-4c** facilitates permitting processes to make decarbonization easier. This Measure is designed to leverage the Regional Climate Committee to lead the development of a decarbonization strategy, prepare and administer an educational program, and support the jurisdictions with policy and ordinance drafting to conserve staff resources. GHG reduction associated with this measure were calculated based on market trends and the assumption that conditions in more urbanized areas are more favorable for decarbonization of nonresidential buildings. As such, the GHG reductions associated with this Measure were conservatively applied only to the natural gas consumption by nonresidential buildings in the incorporated cities of Humboldt, which account for approximately 75% of the region's total nonresidential natural gas consumption. Based on market trends of electric water and space heater technology, voluntary replacement is anticipated to account for 3-4 percent of the region's 5 percent target.[26] GHG Emissions from voluntary replacement of building equipment was quantified using the same methodology as Equations 2 through 2.4. The full set of parameters and data sources that support these electrification programs and incentives for voluntary replacement are identified in Table 7. Table 9 shows the GHG emissions reductions as outlined in Equation 2 through 2.4.

[26] For more information and substantial evidence regarding electric equipment market trends, see *Measure BE-3 Urban: Reduce existing residential building natural gas consumption connected to PG&E natural gas infrastructure by 3.8% by 2030 and 74% by 2045.*

Table 9 Existing Commercial Voluntary Replacement GHG Emission Reduction Calculations

Definition	Definition	Units	Sector	2030	2045
Equation 2.4					
$Eff_{elec,wh}$	Efficiency factor of water heaters relative to natural gas	unitless	Nonresidential	1.00	1.00
$Eff_{elec,HVAC}$	Efficiency factor of HVAC systems relative to natural gas equipment	unitless	Nonresidential	1.36	1.36
Equation 2.3					
$EOL_{NG,y,i,wh}$	Percent of water heaters reaching end-of-life since ordinance implementation	percentage	Nonresidential	50.00%	100.00%
$EOL_{NG,y,i,HVAC}$	Percent of HVAC units reaching end-of-life since ordinance implementation	percentage	Nonresidential	21.74%	86.96%
$imp.y_i$	Ordinance implementation year	year	Nonresidential	2025	2025
Equation 2.2					
$Prop_{urban}$	Estimated proportion of natural gas attributable to incorporated cities	percentage	Nonresidential	76.22%	76.22%
$Fuel_{y,i}$	Forecasted natural gas consumption after new building electrification	therms	Nonresidential	8,649,265	8,691,986
$Fuel\ Avoided_{wh,y,i}$	Natural gas consumption avoided (water heaters)	therms	Nonresidential	145,308	2,433,756
$Fuel\ Avoided_{HVAC,y,i}$	Natural gas consumption avoided (HVAC)	therms	Nonresidential	173,737	3,174,465
Equation 2.1					
$Elec\ Converted_{wh,i}$	Electricity usage from conversion of water heater systems	kWh	Nonresidential	4,257,514	71,309,056
$Elec\ Converted_{HVAC,i}$	Electricity usage from conversion of HVAC systems	kWh	Nonresidential	3,733,038	68,208,662
Equation 2					
$EF_{elec,y,i}$	Forecasted electricity emission factor	MT CO2e/kWh	Nonresidential	0.0000187	0.0000000
CO2e Reduction $_{NG,y,i}$	**Natural gas GHG emission reductions**	**MT CO2e**	**Nonresidential**	**1,961**	**37,228**

Under **Action BE-4d**, the remaining 2-3 percent of natural gas is anticipated to be achieved by including major renovations in the new commercial building ordinance (see Measure BE-6). Major renovations will be defined by this ordinance as renovation projects that affect over 50 percent of the building, add an additional 50 percent of gross floor space to the building, or value more than 50 percent of the assessed value of the property at time of application submittal. These three definitions will be utilized to capture more projects under the ordinance established as part of Measure BE-6.

In the United States, the commercial building renovation market made up about 22 percent of the total commercial building market in 2022. It is anticipated that the commercial renovation market

will continue to grow and make up a larger portion of the commercial building market due to the aging building stock and need for upgrades.[27] A study by the Lawrence Berkely National Laboratory found that of the renovation and retrofit projects occurring in commercial buildings, approximately 18 percent and 20 percent of the projects included water heater and HVAC system replacements, respectively.[28] This equates to an estimated replacement of water heaters and HVAC units at a 4.0 percent and 4.5 percent annual rate, respectively, due to renovation or retrofit.

Since Humboldt is largely a bedroom community where even urban centers are considered to be small rural communities, this Measure assumes the region's nonresidential building stock has a similar history to the residential housing stock. As much of the region can be considered as bedroom communities serving surrounding commercial centers, most of the existing nonresidential buildings in the region were developed to support the residents of Humboldt. Thus, it is anticipated that the development and age of nonresidential buildings would have followed the same path as residential development, so residential housing stock data can be utilized for this Measure. As shown in Table 10, over 60 percent of Humboldt's regional housing stock was built prior to the 1980s. This means the majority of commercial buildings in the community are older than 45 years old, having reached or soon reaching the point of needing major renovations since the average lifespan of a commercial building is 50 to 60 years.[29] This quantification thus conservatively assumes 1 percent of commercial buildings will need major renovations each year through 2045 so that a conservative 3 percent receive major renovations cumulatively by 2030 and 18 percent by 2045.

Table 10 Humboldt's Regional Housing Stock Age

Year Built	Age (years)	Total Houses	Share of Houses
Built 2020 or later	4 or younger	148	0.20%
Built 2010 to 2019	5 to 14	2,757	4.40%
Built 2000 to 2009	15 to 24	5,045	8.10%
Built 1990 to 1999	25 to 34	8,041	12.90%
Built 1980 to 1989	35 to 44	8,391	13.50%
Built 1970 to 1979	45 to 54	9,098	14.60%
Built 1960 to 1969	55 to 64	6,746	10.80%
Built 1950 to 1959	65 to 74	8,764	14.10%
Built 1940 to 1949	75 to 84	4,349	7.00%
Built 1939 or earlier	85 or older	8,967	14.40%
Total		**62,306**	**100%**

1. US Census: https://data.census.gov/table/ACSDP5Y2022.DP04?g=050XX00US06023_040XX00US06&tid=ACSDP5Y2022.DP04

[27] IBISWorld. 2023. Commercial Property Remodeling Industry in the US – market Research Report. Available at: https://www.ibisworld.com/united-states/market-research-reports/commercial-property-remodeling-industry/#IndustryStatisticsAndTrends

[28] Cindy Regnier P.E., Paulk Mathew Ph.D., Alastair Robinson, Jordan Shackelford, Travis, Walter Ph.D. 2020. System Retrofit Trends in Commercial Buildings: Opening Up Opportunities for Deeper Savings. Lawrence Berkeley National Laboratory. Available at: https://buildings.lbl.gov/sites/default/files/Regnier%20-%20Systems%20Retrofit%20Trends.docx__1.pdf

[29] BCI Construction. Which Factors Determine the Lifespan of a Building? (2021). Accessed at: https://bciconstruction.us/which-factors-determine-the-lifespan-of-a-building/.

The annual major renovation percentage (i.e., 1 percent) is applied to a decreasing existing building stock (i.e., buildings receiving major renovations the previous year are removed from the existing building stock) to employ diminishing returns in the quantification. Due to the available incentives, ordinance requirements, and the age of existing appliances, the quantification assumes all major renovations will replace existing natural gas appliances with electric alternatives, eliminating the natural gas usage of the renovated building.

As a component of the new commercial building ordinance, **Action BE-6a** helps local jurisdictions enforce the ordinance through a permit compliance program. Although permits are required for many energy efficiency improvements (e.g., water heaters, insulation, HVAC systems, duct replacement) many jurisdictions face permit evasion issues, with permitted HVAC systems only accounting for eight to about 30 percent of total HVAC system installations.[30, 31] According to a report by the NRDC, only 25 percent of commercial HVAC replacements are properly installed and inspected, highlighting the widespread issue of non-compliance and poor installation practices that undermine energy efficiency and increase operational costs.[32] This trend in permit evasion means jurisdictions face issues determining compliance with building ordinances and codes. Strategies that have proven effective at improving permit compliance in various states and local jurisdictions include streamlining the compliance process and providing advanced training for enforcement staff—actions each jurisdiction's permit compliance program will implement to enforce the major renovation electrification ordinance.[33] Considering challenges in maintaining 100 percent compliance, the quantification conservatively assumes a portion of major renovations (i.e., 12 percent) will not conform with the ordinance each year to electrify. Jurisdictions will monitor permit numbers to estimate compliance rates and adjust the permit compliance program strategies as needed to achieve a high compliance rate with the ordinance.

This Action will result in a 2.6 percent reduction in existing nonresidential natural gas usage by 2030 and 14.7 percent by 2045. Table 11 shows the parameters and data sources that support this Action's GHG emission reductions and Table 12 shows the calculations as outlined in Equations 4 through 4.2.

Electric-Preferred Nonresidential Major Renovation Equations

Equation 4 $$CO_2e\ Reduction_{NG,y,i} = (Fuel\ Avoided_{NG,y,i} * EF_{NG}) + (Fuel\ Avoided_{NG,y,i} * L_{NGL} * EF_{NGL}) - (Elec\ Converted_{y,i} * EF_{elec,y,i} * (1 + L_{T\&D}))$$

Equation 4.1 $$Fuel\ Avoided_{NG,y,i} = Fuel_{NG,y,i} * (1 - MR_i * (1 - NCR_i))^{(y-imp.y)}$$

Equation 4.2 $$Elec_{convert,y,i} = Fuel_{AvoidedNG,y,i} * CF_{elec} / Eff_{elec}$$

[30] Alvarez, Emily and Mast, Bruce. BayREN Codes & Standards Program. Local Government Policy Calculator for Existing Single-Family Buildings – User Guide (2021). Accessed at: https://www.bayrencodes.org/wp-content/uploads/2021/11/BayREN-Policy-Calculator-User-Guide_10.29.2021.pdf.

[31] California Public Utilities Commission (CPUC). Final Report: 2014-16 HVAC Permit and Code Compliance Market Assessment (Work Order 6) Volume I – Report (2017). Accessed at: http://www.calmac.org/publications/HVAC_WO6_FINAL_REPORT_VolumeI_22Sept2017.pdf.

[32] Kiki Velez, Merrian Morgeson. 2023. Poor-Quality HVAC Installs are Costing Us – A solution is within reach. NRDC. Available at: https://www.nrdc.org/bio/kiki-velez/poor-quality-hvac-installs-are-costing-us-solution-within-reach

[33] Meres, Ryan et al. American Council for an Energy-Efficient Economy (ACEEE). Successful Strategies for Improving Compliance with Building Energy Codes (2012). Accessed at: https://www.aceee.org/files/proceedings/2012/data/papers/0193-000112.pdf.

Table 11 Electric-Preferred Nonresidential Major Renovation Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 4				
$CO_2e\ Reduction_{NG}$	Natural gas GHG emission reductions	See calculation table	MT CO_2e	Calculated
$Fuel\ Avoided_{NG}$	Natural gas consumption avoided	See calculation table	therms	Calculated
EF_{NG}	Natural gas emission factor	0.005311	MT CO_2e/therm	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
L_{NGL}	Natural gas leakage factor	2.3%	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
EF_{NGL}	Natural gas leakage emission factor	0.04738	MT CO_2e/therm	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Elec Converted	Electricity usage from conversion	See calculation table	kWh	Calculated
EF_{elec}	Forecasted electricity emission factor	See calculation table	MT CO_2e/kWh	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
y	Year	2030 or 2045	year	–
i	Subsector	Nonresidential	N/A	–
Equation 4.1				
$Fuel_{NG}$	Forecasted natural gas consumption after new building electrification ordinance (Measure BE-1)	See calculation table	therms	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
MR_i	Annual percentage of nonresidential buildings receiving major renovations	1%	percentage	Estimated based on age of Humboldt's regional building stock (Table 10) and average lifespan of commercial buildings. [1]
NCR	Ordinance noncompliance rate	12%	percentage	Estimate based on permit evasion rates and strategies to increase building code compliance.[2, 3, 4]
imp.y	Ordinance implementation year	See calculation table	year	Measure BE-6
Equation 4.2				
CF_{elec}	Electricity to therms conversion factor	29.3	kWh/therm	Metric Conversions[5]
Eff_{elec}	Efficiency factor of electric equipment	3	unitless	Assume ordinance and/or efficiency standards will

Variable	Definition	Value	Unit	Data Source
	relative to natural gas equipment			promote the majority of renovations to implement highly efficient electric equipment such as heat pumps[3]

1. BCI Construction. 2021. Which Factors Determine the Lifespan of a Building?. Available at: MIT Architecture. Architectural Longevity: What Determines a Building's Lifespan? (2023). Accessed at: https://architecture.mit.edu/news/architectural-longevity-what-determines-buildings-lifespan#:~:text=Courtesy%20of%20the%20artists.&text=The%20average%20lifespan%20of%20a,years%2C%20from%20construction%20to%20demolition.
2. Alvarez, Emily and Mast, Bruce. BayREN Codes & Standards Program. Local Government Policy Calculator for Existing Single-Family Buildings – User Guide (2021). Accessed at: https://www.bayrencodes.org/wp-content/uploads/2021/11/BayREN-Policy-Calculator-User-Guide_10.29.2021.pdf.
3. California Public Utilities Commission (CPUC). Final Report: 2014-16 HVAC Permit and Code Compliance Market Assessment (Work Order 6) Volume I – Report (2017). Accessed at: http://www.calmac.org/publications/HVAC_WO6_FINAL_REPORT_VolumeI_22Sept2017.pdf.
4. Meres, Ryan et al. American Council for an Energy-Efficient Economy (ACEEE). Successful Strategies for Improving Compliance with Building Energy Codes (2012). Accessed at: https://www.aceee.org/files/proceedings/2012/data/papers/0193-000112.pdf.
5. Metric Conversions. Therms (US) to Kilowatt-hours. Available at: https://www.metric-conversions.org/energy-and-power/therms-us-to-kilowatt-hours.htm
6. Leonardo Energy - Knowledge Base. 2023. How efficient is a heat pump?. Available at: https://help.leonardo-energy.org/hc/en-us/articles/203047881-How-efficient-is-a-heat-pump

Table 12 Electric-Preferred Nonresidential Major Renovation GHG Emission Reduction Calculations

Variable	Definition	Units	Sector	2030	2045
Equation 6.1					
$Fuel_{NG}$	Forecasted natural gas consumption after new building electrification ordinance (Measure BE-1)	therms	Nonresidential	11,028,690	5,795,564
imp.y	Ordinance implementation year	year	Nonresidential	2027	2027
$Fuel\ Avoided_{NG}$	Natural gas consumption avoided	therms	Nonresidential	288,603	852,469
Equation 6.2					
Elec Converted	Electricity usage from conversion	kWh	Nonresidential	2,818,687	8,325,777
Equation 6					
EF_{elec}	Forecasted electricity emission factor	MT CO_2e/kWh	Nonresidential	0.0000187	0.0000000
$CO_2e\ Reduction_{NG}$	**Natural gas GHG emission reductions**	**MT CO_2e**	**Nonresidential**	**1,860**	**5,659**

Measure BE-5: Decarbonize 95% of new residential building construction by 2027.

Measure BE-5 commits the Humboldt region to decarbonize new residential building construction in the community. The primary Action that enables this Measure is:

- **Action BE-5a** which directs each jurisdiction to adopt an energy design rating, reach code, energy performance ordinance, or some other type of ordinance in 2027 to limit new natural gas construction for residential buildings. The action also establishes a permit compliance program to monitor and reach the 95% goal.

Humboldt jurisdictions are committed to limiting new natural gas developments in the community. However, the U.S. Court of Appeals for the Ninth Circuit's decision to overturn Berkeley's natural gas regulation—the ordinance that prohibited the installation of natural gas piping within newly constructed buildings—limits the region's ability to establish regulations to ban new natural gas construction.[34] As part of the previous CAP initiative, some jurisdictions in the region had already drafted electrification ordinances as part of their efforts to pursue building decarbonization. However, these efforts were halted prior to adoption due to the results of the Berkeley case. Despite this setback, the drafting of these electrification building codes demonstrates the regional interest in pursuing building decarbonization and highlights the community's commitment to reducing reliance on natural gas. Through **Action BE-5a**, each jurisdiction will employ the most stringent regulation currently available and suitable to their needs to electrify or otherwise decarbonize the majority of new construction in the community. To conserve staff resources and increase efficiencies, the Regional Climate Committee will develop an ordinance template based on jurisdictional input and feedback that can be modified as needed by each jurisdiction. **Action BE-5a**'s ordinance will be designed to either strongly encourage electrification of new construction as a single margin energy score or specifically restrict the use of natural gas in new construction.

As a single margin source energy score, the ordinance would establish a low Energy Design Rating (EDR)—a scoring metric that determines a building's compliance with California's Building Energy Efficiency Standards—that new residential buildings in the applicable jurisdiction would need to meet. The EDR would be set in a way to make electrification the easiest pathway to meet the standard. However, since the ordinance does not ban natural gas infrastructure outright, this ordinance may permit some new construction to be built with natural gas. These exceptions are expected to be minimal because of the cost effectiveness of new building electrification and the available incentives in the region that will help continue the natural growth in electric space and water heater installations seen in California over the past decade. As previously discussed, electric space heaters have grown to a 20 percent market share in 2019, while electric water heaters have grown to an 11 percent market share in 2019.[35] This trend is not only expected to continue through 2030 because all-electric new construction has proven to be cost-effective in the region for most all buildings types,[36,37] but also be accelerated when coupled with the large amount of funding available for community members to install electric or heat pump space and water heating

[34] CRA V. City of Berkeley, No. 21-16278. Accessed at: https://law.justia.com/cases/federal/appellate-courts/ca9/21-16278/21-16278-2023-04-17.html.

[35] Opinion Dynamics. California Heat Pump Residential Market Characterization and Baseline Study (2022). Accessed at: https://pda.energydataweb.com/#!/documents/2625/view.

[36] California Energy Codes and Standards. Cost Effectiveness Explorer (2024). Accessed at: https://explorer.localenergycodes.com/jurisdiction/eureka-city/study-results/1-PGE?only_study_type=new-buildings

[37] According to the California Energy Codes and Standards' Cost Effectiveness Explorer, all-electric construction is cost effective for all residential building types.

appliances. While the total amount of funding available will change with sunset dates and budget cycles, the currently available federal (i.e., High Efficiency Electric Home Rebate [HEEHRA], Homeowner Managing Energy Savings [HOMES] Rebate, Inflation Reduction Act), State (i.e., TEHC Clean California), and local (i.e., RCEA's Residential Equipment Rebate Catalog and Heat Pump Rebate Catalog) funding makes it so that low- and middle-income residents in the region can install electric or heat pump space and water heaters at no additional cost compared to gas space and water heaters. In some cases, such customers will even be able to install the heat pump water heaters for free.[38]

For those minimal cases where construction with natural gas may still occur under a single margin source energy score despite cost effectiveness and incentives, this Measure relies on CEQA mechanisms to require such buildings to mitigate the GHG emissions from natural gas construction. This mitigation can be assumed because the RCAP assumes 95 percent of new construction will be all-electric or otherwise decarbonized. This assumption is then incorporated into the regional CEQA GHG Emissions Thresholds and CEQA GHG Emissions Analysis Compliance Checklist. This incorporation means new construction that utilizes natural gas will need to identify other ways to mitigate GHG emissions to meet the GHG emission threshold of an all-electric building. Moreover, **Action BE-5a** also allows jurisdictions to adopt a more stringent ordinance that effectively bans new natural gas construction. This option may be feasible as more jurisdictions across the State explore pathways for all-electric new construction after the Berkeley case. With limited exemptions, this option would also allow for 95 percent electric-preferred or decarbonized new construction.

Thus, the GHG emission reductions from this Measure are based on the forecasted residential building growth and the assumption that 95 percent of new buildings will be all-electric or otherwise decarbonized. Table 13 shows the parameters and data sources that support these electrification ordinance GHG emission reductions and Table 14 shows the calculations as outlined in Equations 4 through 4.2.

All-electric New Residential Construction Equations

Equation 4 $CO_2e\ Reduction_{NG,y,i}=(Fuel\ Avoided_{NG,y,i}*EF_{NG})+(\ Fuel\ Avoided_{NG,y,i}*EF_{NGL})-(Elec\ Convert_{y,i}*EF_{elec,y,i}*(1+L_{T\&D}))$

Equation 4.1 $Fuel\ Avoided_{NG,y,i}=(Fuel_{NG,y,i}-Fuel_{NG,imp.y,i})*Ord_{target,i}$

Equation 4.2 $Fuel\ Avoided_{NGL,y,i}=(Fuel\ Avoided_{NG,y,i}*(1+L_{End\text{-}use}))*(L_{Pipeline}+L_{End\text{-}use})$

Equation 4.3 $Elec\ Convert_{,y,i} = Fuel_{\ AvoidedNG,y,i}*CF_{elec}/Eff_{elec}$

Table 13 All-electric New Construction Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 4				
$CO_2e\ Reduction_{NG,y,i}$	Natural gas GHG emission reductions	See calculation table	MT CO_2e	Calculated
$Fuel\ Avoided_{NG,y,i}$	Natural gas consumption avoided	See calculation table	therms	Calculated
EF_{NG}	Natural gas emission factor	0.005311	MT CO_2e/therm	See references in Appendix GHG Inventory,

[38] Rincon Consultants, Inc. Installation Costs for Zero-NOx Space and Water Heating Appliances (2024).

Variable	Definition	Value	Unit	Data Source
				Forecast, and Targets Technical Report
EF_{NGL}	Natural gas leakage emission factor	0.047381	MT CO_2e/therm	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Elec\ Convert_{y,i}$	Electricity usage from conversion	See calculation table	kWh	Calculated
$EF_{elec,y,i}$	Forecasted electricity emission factor	See calculation table	MT CO_2e/kWh	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$L_{T\&D}$	Electricity transmission and distribution loss percentage	5.10%	Percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
y	Year	2030 or 2045	year	–
i	Subsector	Residential or Nonresidential	–	–
Equation 4.1				
$Fuel_{NG,y,i}$	Forecasted natural gas consumption	See calculation table	therms	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Fuel_{NG,imp,i}$	Forecasted natural gas in implementation year	See calculation table	therms	Calculated
$Ord_{target,i}$	Percent of buildings ordinance applies to	–	percentage	–
$Ord_{target,res}$	–	95%	percentage	Assumed due to electric appliance market trends, cost-effectiveness, incentives, and inclusion of all-electric assumption in CEQA documents.
$Ord_{target,nonres}$	–	95%	percentage	
imp.y	Ordinance implementation year	–	year	–
imp.y,res	–	2027	year	Building code adoption cycle
imp.y,nonres	–	2027	year	Building code adoption cycle
Equation 4.2				
$L_{Pipeline}$	Natural gas pipeline leakage percentage	2.3%	kWh/therm	Metric Conversions[1]
$L_{End\text{-}use}$	Natural gas end-use leakage percentage	0.5%	unitless	Leonardo Energy[2] and European Copper Institute[3]
Equation 4.3				
CF_{elec}	Electricity to therms conversion factor	29.3	kWh/therm	Metric Conversions[1]

Variable	Definition	Value	Unit	Data Source
Eff_{elec}	Efficiency factor of electric equipment relative to natural gas equipment	3	unitless	Leonardo Energy[2] and European Copper Institute[3]

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. Metric Conversions. Therms (US) to Kilowatt-hours. Available at: https://www.metric-conversions.org/energy-and-power/therms-us-to-kilowatt-hours.htm
2. Leonardo Energy - Knowledge Base. 2023. How efficient is a heat pump?. Available at: https://help.leonardo-energy.org/hc/en-us/articles/203047881-How-efficient-is-a-heat-pump
3. European Copper Institute. 2018. Heat Pumps: Integrating technologies to decarbonise heating and cooling. Accessed at: https://www.ehpa.org/wp-content/uploads/2022/10/White_Paper_Heat_pumps-1.pdf.

Table 14 All-electric New Residential Construction GHG Emission Reduction Calculations

Variable	Definition	Units	Sector	2030	2045
Equation 4.1					
$Fuel_{NG,y,i}$	Forecasted natural gas consumption	therms	Residential	20,284,903	22,120,804
imp.y	Ordinance implementation year	year	Residential	2027	2027
$Fuel_{NG,imp,i}$	Forecasted natural gas in implementation year	therms	Residential	19,917,723	19,917,723
$Fuel\ Avoided_{NG,y,i}$	Natural gas consumption avoided	therms	Residential	348,821	2,092,927
Equation 4.2					
$Fuel\ Avoided_{NGL,y,i}$	Natural gas leakage avoided	therms	Residential	9,816	58,895
Equation 4.3					
$Elec\ Convert_{y,i}$	Electricity usage from conversion	kWh	Residential	3,406,820	20,440,921
Equation 4					
$EF_{elec,y,i}$	Forecasted electricity emission factor	MT CO_2e/kWh	Residential	0.0000183	0.000000
$CO_2e\ Reduction_{NG}$	**Natural gas GHG emission reductions**	**MT CO_2e**	**Residential**	**2,252**	**13,907**

Measure BE-6: Decarbonize 95% of new nonresidential building construction by 2027.

Measure BE-5 commits the Humboldt region to electrify new nonresidential building construction in the community. The primary Action that enables this Measure is:

- **Action BE-6a** which directs each jurisdiction to adopt an energy design rating, reach code, energy performance ordinance, or some other type of ordinance in 2027 to avoid new natural gas construction for nonresidential (including commercial, industrial, and multi-family) buildings. The action also establishes permit compliance program to monitor and reach the 95% goal.

The Humboldt regional jurisdictions are committed to limiting new natural gas developments in the community from nonresidential buildings. Similar to Action BE-5a, **Action BE-6a** commits each jurisdiction to employ the most stringent regulation currently available and suitable to their needs to electrify or otherwise decarbonize the majority of new nonresidential construction in the community. To conserve staff resources and increase efficiencies, the Regional Climate Committee will develop an ordinance template based on jurisdictional input and feedback that can be modified as needed by each jurisdiction. **Action BE-6a**'s ordinance will be designed to either strongly encourage electrification of new construction as a single margin energy score or specifically restrict the use of natural gas in new construction. For further discussion supporting the effectiveness of this method in achieving natural gas reductions, see *Measure BE-5: Decarbonize 95% of new nonresidential building construction by 2027*.

Similar to Measure BE-5, this Measure relies on CEQA mechanisms such as CEQA GHG Emissions Thresholds and CEQA GHG Emissions Analysis Compliance Checklist to require such buildings to mitigate the GHG emissions from nonresidential natural gas construction. By incorporating all-electric or decarbonized construction requirements through CEQA mechanisms, it is assumed that RCAP mitigation will achieve 95 percent decarbonization of new nonresidential building construction. This incorporation means new nonresidential construction that utilizes natural gas will need to identify other ways to mitigate GHG emissions to meet the GHG emission threshold of an all-electric or fully decarbonized building. Moreover, **Action BE-6a** also allows jurisdictions to adopt a more stringent ordinance that effectively bans new natural gas construction. This option may be feasible as more jurisdictions across the State explore pathways for all-electric new construction after the Berkeley case. Without limited exemptions, this option would also allow for 95 percent all-electric new construction.

Thus, the GHG emission reductions from this Measure are based on the forecasted nonresidential building growth and the assumption that 95 percent of new buildings will be all-electric. GHG reductions were quantified according to the methodology outlined by Table 13 and Equation 4 through 4.3 (See Measure BE-5). Table 15 shows the calculations and estimated GHG reductions from ordinance implementation for new nonresidential construction.

Table 15 All-electric New Nonresidential Construction GHG Emission Reduction Calculations

Variable	Definition	Units	Sector	2030	2045
Equation 4.1					
$Fuel_{NG,y,i}$	Forecasted natural gas consumption	therms	Nonresidential	11,560,724	12,681,718
imp.y	Ordinance implementation year	year	Nonresidential	2027	2027
$Fuel_{NG,imp,i}$	Forecasted natural gas in implementation year	therms	Nonresidential	11,336,525	11,336,525
$Fuel\ Avoided_{NG,y,i}$	Natural gas consumption avoided	therms	Nonresidential	212,989	1,277,933
Equation 4.2					
$Fuel\ Avoided_{NGL,y,i}$	Natural gas leakage avoided	therms	Nonresidential	5,994	35,961
Equation 4.3					
$Elec\ Convert_{y,i}$	Electricity usage from conversion	kWh	Nonresidential	2,080,192	12,481,149
Equation 1					
$EF_{elec,y,i}$	Forecasted electricity emission factor	MT CO_2e/kWh	Nonresidential	0.0000187	0.000000
$CO_2e\ Reduction_{NG}$	**Natural gas GHG emission reductions**	**MT CO_2e**	**Nonresidential**	**1,374**	**8,492**

Measure BE-7: Decarbonize 30% municipal buildings and facilities by 2030.

Measure BE-5 commits the jurisdictions to lead by example through decarbonizing municipal buildings and facilities region-wide. While the strategies to decarbonize municipal buildings and facilities will reduce GHG emissions, emissions from municipal building energy are included as a subset of the nonresidential building energy sector in the Humboldt Regional GHG Inventory. This means the associated GHG emission reductions are included within the community mitigation Measures (i.e., BE-1 through BE-6). Thus, to avoid double counting, this municipal mitigation measure emissions reductions are not counted towards the 2030 and 2045 targets.

Measure BE-8: Advocate for Offshore Wind developers to fund transmission infrastructure and work with PG&E, the California Public Utilities Commission (CPUC), and other related agencies to build electrical transmission infrastructure to supply Humboldt with energy produced by the future off-shore wind projects which will increase regional supply and resilience.

The Humboldt Bay Offshore Wind project recently received over $400 million in grant funding to construct a wind farm off the coast of Humboldt In December 2022, two adjacent 'offshore wind lease areas' twenty miles off the coast of Humboldt were leased to private energy companies for the development of offshore wind farms. Those two project's will are estimated to produce 1 GW of energy and the project will help toward the State's 2030 target to deploy 5 GW of offshore wind.[39] Though this energy would be produced off the coast of Humboldt County, local jurisdictions and interested parties have expressed concern that, due to current infrastructure limitations, this energy will be entirely sold outside of the County and the local community will not receive an equitableadditional renewable energy benefits from the project. The amount of energy produced by the wind farms off the Humboldt coast will significantly exceed Humboldt County's peak electrical demand, which means that a majority of the energy produced by the wind farms will need to be sold outside of the County. While this has an overall net benefit for the Statewide reduction of GHG emissions, there is an opportunity for a substantial portion of the County's energy demand to be supplied by the renewable offshore wind energy. However, this would require transmission and distribution upgrades throughout the County, all of which would need to be planned, permitted, funded, and constructed by PG&E, CPUC, and other related agencies.

Measure BE-8 focuses on advocating for the funding and development of appropriate electrical transmission infrastructure by offshore wind developers, and PG&E, CPUC and other related agencies so that the community can benefit from the Humboldt Bay Offshore Wind projectgeneration. Receiving an equitable share of the generated electricity would increase the region's energy resilience and increase capacity to meet other electrification goals outlined in the RCAP (see measures BE-1 through BE-7, and T-6 through T-8). While the GHG emission reductions from this measure are not quantified in the RCAP, it plays a vital role in supporting the region's transition to renewable energy and strengthening energy security.

[39] Bureau of Ocean Energy Management (BOEM). 2025. Humboldt Wind Energy Area. Available at: https://www.boem.gov/renewable-energy/state-activities/humboldt-wind-energy-area Humboldt Bay Harbor Recreation $ Conservation District. 2024. Humboldt Bay Offshore Wind Heavy Lift Marine Terminal Project. Available at: https://humboldtbay.org/humboldt-bay-offshore-wind-heavy-lift-marine-terminal-project-3

4 Strategy T: Transportation

The Humboldt regional Transportation Strategy aims to reduce vehicle miles travelled (VMT) and leverage renewable and carbon-free electricity (partially provided by Strategy BE) to reduce GHG emissions from the transportation system. Reducing VMT consists of transitioning residents and visitors out of single-occupancy vehicles and into active transportation mode options (i.e., walking and biking) and public and shared transit options (e.g., public buses, rail, carpools) by improving these mode options and adopting policies to discourage single-occupancy vehicle commutes. Additionally, land use changes such as promoting jobs and amenities to be located near residents, particularly in more rural areas, can help reduce the community's average trip length as well as encourage mode shifts to active or public transit. VMT reduction is further supported by the use of VMT thresholds developed by Fehr & Peers for the County where the County has elected to establish a threshold of significance at 15 percent below existing baseline VMT per capita, in line with current Office of Planning and Research (OPR) guidance and consistent with the achievement of the state's climate goals.

The remaining VMT will then be decarbonized by increasing the adoption of zero-emission vehicles (ZEVs). When combined with renewable and carbon-free electricity, electric vehicles (EVs) eliminate GHG emissions from fossil fuel combustion and transition commutes to a zero-emission operational footprint. Other ZEVs such as fuel cell electric vehicles (FCEVs), which are powered by hydrogen and only produce water when operated, also result in zero tailpipe emissions[40] and serve as important options for reducing emissions from hard to electrify sectors such as heavy-duty and off-road transportation equipment. Though upstream production of fuel is not considered in the GHG emissions attributable to a community, hydrogen fuel has the potential to further decarbonize the transportation sector when the fuel is produced from electricity sourced from renewable energy sources, known as "green hydrogen."[41,42] In addition to targeting mode shift and increasing the number of ZEVs, the Strategy targets off-road equipment and vehicles for decarbonization. Based on this approach, the RCAP's Transportation Strategy consists of the following Measures presented in Table 16.

The table also indicates which Measures are quantitative and which Measures are supportive. The following subsections detail the substantial evidence and calculation methodologies of the quantitative Measures and the role of the supportive Measures. Note that Measures which are designated as "Urban" provide strategies and targets designed for the incorporated cities of Arcata, Fortuna, and Eureka,[43] while "Rural" Measures are intended for areas which are not considered central economic hubs such as the unincorporated Humboldt County as well as incorporated cities of Blue Lake, Ferndale, Rio Dell, and Trinidad that have transportation networks more characteristic of rural areas.

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[40] U.S. Department of Energy. Fuel Cell Electric Vehicles. Available at: https://afdc.energy.gov/vehicles/fuel-cell#:~:text=Fuel%20cell%20electric%20vehicles%20(FCEVs,the%20early%20stages%20of%20implementation.

[41] National grid. The Hydrogen Colour Spectrum (2023). Available at: https://www.nationalgrid.com/stories/energy-explained/hydrogen-colour-spectrum

[42] Energy Education. Types of Fuel. Available at: https://energyeducation.ca/encyclopedia/Types_of_hydrogen_fuel

[43] Caltrans. Caltrans District 1 Active Transportation Plan. Available at: https://storymaps.arcgis.com/stories/75fb376153094696b56c0e6dac3055d7

Table 16 Strategy TR: Transportation GHG Emission Reduction Summary

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
Measure T-1 Urban	Implement programs, such as those identified in HCAOG's RTP, to increase the mode share of active transportation in urbanized areas from 9% to 12% by 2030 thereby achieving a regional active transportation mode share of 8%.	1,147	2,594
Measure T-1 Rural	Implement programs, such as those identified in HCAOG's RTP, that increase access to safe active transportation, to increase the mode share of active transportation in rural areas from 5% to 6% by 2030 thereby achieving a regional active transportation mode share of 9%.	1,080	4,405
Measure T-2 Urban	Expand the public transit network in support of HCAOG's Regional Transportation Plan to increase public transit mode share from 2% to 20% public transit mode share in urbanized areas to achieve a regional 13% public transit mode share by 2030.	18,055	26,482
Measure T-2 Rural	Develop a robust public transit network in support of HCAOG's Regional Transportation Plan to increase public transit mode share from 1% to 10% in rural areas and achieve a regional 13% public transit mode share by 2030.	20,180	29,703
Measure T-3	Reduce regional VMT by increasing promotion of mixed-use development in infill priority areas in alignment with HCAOG's baseline connectivity score included in the RTP.	Supportive	Supportive
Measure T-4	Develop and implement regional mobility hubs and ZEV car-share programs to support mode shift from single occupancy vehicles.	Supportive	Supportive
Measure T-5	Require commercial and industrial employers with 25 employees or more to develop a Transportation Demand Management plan.	Supportive	Supportive
Measure T-6	Decarbonize 15% of passenger vehicle miles traveled by 2030 and 100% by 2045 through increased adoption of low and zero-emission vehicles and development of a regional electric vehicle charging and hydrogen fueling network.	55,726	590,124
Measure T-7	Increase commercial zero-emission vehicle use and adoption to 10% by 2030 and 100% by 2045 through a regional charging network and development of hydrogen hubs.	17,441	279,775
Measure T-8	Electrify or otherwise decarbonize 12% of applicable SORE off-road equipment by 2030 and 100% by 2045 and replace fossil diesel consumption with renewable diesel in 55% of applicable large diesel in alignment with EO N-79-20 by 2030.	49,143	139,645
Measure T-9	Establish Humboldt as a pilot program for the decarbonization of the transportation sector to	Supportive	Supportive

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
	help drive State and philanthropic investment throughout Humboldt.		
Measure T-10	Work with the State and renewable fuel industry to establish a renewable fuel network within Humboldt thereby funding new green industry and job growth to support the decarbonization of the transportation sector.	Supportive	Supportive
Measure T-11	Lead by example and electrify or otherwise decarbonize 50% of the municipal fleet by 2030 in alignment with the State's Advanced Clean Fleet Rule.	Supportive	Supportive
Total		**162,772**	**1,072,728**

Measure T-1 Urban: Implement programs, such as those identified in HCAOG's RTP, to increase the mode share of active transportation in urbanized areas from 9% to 12% by 2030 thereby achieving a regional active transportation mode share of 8%.

Measure T-1 Urban aims to increase the active transportation mode share in urbanized areas in Humboldt to 12 percent by 2030 and to 16 percent by 2045. The primary Actions that enable this Measure are:

- **Action T-1a** which directs the Regional Climate Committee to facilitate partnerships between urbanized areas of Humboldt and Humboldt County Association of Governments (HCAOG) to identify and pursue funding opportunities to support the goals set forth in HCAOG's Regional Transportation Plan (RTP).
- **Action T-1f** which directs the Regional Climate Committee established in the RCAP measures to work with HCAOG to identify land use and interconnectivity opportunities and to pursue regional funding to implement active transportation interconnectivity improvement projects.

In 2022 (i.e. Humboldt's regional GHG Inventory year), the urban areas of Humboldt had weighted average commuting bicycle and walking mode shares of 1.4 percent and 7.7 percent, respectively, equating to a 9 percent total commuting active transportation mode share.[44,45] At 12.2 percent walking and 1.9 percent bike, the incorporated city of Arcata has the highest active transit mode share in the region. Census reported active mode shares only include commute-based trips and exclude tourist-based travel on trails focused on eco-tourism that is prevalent in the region, though expansion of these trails can also serve to reduce VMT. Though the more urbanized areas of the region exhibit relatively high combined walking and biking mode share, studies show that investments in active transportation infrastructure can further drive active transportation mode shifts and GHG emissions reductions.[46] For example, urban cities that make a strong commitment to bicycle travel can see up to an 11 percent reduction in vehicle miles traveled and associated GHG emissions.[47] Such reductions can be reasonably expected because in 2022, about 16 percent of vehicle trips made nationally were one mile or less—a distance easily travelled by foot or bicycle.[48]

To estimate the mode shift potential of developing and implementing an Active Transportation Plan in Humboldt urbanized centers, other cities' bicycle and road networks were analyzed. The City of Berkeley leads the State with an 18 percent active transportation mode share in 2022 (i.e., 4.9 percent bicycle mode share and 13.4 percent pedestrian mode share) followed by the City of Davis with a 16 percent active transportation mode share in 2022 (i.e., 13.5 percent bicycle mode share

[44] US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table/ACSST5Y2022.S0801?q=Humboldt%20County,%20California&t=Commuting

[45] Weighted average mode shares were estimated based on mode share data provided in the U.S. Census Bureau's ACS 5-Year Survey and vehicle miles travelled (VMT) data for each region as reported in the Humboldt Regional 2022 GHG Inventory Report for the CAP.

[46] Glazener, Andrew and Khreis, Haneen. Transforming our Cities: Best Practices Towards Clean Air and Active Transportation (2019). Accessed at: https://link.springer.com/article/10.1007/s40572-019-0228-1

[47] Jacob Mason et al., Institute for Transportation & Development Policy and the University of California, Davis. A Global High Shift Cycling Scenario (2015). Accessed at: https://itdpdotorg.wpengine.com/wp-content/uploads/2015/11/A-Global-High-Shift-Cycling-Scenario_Nov-2015.pdf

[48] National Household Travel Survey. Population Vehicle Trips Statistics (2021). Accessed at: https://nhts.ornl.gov/vehicle-trips

and 2.6 percent pedestrian mode share).[49, 50] The City of Davis has 9.8 miles of bike lane per square mile, which equates to approximately 0.6 miles of bike lane per mile of street. [51,52] City of Berkley has approximately 4.8 miles of bike lane per square mile, but equates to 0.2 miles of bike lane per mile of street given the number of street miles in the Cities 10.5 square miles.[53,54] Currently the urbanized areas of Humboldt (e.g. Arcata, Eureka, and Fortuna) have about 2 miles of bike lane per square mile based on the bike map provided by HCAOG.[55] HCAOG's Regional Bicycle Plan plans for approximately 506 miles of bikeways over the 20 year planning horizon throughout Humboldt county to connect all the cities and unincorporated areas as well as connecting the County to adjacent counties.[56] Humboldt County has approximately 1,200 miles of county roads and city streets roadway, full implementation of this plan would lead to 0.4 miles of bike lane per mile of street. Based on other similar cities it would seem that this increase in bicycle lane miles per street mile would lead to a bicycle mode share of approximately 10-15%. Implementation of the Bicycle Plan largely depends on securing funding. The region has had good success at obtaining funding to implement the projects to increase the bicycle and pedestrian routes. In 2023 HCAOG allocated $2.1 million to jurisdictions for road improvements including funds specifically for bicycle and pedestrian improvements.[57] Additionally, Eureka was recently awarded a combined $11.3 million from Caltrans for a multi-use trail and a bike boulevard in the city.[58]

Given the success of the region at obtaining funding and continually implementing priority bicycle projects, the current active transportation mode share, and trends in active transportation in other locations with similar bike lane to street ratios, it was assumed that this Measure would lead to a 3 percent increase in active transportation mode share to 12 percent in urbanized regions. It was assumed that the increase would come predominantly from bicycle mode share while walking mode share is conservatively assumed to remain constant. 2045 quantification estimates an active transportation mode shift by an additional 4 percent to 16 percent to align with the City of Davis and assumes by 2045 the regional infrastructure will support significant active transit mode shift for the last mile of distance travelled. An increase in active transportation to 12 percent and 16 percent in urbanized areas equates to a 0.2 percent and 0.4 percent passenger VMT reduction, respectively. This is conservative compared with the VMT reduction target of 15 percent from baseline conditions used for the VMT Significance Threshold established by the County in compliance with SB 743. Like 2030, the 2045 quantification assumes the increases would be attributable to bicycle mode share,

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49 US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table?t=Commuting&g=160XX00US0618100.

50 US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table?t=Commuting&g=160XX00US0606000.

51 https://www.cityofdavis.org/city-hall/public-works-utilities-and-operations/streets

52 https://www.cityofdavis.org/city-hall/public-works-engineering-and-transportation/bike-pedestrian-program/davis-bike-and-pedestrian-infrastructure#:~:text=4%20miles%20of%20buffered%20bike,and%20twenty%2Done%20underpass%20crossings.

53 https://www.visitberkeley.com/media-press/press-kit/fact-sheet/

54 https://berkeleyca.gov/your-government/about-us/departments/public-works#:~:text=Our%20325%2B%20staff%20are%20responsible,%2C%20and%20waste%2C%20recycling%2C%20and

55 https://www.hcaog.net/map/

56 Humboldt County Association of Governments (HCAOG). (2018). Humboldt Regional Bicycle Plan. Available at: https://www.hcaog.net/sites/default/files/Final%20Bike%20Plan%20Update%202018%20incl%20maps.pdf

57 https://www.hcaog.net/sites/default/files/HCAOG%202023%20Highlights%20(Canva).pdf

58 https://dot.ca.gov/news-releases/news-release-2022-043

while walking mode share remains constant. These 2030 and 2045 targets conservatively support HCAOG's Regional Transportation Plan which sets ambitious goals to increase public and active transit mode share by a combined 30 percent by 2030, and 40 percent by 2050.[59]

Table 17 shows the parameters and data sources that support the GHG emission reductions from active transportation mode shifts and Table 18 shows the calculations as outlined in Equations 5 through 5.2.

Active Transportation Mode Share Equations

Equation 5 $CO_2e\ Reduction_{i,y} = VMT\ Reduced_{i,y} * VMT\ EF_{i,y}$

Equation 5.1 $VMT\ Reduced_{i,y} = VMT_{i,y} * Prop_j * TPM_{i,y} * TL_i * MS\ Increase_{Bike,y}$

Equation 5.2 $MS\ Increase_{Bike,y} = MS\ Target_{Active,y} - MS_{Walk,by} - MS_{Bike,by}$

Table 17 Active Transportation Mode Share Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 5				
CO_2e *Reduction*	VMT GHG emission reductions	See calculation table	MT CO_2e	Calculated
VMT Reduced	VMT reduced	See calculation table	miles	Calculated
VMT EF	VMT emission factor	See calculation table	MT CO_2e/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Equation 5.1				
$VMT_{i,y}$	Forecasted VMT	See calculation able	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Prop_j$	Proportion of total regional VMT	See calculation able	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report /Calculated
$TPM_{i,y}$	Forecasted trips per mile	See calculation table	trips/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
TL_i	Average bicycle trip length	1.5	miles	CARB Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks: Technical Documentation[1]
$MS\ Increase_{Bike,y}$	Bicycle mode share increase	See calculation table	percentage	Calculated
i	VMT type	Passenger	–	–
y	Year	2030 or 2045	–	–
j	County subregion	Urban or rural	–	–
Equation 5.2				

[59] Humboldt County Association of Governments (HCAOG). Regional Transportation Plan, VROOM 2022-2042. Available at: https://www.hcaog.net/sites/default/files/vroom_2022-2042_full_report_0.pdf

Variable	Definition	Value	Unit	Data Source
$MS\ Target_{Active,y}$	Active transportation mode share target	–	percentage	Conservative estimate based on bicycle mode shares currently seen in Davis and Berkeley.[2,3]
$MS\ Target_{Active,2030}$	–	12.00%	percentage	City of Davis and Berkeley.[2,3]
$MS\ Target_{Active,2045}$	–	16.00%	percentage	HCAOG RTP goals
$MS_{Walk,by}$	Walking mode share in baseline year	7.73%	percentage	US Census Bureau. ACS 5-Year Estimates Subject Tables (2022) [4]
$MS_{Bike,by}$	Bicycle mode share in baseline year	1.35%	percentage	US Census Bureau. ACS 5-Year Estimates Subject Tables (2022)[4]
by	Baseline year	2022	year	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. CARB. Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks: Technical Documentation (2019). Accessed at: https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle_facilities_technical_041519.pdf.
2. US Census Bureau. ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex, Davis (2022). Available at: https://data.census.gov/table/ACSST5Y2022.S0801?t=Commuting&g=160XX00US0618100
3. US Census Bureau. ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex, Berkley (2022). Available at: https://data.census.gov/table/ACSST5Y2022.S0801?t=Commuting&g=160XX00US0606000
4. US Census Bureau. ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex (2022). Available at: https://data.census.gov/table/ACSST5Y2022.S0801?q=Humboldt%20County,%20California&t=Commuting

Table 18 Active Transportation Mode Share GHG Emission Reduction Calculations

Variable	Definition	Units	VMT Type	2030	2045
Equation 5.2					
$MS\ Target_{Active,y}$	Active transportation mode share target	percentage	Passenger	12.00%	16.00%
$MS\ Increase_{Bike,y}$	Bicycle mode share increase	percentage	Passenger	2.92%	6.92%
Equation 5.1					
VMT	Forecasted VMT	miles	Passenger	2,308,368,699	2,532,201,389
$Prop_{urban}$	Proportion of total regional VMT	percentage	Passenger	30.77%	30.77%
TPM	Forecasted trips per mile	trips/mile	Passenger	0.121980	0.124294
VMT Reduced	VMT reduced	miles	Passenger	3,797,653	10,055,097
Equation 5					
VMT EF	VMT emission factor	MT CO_2e/mile	Passenger	0.000302	0.000258
CO_2e Reduction	**VMT GHG emission reductions**	**MT CO_2e**	**Passenger**	**1,147**	**2,594**

Measure T-1 Rural: Implement programs, such as those identified in HCAOG's RTP, that increase access to safe active transportation, to increase the mode share of active transportation in rural areas from 5% to 6% by 2030, thereby achieving a regional active transportation mode share of 8%.

Measure T-1 Rural aims to increase rural area active transportation mode share to 6 percent by 2030 and to 10 percent by 2045. For the purpose of transportation related Measures, "rural" is defined as small, incorporated cities not considered to be major commuter hubs in the region (i.e. Blue Lake, Ferndale, Rio Dell, and Trinidad) as well as unincorporated Humboldt County. The primary Actions that enable this Measure are:

- **Action T-1c** which directs the Regional Climate Committee to work with the regions rural jurisdictions and HCAOG to obtain funding and prioritize construction and improvement projects connecting bikeway and pedestrian systems to high employment zones such as Eureka, Arcata, and Fortuna;
- **Action T-1e** which commits jurisdictions with planned land use development to establish building code standards for inclusion of bicycle and pedestrian facilities; and
- **Action T-1g** which dedicates staff time or the Regional Climate Committee to assist HCAOG in pursuing grant opportunities such as the Active Transportation Program, AARP Community Challenge, CalEPA's Environmental Justice Action Grants, and Caltrans Sustainable Transportation Planning Grants.

Actions under Measure T-1 Rural are designed to align with HCAOG's RTP program, VROOM 2022-2042. HCAOG's VROOM 2022-2042 plan is the County-wide guiding long range regional planning document when it comes to public and active transportation implementation. Listed projects focus on aggressive mode share shift projects to achieve an aggregate public and active transportation mode share of 30 percent by 2030 and 40 percent by 2050.[60] Though increasing active transportation mode share can be a challenge, the projects listed in the RTP and supported by the Actions in **Measure T-1 Rural** employ many recommended strategies for increasing active transportation in rural communities, such as focusing on strategic land use development planning, implementing complete streets, pursuit of diverse funding sources, building partnerships, and defining activity centers.[61] In order to achieve VMT reductions from these Actions, the rural areas will need to work collaboratively with the high employment centers of the County to implement mutually beneficial projects found in the RTP. Many of the zoning and land use policies are implemented through the General Plan. The RTP modeling results provide additional evidence for the ability of the region to reduce VMT through improved land use and growth management.

Despite their rural characteristics, the rural cities and unincorporated areas of Humboldt currently have relatively high walking mode shares, though biking mode shares are low. In 2022, the weighted average bicycle and pedestrian mode shares for the designated rural areas were 0.55 percent and 4.78 percent, respectively.[62] However, studies show that investments in active transportation infrastructure have demonstrated significant improvements in active transportation mode shifts and

[60] For a full list of the projects please see the Connected 2050 plan. Accessed here: https://www.hcaog.net/sites/default/files/vroom_2022-2042_full_report_0.pdf

[61] Smart Growth America. 2023. An Active Roadmap: Best Practices in Rural Mobility. Available at: https://smartgrowthamerica.org/wp-content/uploads/2023/07/SGA-Rural-Transportation-Field-Scan_Final_7.27.pdf

[62] US Census Bureau. 2017: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table/ACSST5Y2019.S0801?q=Humboldt%20County,%20California&t=Commuting&g=160XX00US0602476,0623042,0625296

GHG emissions reductions.[63] Rural areas can also reasonably expect to see significant mode share increases, as approximately 7.7 percent of rural trips nation-wide are one mile or less, with 15 percent of trips being three miles or less.[64] As the average bike trip length is approximately 1.5 miles,[65] a similar 11 percent reduction in vehicles miles travelled can be similarly expected with rural investment in bicycle and pedestrian infrastructure. A key to increasing active transportation mode share in rural areas in the County is creating an interconnected system of safe pedestrian and bicycle lanes that connect to city centers, job centers, amenities, and other parts of the region. HCAOG's 2018 Regional Bicycle Plan and VROOM 2022-2042 plan recognize the need for interconnectivity across the region and have identified specific projects to enhance the interconnectivity of the bicycle and pedestrian system. Of the 506 miles of bikeway planned in the 2018 Regional Bicycle Plan, 406 of those miles are planned for the unincorporated county with many of the planned bikeways designated as rural routes that would connect the incorporated cities and unincorporated communities. The Actions in this Measure focus on obtaining the funding and resources to implement priority infrastructure projects that will continue to build out this interconnected system. The region has seen success with obtaining funding for such projects already, including grant funding for the bicycle and pedestrian improvements through the Caltrans Sustainable Transportation Planning Grant.[66]

Based on these factors and the alignment of the Actions for this Measure with HCAOG's RTP and the planned county-wide bicycle and pedestrian projects to increase interconnectivity, it is conservatively estimated that rural areas can increase their combined biking and walking mode share from 4.8 percent to 6.0 percent by 2030. An increase in active transportation to 4.8 percent and 6.0 percent in rural areas equates to a 0.2 percent and 0.7 percent passenger VMT reduction, respectively. This is conservative compared with the VMT reduction target of 15 percent from baseline conditions used for the VMT Significance Threshold established by the County in compliance with SB 743. A 1.2 percent increase in active transportation in rural areas is further supported by the California Air Pollution Control Officers Association (CAPCOA) Handbook that found that enhancing the pedestrian network and expanding the bikeway network can reduce VMT by up to 7%.[67] Bike share programs, such as those to be implemented by **Action T-1i** have also been shown to reduce VMT.[67]

Table 19 shows the parameters and data sources that support these electrification ordinance GHG emission reductions and Table 20 shows the calculations as outlined in Equations 6 through 6.5.

Active Transportation Mode Share Equations

Equation 6 $CO_2e\ Reduction_{i,y} = VMT\ Reduced_{i,y} * VMT\ EF_{i,y}$

Equation 6.1 $VMT\ Reduced_{i,y} = VMT_{i,y} * Prop_j * TPM_{i,y} * TL_i * MS\ Increase_{Bike,y}$

[63] Glazener, Andrew and Khreis, Haneen. Transforming our Cities: Best Practices Towards Clean Air and Active Transportation (2019). Accessed at: https://link.springer.com/article/10.1007/s40572-019-0228-1

[64] U.S. Department of Transportation. 2022. Downloads, 2022 NHTS Dataset. Available at: https://nhts.ornl.gov/downloads

[65] CARB. Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks: Technical Documentation (2019). Accessed at: https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle_facilities_technical_041519.pdf.

[66] https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/fiscal-year-2023-24-award-list-a11y.pdf

[67] California Air Pollution Control Officers Association (CAPCOA). 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Accessed at: https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf

Equation 6.2 $MS\ Increase_{Bike,y}=MS\ Target_{Active,y}-MS_{Walk,by}-MS_{Bike,by}$

Table 19 Rural Active Transportation Mode Share Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 6				
CO_2e *Reduction*	VMT GHG emission reductions	See calculation table	MT CO_2e	Calculated
VMT Reduced	VMT reduced	See calculation table	miles	Calculated
VMT EF	VMT emission factor	See calculation table	MT CO_2e/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Equation 6.1				
$VMT_{i,y}$	Forecasted VMT	See calculation able	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Prop_j$	Proportion of total regional VMT	See calculation able	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$TPM_{i,y}$	Forecasted trips per mile	See calculation table	trips/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
TL_i	Average bicycle trip length	1.5	miles	CARB[1]
$MS\ Increase_{Bike,y}$	Bicycle mode share increase	See calculation table	percentage	Calculated
i	VMT type	Passenger	–	–
y	Year	2030 or 2045	–	–
j	County subregion	Urban or rural	–	–
Equation 6.2				
$MS\ Target_{Active,y}$	Active transportation mode share target	–	percentage	–
$MS\ Target_{Active,2030}$	–	6.00%	percentage	U.S. Department of Transportation[1] and Jabon Mason[3]
$MS\ Target_{Active,2045}$	–	10.00%	percentage	Conservative alignment with HCAOG RTP goals and T-1 Urban active transportation goals
$MS_{Walk,by}$	Walking mode share in baseline year	0.55%	percentage	US Census Bureau. ACS 5-Year Estimates Subject Tables (2022) [4,5]
$MS_{Bike,by}$	Bicycle mode share in baseline year	4.22%	percentage	US Census Bureau. ACS 5-Year Estimates Subject Tables (2022)[4,5]
by	Baseline year	2022	year	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

Variable	Definition	Value	Unit	Data Source

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. CARB. Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks: Technical Documentation (2019). Accessed at: https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle_facilities_technical_041519.pdf.
2. U.S. Department of Transportation. 2022. Downloads, 2022 NHTS Dataset. Available at: https://nhts.ornl.gov/downloads
3. Jacob Mason et al., Institute for Transportation & Development Policy and the University of California, Davis. A Global High Shift Cycling Scenario (2015). Accessed at: https://itdpdotorg.wpengine.com/wp-content/uploads/2015/11/A-Global-High-Shift-Cycling-Scenario_Nov-2015.pdf
4. US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table/ACSST5Y2022.S0801?q=Humboldt%20County,%20California&t=Commuting
5. Weighted average active transit mode share estimated based on walking and biking mode shares provided by U.S. Census data for Blue Lake (2.9%, 2.6%), Ferndale (4.5%, 0.0%), Rio Dell (0.9%, 0.0%), Trinidad (3.4%, 0.0%), and Unincorporated Humboldt County (4.36%, 0.57%), and their respective VMT contributions as reported in the Humboldt Regional 2022 GHG Inventory.

Table 20 Rural Active Transportation Mode Share GHG Emission Reduction Calculations

Variable	Definition	Units	VMT Type	2030	2045
Equation 6.2					
$MS\ Target_{Active,y}$	Active transportation mode share target	percentage	Passenger	6.00%	10.00%
$MS\ Increase_{Bike,y}$	Bicycle mode share increase	percentage	Passenger	1.22%	5.22%
Equation 6.1					
VMT	Forecasted VMT	miles	Passenger	2,308,368,699	2,532,201,389
$Prop_{rural}$	Proportion of total regional VMT	percentage	Passenger	69.23%	69.23%
TPM	Forecasted trips per mile	trips/mile	Passenger	0.121980	0.124294
VMT Reduced	VMT reduced	miles	Passenger	3,576,953	17,072,304
Equation 6					
VMT EF	VMT emission factor	MT CO_2e/mile	Passenger	0.000302	0.000258
CO_2e Reduction	**VMT GHG emission reductions**	**MT CO_2e**	**Passenger**	**1,080**	**4,405**

Measure T-2 Urban: Expand the public transit network in support of HCAOG's Regional Transportation Plan to increase public transit mode share from 2% to 20% public transit mode share in urbanized areas to achieve a regional 13% public transit mode share by 2030.

Measure T-2 Urban aims to increase major regional urban centers' (i.e. Arcata, Eureka, Fortuna) public and shared transit mode share to 20 percent by 2030 and 30 percent by 2045. The primary Actions that enable this Measure are:

- **Action T-2a** which directs the Regional Climate Committee to work with HCAOG and Humboldt Transit Authority (HTA) to implement initiatives in HCAOG's Regional Transportation Plan (RTP) to achieve a 10-minute headway; and
- **Action T-2f, g** which commits the region to developing a multi-jurisdictional staff position through the Regional Climate Committee to support HTA and HCAOG in obtaining funding through grant opportunities or other identified sources and prioritize access improvements in low-income communities.

Actions under Measure T-2 Urban are designed to align with HCAOG's RTP program, VROOM 2022-2042. HCAOG's VROOM 2022-2042 plan is the county-wide guiding long range regional planning document when it comes to public and active trasportation implementation. Listed projects focus on aggressive mode share shift projects to achieve an aggregate public and active transportation mode share of 30 percent by 2030 and 40 percent by 2050.[68] Additionally, HTA's acquisition of 11 zero-emissions buses makes the shift to increased public transit mode share an even more attractive option for reducing GHG emissions.[69] Consistent with the RTP, a majority of VMT reductions will come from land use changes and infrastructure improvement projects to aid the expansion of HTA services and prioritizing neighboring city and rural interconnectivity improvement projects. In order to achieve these reductions, the cities will need to work collaboratively with the County and neighboring cities to implement mutually beneficial projects found in the RTP. By leveraging the Regional Climate Committee to administer a multi-jurisdictional staff position to work with HTA and HCAOG on behalf of the jurisdictions to support transit projects that best improve interconnectivity and serve the jurisdictions' needs, it will lessen the load on each individual jurisidiction and create consistency in planning. Many of the zoning and land use policies are implemented through the General Plan. The RTP modeling results provide additional evidence for the ability of the region to reduce VMT through improved land use and growth management.

In general, increases and improvements to public transportation systems reduce a jurisdiction's dependence on fossil fuels and reduce VMT. The best ways to improve a transit system and reduce driving is to expand its geographical reach and increase the frequency and reliability of transit service. Each new mile of transit usage reduces VMT on much more than a 1:1 basis. Approximately 1% increase in transit frequency saves 0.5% in VMT.[70] Further, improving transit access has the

[68] For a full list of the projects please see the Connected 2050 plan. Accessed here: https://www.hcaog.net/sites/default/files/vroom_2022-2042_full_report_0.pdf

[69] Humboldt Transit Authority (HTA). 2024. Expanding Transit Services and Introducing Zero-Emission Fleets on the North Coast. Available at: https://hta.org/projects-tircp/

[70] Todd Litman. Victoria Transport Policy Institute. August 2021. Evaluating Public Transit Benefits and Costs Best Practices Guidebook. Accessed at: https://www.vtpi.org/tranben.pdf

potential to shift trips from cars to transit, which may reduce vehicle trips, VMT, and greenhouse gas emissions, with time spent getting to a transit stop being the key indicator of transit access.[71]

In 2022 (i.e., the Humboldt RCAP inventory year), Arcata, Eureka, and Fortuna had a weighted average regional public transit mode share of 1.74 percent.[72] However, other city areas have shown that increasing investment can significantly raise public mode transit mode share. The City of San Francisco leads the state with 26% transit mode share in 2017 (pre-COVID).[73, 74] The City of Seattle has documented significant increases in public transit mode share to 48% in 2017 (pre-COVID).[75] Key strategies employed by these cities include significant expansions of transit service lines, designated streets or lanes for bus lines to decrease headways, implementation of taxes to support transit, reduced parking availability, and user taxes. Though these city areas experience higher population density compared to the urban centers of Humboldt, these strategies represent core principles for improving public transit and largely align with objectives set forth in the Humboldt RTP. Therefore, it is anticipated that the urban areas (e.g., Arcata, Eureka, and Fortuna) will follow the trends of San Francisco and Seattle by implementing similar strategies under Measure T-2. Quantification estimates suggest that, with full implementation of public transit improvement actions, achieving a public transit mode share of 29% (the average of Seattle and San Francisco) by 2030 is ambitious for the urban areas in the region. This is due to the current impacts of COVID-19 and existing barriers to public transit in the region. A more realistic goal set forth by this measure is public transit mode share of 20% by 2030. Though this goal is still ambitious, it conservatively aligns with the aggressive 2030 alternative mode share goals set by HCAOG in the RTP and HTA's goals to expand transit services such that there is a less than 10-minute headway. An increase in public transportation mode share to 20 percent in urbanized areas equates to a 3 percent passenger VMT reduction. This is conservative compared with the VMT reduction target of 15 percent from baseline conditions used for the VMT Significance Threshold established by the County in compliance with SB 743. It is further supported by CAPCOA's findings that expanding transit network coverage or hours can reduce VMT by up to 4.6 %, while increasing transit service frequency (e.g., reducing headway) can reduce VMT by up to 11.3%.[76] Obtaining funding to expand transit coverage and frequency will be key to achieving these aggressive goals. HCAOG and HTA have continually worked to procure funds for transit. In 2023 HCAOG allocated over $9 million in funds for funding transit operations, route planning, and operation assistance.[77] Additionally, HTA was awarded a $38.7 million grant from the California State Transportation Agency's Transit and Intercity Rail Capital Program to expand fleet

[71] California Air Resources Board (CARB). August 2017. Methods to Assess Co-Benefits of California Climate Investments: Vehicle Miles Travelled. Accessed at: http://ww2.arb.ca.gov/sites/default/files/auction-proceeds/carb_vehicle_miles_traveled.pdf

[72] US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table/ACSST5Y2022.S0801?q=Humboldt%20County,%20California&t=Commuting&g=160XX00US0602476,0623042,0625296

[73] San Francisco Municipal Transportation Agency (SFMTA). December 2021. Sustainable Transportation Mode Share. Accessed at: https://www.sfmta.com/reports/sustainable-transportation-mode-share

[74] Pre-COVID numbers are referenced here with the understanding that public transit usage during the COVID pandemic were lower than normal and are likely to increase again assuming a return to pre-COVID conditions.

[75] Commute Seattle. December 2021. 2019 Mode Split Study Report. Accessed at: https://www.commuteseattle.com/resource/2019-mode-split-study/

[76] California Air Pollution Control Officers Association (CAPCOA). 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Accessed at: https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf

[77] HCAOG. 2023. HCAOG 2023 Highlights. Accessed at: https://www.hcaog.net/sites/default/files/HCAOG%202023%20Highlights%20(Canva).pdf

services and procure 11 new zero-emission hydrogen fuel cell electric buses to add to the fleet.[78] Further, HCAOG recently submitted a competitive application for the Caltrans Sustainable Communities Planning Grant Program - Strategic Transit Partnerships that focuses on building strong relationships among HCAOG, HTA, other transit and mobility-service providers, Caltrans, local tribes, cities, and county agencies in order to plan transportation and land use together. The focus on regional collaboration for land use planning and coordination for transit is key to creating an interconnected network. With this Measure providing additional support through the Regional Climate Committee to identify and apply for funding and jurisdictions committing to implementing initiatives locally, it is anticipated to accelerate implementation of the projects necessary to meet the HCAOG and HTA goals.

Table 21 shows the parameters and data sources that support the GHG emission reductions associated with reducing vehicle miles traveled through public transit mode share and Table 22 shows the calculations as outlined in Equations 7 through 7.2.

Public Transit Mode Share Equations

Equation 7 $CO_2e\ Reduction_{i,y} = VMT\ Reduced_{i,y} * VMT\ EF_{i,y}$

Equation 7.1 $VMT\ Reduced_{i,y} = ((VMT_{i,y} * Prop_j) - VMT_{active}) * TPM_{i,y} * TL_i * MS\ Increase_{public,y}$

Equation 7.2 $MS\ Increase_{public,y} = MS\ Target_{public,y} - MS_{public,by}$

Table 21 Public Transit Mode Share Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 7				
$CO_2e\ Reduction_{i,y}$	VMT GHG emission reductions	See calculation table	MT CO_2e	Calculated
$VMT\ Reduced_{i,y}$	VMT reduced	See calculation table	miles	Calculated
$VMT\ EF_{i,y}$	VMT emission factor	See calculation table	MT CO_2e/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Equation 7.1				
$VMT_{i,y}$	Forecasted VMT after active transportation reductions	See calculation able	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Prop_j$	Proportion of total regional VMT	See calculation able	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$VMT_{active,y}$	VMT reduction from active transportation targets	See calculation able	miles	Calculated (See Measures T-1)
$TPM_{i,y}$	Forecasted trips per mile	See calculation table	trips/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

[78] Humboldt Transit Authority (HTA). 2022. Humboldt Transit Authority Awarded $38.7M Grant for Fuel Cell Electric Buses. Accessed at: https://hta.org/wp-content/uploads/2022/07/2022-07_HTA-TIRCP-Press-Release.pdf

Variable	Definition	Value	Unit	Data Source
TL_i	Average public transit trip length	3.8	miles	American Public Transportation Association's Public Transportation Fact Book[1,2]
$MS\ Increase_{Public,y}$	Public transit mode share increase	See calculation table	percentage	Calculated
i	VMT type	Passenger	–	–
y	Year	2030 or 2045	–	–
j	County subregion	Urban or Rural	–	–
Equation 7.2				
$MS\ Target_{Public,y}$	Public transit mode share target	–	percentage	–
$MS\ Target_{Public,2030}$	Public transit mode share target (2030)	20%	percentage	Conservative estimate based on achievable pre-COVID public transit mode shares in San Francisco[3] and Seattle.[4]
$MS\ Target_{Public,2045}$	Public transit mode share target (2045)	30%	percentage	
$MS_{Public,by}$	Public transit mode share in baseline year	1.74%	percentage	US Census Bureau[5,6]
by	Baseline year	2022	year	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. American Public Transportation Association. Public Transportation Fact Book (2018). Accessed at: https://www.apta.com/wp-content/uploads/Resources/resources/statistics/Documents/FactBook/2018-APTA-Fact-Book.pdf.
2. Note: Regular bus trip length was utilized to remain conservative.
3. San Francisco Municipal Transportation Agency (SFMTA). December 2021. Sustainable Transportation Mode Share. Accessed at: https://www.sfmta.com/reports/sustainable-transportation-mode-share
4. Commute Seattle. December 2021. 2019 Mode Split Study Report. Accessed at: https://www.commuteseattle.com/resource/2019-mode-split-study/
5. US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table/ACSST5Y2022.S0801?q=Humboldt%20County,%20California&t=Commuting&g=160XX00US0602476,0623042,0625296
6. Weighted average public transit mode share estimated based on mode shares provided by U.S. Census data for Arcata (2.5%), Eureka (0.9%) and Fortuna (1.2%), and their respective VMT contributions as reported in the Humboldt Regional 2022 GHG Inventory.

Table 22 Public Transit Mode Share GHG Emission Reduction Calculations

Variable	Definition	Units	VMT Type	2030	2045
Equation 7.2					
$MS\ Target_{Public}$	Public transit mode share target	percentage	Passenger	20.00%	30.00%
$MS\ Increase_{Public}$	Public transit mode share increase	percentage	Passenger	18.26%	28.26%
Equation 7.1					
VMT	Forecasted VMT after active transportation reductions	miles	Passenger	2,308,368,699	2,532,201,389
$Prop_{urban}$	Proportion of total regional VMT	Percentage	Passenger	30.77%	30.77%
VMT_{active}	VMT reduction from active transportation targets	miles	Passenger	3,797,653	10,055,097

Variable	Definition	Units	VMT Type	2030	2045
TPM	Forecasted trips per mile	trips/mile	Passenger	0.121980	0.124294
VMT Reduced	VMT reduced	miles	Passenger	59,785,448	102,641,693
Equation 7					
VMT EF	VMT emission factor	MT CO_2e/mile	Passenger	0.000302	0.000258
CO_2e Reduction	**VMT GHG emission reductions**	**MT CO_2e**	**Passenger**	**18,055**	**26,482**

Measure T-2 Rural: Develop a robust public transit network in support of HCAOG's Regional Transportation Plan to increase public transit mode share from 1% to 10% in rural areas and achieve a regional 13% public transit mode share by 2030.

Measure T-2 Rural aims to increase rural incorporated and unincorporated regions of the County (i.e. Blue Lake, Ferndale, Rio Dell, Trinidad, and Unincorporated Humboldt County) public and shared transit mode share to 10 percent by 2030 and 15 percent by 2045. The primary Actions that enable this Measure are:

- **Action T-2a** which directs the Regional Climate Committee to work with HCAOG and Humboldt Transit Authority (HTA) to implement initiatives in HCAOG's Regional Transportation Plan (RTP) to achieve a 30-minute headway in rural areas;
- **Action T-2c, d** which directs jurisdictions to work with HCAOG to conduct a feasibility study for micro transit programs to enhance public transit use and develop a micro-mobility policy that establishes the process for implementing a micro-mobility program; and
- **Action T-2e** which directs jurisdictions to require nonresidential and mixed-use developments to participate in Transportation Demand Management strategies such as shuttle services or pre-tax commute benefits; and
- **Action T-2i** which commits the Regional Climate Committee to direct a multi-jurisdictional staff position to support HCAOG and HTA in pursuing funding for expanding the transit network and prioritizing public transportation access in low-income communities.

Actions under Measure T-2 Rural are designed to align with HCAOG's RTP program, VROOM 2022-2042. HCAOG's VROOM 2022-2042 plan is the county-wide guiding long range regional planning document when it comes to public and active transportation implementation. Listed projects focus on aggressive mode share shift projects to achieve an aggregate public and active transportation mode share of 30 percent by 2030 and 40 percent by 2050.[79] As previously mentioned, HTA's acquisition of 11 zero-emissions buses makes the shift to increased public transit mode share an even more attractive option for reducing GHG emissions.[80] Consistent with the RTP, a majority of VMT reductions will come from land use changes and infrastructure improvement projects to aid the expansion of HTA services and prioritize neighboring city and rural interconnectivity improvement projects. To achieve these reductions, the rural areas will need to work collaboratively with the employment centers of the County to implement mutually beneficial projects found in the RTP.

In 2022, rural areas had a weighted average regional public transit mode share of 0.96 percent.[81] Urbanized areas have shown that increasing investment can significantly raise public mode transit mode share (See Measure T-2 Urban for more information). As previously mentioned, key strategies employed by these cities include significant expansions of transit service lines, designated streets or

[79] For a full list of the projects please see the Connected 2050 plan. Accessed here: https://www.hcaog.net/sites/default/files/vroom_2022-2042_full_report_0.pdf

[80] Humboldt Transit Authority (HTA). 2024. Expanding Transit Services and Introducing Zero-Emission Fleets on the North Coast. Available at: https://hta.org/projects-tircp/

[81] US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table/ACSST5Y2022.S0801?q=Humboldt%20County,%20California&t=Commuting&g=160XX00US0602476,0623042,0625296

lanes for bus lines to decrease headways, implementation of taxes to support transit, reduced parking availability, and user taxes.

While these core strategies typically result in increased public transit mode share, more rural areas may not experience comparably significant benefits. Rural communities make up 68 percent of road miles in the United States, these areas are often underfunded such that only 36 percent have access to airline, rail, and bus transportation services.[82] To increase rural mode shift to public transportation, access needs to be increased, and transit use must be more convenient. Effective communication, especially communication that takes advantage of new and emerging technologies to accurately and easily disseminate trip planning and real-time status information, is a strong factor in helping customers decide to use transit for business or leisure trips.[83] **Action T-2a** focuses on supporting the implementation of infrastructure and technology improvements that would improve access and convenience to public transit for rural communities.

Strategies such as expansion of fixed-route systems, a core strategy for urban centers, may not pose the best solution on its own as compared to leaning on other solutions for public transit, such as on-demand or micro transit options.[84,85] Many cities in California and throughout the Country have been conducting micro-transit projects for several years and the number of projects is continuing to grow due to their success.[86], [87] Further, CAPCOA's Handbook found several studies that micro transit programs such as bike and scooter share can reduce VMT and improve access to public transit thereby increasing mode shift to public transit.[88]Recently HCAOG in collaboration with HTA and a community based partner received a grant for $2.6 million to expand transit options throughout an unincorporated community of Humboldt, McKinleyville, by piloting an on-demand micro transit program that would offer in-town trips and connections to intercity buses. It is anticipated that this program may serve as a model for other areas in the region that have potential for infill but do not have the population density for a fixed-route transit [89] **Action T-2c** directs jurisdictions to work with HCAOG and HTA to conduct a feasibility study for implementing micro transit programs in other parts of the County, using information gained from the McKinleyville pilot program to inform effectiveness of such a program. Based on the feasibility study and if determined that micro transit could be a solution, jurisdictions would develop a micro-mobility policy through **Action T-2d** that would establish the framework for implementing a micro-mobility program the community.

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[82] U.S. Department of Transportation. 2023. The Critical Role of Rural Communities in the U.S. Transportation System. Available at: https://www.transportation.gov/rural/grant-toolkit/critical-role-rural-communities

[83] https://transitleadership.org/docs/TLS-WP-Improving-the-Customer-Experience.pdf

[84] Cities Today. 2021. Public transit in rural communities is extremely inefficient — this data tells us how to change that. Available at: https://cities-today.com/industry/public-transit-rural-communities-extremely-inefficient-data-change/

[85] Smart Growth America. 2023. An Active Roadmap: Best Practices in Rural Mobility. Available at: https://smartgrowthamerica.org/wp-content/uploads/2023/07/SGA-Rural-Transportation-Field-Scan_Final_7.27.pdf

[86] https://www.apta.com/research-technical-resources/mobility-innovation-hub/microtransit/

[87] https://transweb.sjsu.edu/research/2249-Demand-Responsive-Transportation-Shared-Mobility

[88] California Air Pollution Control Officers Association (CAPCOA). 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Accessed at: https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf

[89] HCAOG. 2023. HCAOG and Partners Awarded $2.6 million Grant for Community Based Housing and Transportation. Accessed at: https://kymkemp.com/2023/10/18/hcaog-and-partners-awarded-2-6-million-grant-for-community-based-housing-and-transportation/

In recognition of the need for varied transportation methods throughout the County, HCAOG's VROOM 2022-2042 sets goals and projects for expanding on-demand and micro transit infrastructure in addition to public transit to meet the 30 percent mode alternative transit goal by 2030. Therefore, by aligning the Actions for Measure T-2 Rural with the RTP and partnering with HCAOG, it is anticipated that rural regions will be able to meet the goal of 10 percent public transit mode share by 2030. An increase in public transportation mode share to 10 percent in rural areas equates to a 3 percent passenger VMT reduction. This is conservative compared with the VMT reduction target of 15 percent from baseline conditions used for the VMT Significance Threshold established by the County in compliance with SB 743.Table 23 shows the parameters and data sources that support the GHG emission reductions associated with reducing vehicle miles traveled through rural public transit mode share and Table 24 shows the calculations as outlined in Equations 8 through 8.2.

Public Transit Mode Share Equations

Equation 8 $CO_2e\ Reduction_{i,y} = VMT\ Reduced_{i,y} * VMT\ EF_{i,y}$

Equation 8.1 $VMT\ Reduced_{i,y} = ((VMT_{i,y} * Prop_j) - VMT_{active}) * TPM_{i,y} * TL_i * MS\ Increase_{public,y}$

Equation 8.2 $MS\ Increase_{public,y} = MS\ Target_{public,y} - MS_{public,by}$

Table 23 Public Transit Mode Share Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 8				
$CO_2e\ Reduction_{i,y}$	VMT GHG emission reductions	See calculation table	MT CO_2e	Calculated
$VMT\ Reduced_{i,y}$	VMT reduced	See calculation table	miles	Calculated
$VMT\ EF_{i,y}$	VMT emission factor	See calculation table	MT CO_2e/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Equation 8.1				
$VMT_{i,y}$	Forecasted VMT after active transportation reductions	See calculation able	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Prop_j$	Proportion of total regional VMT	See calculation able	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$VMT_{active,y}$	VMT reduction from active transportation targets	See calculation able	miles	Calculated (See Measures T-1)
$TPM_{i,y}$	Forecasted trips per mile	See calculation table	trips/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
TL_i	Average public transit trip length	3.8	miles	American Public Transportation Association's Public Transportation Fact Book[1,2]
$MS\ Increase_{Public,y}$	Public transit mode share increase	See calculation table	percentage	Calculated

Variable	Definition	Value	Unit	Data Source
i	VMT type	Passenger	–	–
y	Year	2030 or 2045	–	–
j	County subregion	Urban or Rural	–	–
Equation 8.2				
$MS\ Target_{Public,y}$	Public transit mode share target	–	percentage	–
$MS\ Target_{Public,2030}$	Public transit mode share target (2030)	10%	percentage	Based on rural strategies for public transportation[3,4] and alignment with regional RTP.[5]
$MS\ Target_{Public,2045}$	Public transit mode share target (2045)	15%	percentage	
$MS_{Public,by}$	Public transit mode share in baseline year	0.96%	percentage	US Census Bureau[5,6]
by	Baseline year	2022	year	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. American Public Transportation Association. Public Transportation Fact Book (2018). Accessed at: https://www.apta.com/wp-content/uploads/Resources/resources/statistics/Documents/FactBook/2018-APTA-Fact-Book.pdf.
2. Note: Regular bus trip length was utilized to remain conservative.
3. Cities Today. 2021. Public transit in rural communities is extremely inefficient — this data tells us how to change that. Available at: https://cities-today.com/industry/public-transit-rural-communities-extremely-inefficient-data-change/
4. Smart Growth America. 2023. An Active Roadmap: Best Practices in Rural Mobility. Available at: https://smartgrowthamerica.org/wp-content/uploads/2023/07/SGA-Rural-Transportation-Field-Scan_Final_7.27.pdf
5. Humboldt County Association of Governments (HCAOG). Regional Transportation Plan, VROOM 2022-2042. Available at: https://www.hcaog.net/sites/default/files/vroom_2022-2042_full_report_0.pdf
6. US Census Bureau. 2022: ACS 5-Year Estimates Subject Tables. S0801|Commuting Characteristics by Sex. Accessed at: https://data.census.gov/table/ACSST5Y2022.S0801?q=Humboldt%20County,%20California&t=Commuting&g=160XX00US0602476,0623042,0625296
7. Weighted average public transit mode share estimated based on mode shares provided by U.S. Census data for Blue Lake, (2.6%), Ferndale (0.0%), Rio Dell (0.0%), Trinidad (0.0%), and Unincorporated Humboldt County (0.57%) and their respective VMT contributions as reported in the Humboldt Regional 2022 GHG Inventory.

Table 24 Public Transit Mode Share GHG Emission Reduction Calculations

Variable	Definition	Units	VMT Type	2030	2045
Equation 8.2					
$MS\ Target_{Public}$	Public transit mode share target	percentage	Passenger	10.00%	15.00%
$MS\ Increase_{Public}$	Public transit mode share increase	percentage	Passenger	9.04%	14.04%
Equation 8.1					
VMT	Forecasted VMT after active transportation reductions	miles	Passenger	2,308,368,699	2,532,201,389
$Prop_{urban}$	Proportion of total regional VMT	Percentage	Passenger	69.23%	69.23%
VMT_{active}	VMT reduction from active transportation targets	miles	Passenger	3,576,953	17,072,304
TPM	Forecasted trips per mile	trips/mile	Passenger	0.121980	0.124294
VMT Reduced	VMT reduced	miles	Passenger	66,822,406	115,129,048
Equation 8					
VMT EF	VMT emission factor	MT CO_2e/mile	Passenger	0.000302	0.000258
CO_2e Reduction	**VMT GHG emission reductions**	**MT CO_2e**	**Passenger**	**20,180**	**29,703**

Measure T-3 Urban: Reduce regional VMT by increasing promotion of mixed-use development in infill priority areas ~~in alignment with HCAOG's baseline connectivity score included in the RTP~~.

Measure T-3 aims to encourage mixed-use development in designated infill priority areas within urban areas ~~incorporated cities, aligning with the baseline connectivity score identified in HCAOG's VROOM 2022-2042.~~[90] Promoting mixed-use development in infill areas supports efficient land use by combining residential, commercial, and recreational spaces, which can reduce traffic congestion, lower transportation-related emissions, and dissuade regional sprawl. Such efforts are already underway in the City of Arcata which recently approved a final draft of the Gateway Area Plan which establishes long-range planning for high-density housing and mixed-use developments.[91]

This measure enhances community livability by supporting the development of walkable neighborhoods with easy access to essential services and amenities. ~~By aligning with the initiatives outlined in the RTP, the infill projects will be strategically planned to increase connectivity and accessibility.~~ Though this measure will aid in reducing regional VMT and associated GHG emissions, reductions from this Measure are not quantified due to complex indirect impacts and high risk of double counting with other RCAP Measures (see Measures T-1 and T-2).

~~90 Humboldt County Association of Governments (HCAOG). Regional Transportation Plan, VROOM 2022-2042. Available at: https://www.hcaog.net/sites/default/files/vroom_2022-2042_full_report_0.pdf~~

91 Lost Coast Outpost. 2024. 'This is a Major Milestone': Arcata Planning Commission Passes Final Draft of Gateway Area Plan. Available at: https://lostcoastoutpost.com/2024/may/15/major-milestone-arcata-planners-pass-final-draft-g/

Measure T-4: Develop and implement regional mobility hubs and ZEV car-share programs to support mode shift from single occupancy vehicles.

Measure T-4 focuses on creating regional mobility hubs and implementing ZEV car-share programs to encourage a shift away from single-occupancy vehicle use. This measure aims to enhance transportation options across urban and rural communities, making it easier for residents to choose sustainable and efficient modes of travel. Regional mobility hubs integrate various transportation services, such as public transit, bike-sharing, and car-sharing, in a single location to provide convenience and increase connections between different modes of travel.[92,93] The introduction of ZEV car-share programs further supports this initiative by offering clean transportation alternatives, reducing the reliance on fossil fuels. While the GHG emission reductions from this measure are not quantified in the RCAP due to the complexity of directly attributing these reductions and risk of double counting with other Measures in the RCAP, it plays a critical role in increasing access to alternative, more sustainable forms of transportation and reducing overall vehicle emissions.

[92] Sacramento Area Council of Governments (SACOG). Mobility Hub Design Guidance. Available at: https://www.sacog.org/planning/transportation/innovative-mobility-program/mobility-hubs

[93] CoMoUK. Mobility Hubs Overview and benefits. Available at: https://www.como.org.uk/mobility-hubs/overview-and-benefits

Measure T-5: Require commercial and industrial employers with 25 employees or more to develop a Transportation Demand Management plan.

Measure T-5 commits jurisdictions, particularly high employment areas, to require that commercial and industrial employers with 25 or more employees create a Transportation Demand Management (TDM) plan. This measure aims to lower GHG emissions and better accommodate employees living far from their place of work by further incentivizing alternative commuting options through employer-based subsidies for alternative modes of travel, which can also reduce their commuting costs. TDM plans can include strategies such as promoting carpooling, offering public transit incentives, supporting telecommuting, and providing facilities for cycling and walking. Employer-based TDM plans with these types of strategies which combine incentives with improved commute alternatives can lead to a 25 percent reduction in employee trips.[94] By requiring these plans, Measure T-5 encourages employers to actively participate in reducing their transportation footprint, improving air quality, and enhancing the overall efficiency of the transportation network. While the GHG emission reductions from this Measure are not quantified in the RCAP due to the challenges in measuring individual employer contributions, it has been included to support the RCAP goals as an effective means to reduce transportation sector emissions.

[94] U.S. Department of Transportation. 2020. 10. Known Effectiveness of TDM Strategies. Available at: https://ops.fhwa.dot.gov/publications/fhwahop12035/chap10.htm

Measure T-6: Decarbonize 15% of passenger vehicle miles traveled by 2030 and 100% by 2045 through increased adoption of low and zero-emission vehicles and development of a regional electric vehicle charging and hydrogen fueling network.

Measure T-6 aims to increase passenger zero-emission vehicle (ZEV) adoption across the County through increased ZEV adoption and implementation of hydrogen hubs as an alternative to electric ZEVs. The state has established a goal of putting 5 million ZEVs on the road by 2030 and, according to executive order N-79-20, 100 percent of passenger vehicle sales are to be zero emission by 2035. This new executive order puts the total number of ZEVs on the road by 2035 at approximately 15 million.[95] Based on the current number of vehicles registered in California and a 2% growth rate per year, 15 million ZEVs accounts for 35% of total passenger vehicles in 2035. Currently, the State is only anticipated to reach a 26 percent ZEV adoption rate by 2030,[96,97] Though jurisdictions in Humboldt are expected to aid in aligning regional ZEV adoption with state goals, Humboldt's electricity infrastructure[98,99] and rural nature poses challenges with matching the State's goals or anticipated ZEV market rate. In recognition of these challenges as well as the pressing need to decarbonize the transportation sector, Measure T-6 sets a conservative goal of 15 percent ZEV adoption by 2030 and 100 percent by 2045. While Measure T-6 focuses on ZEVs, hybrids also pose a viable option for interim GHG reduction of on-road transportation. However, legislative reductions from hybrid use are largely captured in the forecast of the RCAP, therefore it is more conservative to exclude hybrid-specific targets to avoid double-counting these reductions. Furthermore, California's manufacturing legislation will mean no fossil-fueled cars will be manufactured in the state after 2035, reinforcing the long-term focus on ZEVs. The primary Actions that are designed to drive these investments and enable this Measure include:

- **Action T-6b** which commits the Regional Climate Committee to develop a streamlined EV infrastructure permitting process and ordinance which can be utilized as a template for jurisdictions to utilize and adopt;
- **Action T-6c** which commits the Regional Climate Committee to working with local jurisdictions to modify the Municipal code to promote EV charger access in new developments, redevelopment and existing parking spaces;

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95 Susan Carpenter. Spectrum News 1. October 2020. What it will take to get 100% EV sales in California. Accessed at: https://spectrumnews1.com/ca/la-west/transportation/2020/10/05/what-it-will-take-to-sell-100--evs-in-california

96 Crisostomo, Noel et al. Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment: Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030. Accessed at: Calmatters.org/environment/2023/03/california-electric-cars-demographics/?utm_id=91724&sfmc_id=4863450.

97 Based on the zero-emission vehicle goals for passenger vehicles established by Executive Order N-79-20, eight million zero-emission vehicles are anticipated statewide by 2030. Humboldt calculated that these eight million zero-emission vehicles represent 26 percent of the total passenger vehicles expected statewide by 2030 (based on statewide passenger car and light-duty truck counts in 2016 and population estimates for 2016 and 2030).

98 According to the CEC's electric vehicle charger 2025 capacity planning tool, the regional capacity varies considerably across the county, with some areas anticipated to have negative capacity (aka the projected electric capacity is not anticipated to support the modeled EV load).

99 California Energy Commission (CEC). 2024. EVSE Deployment and Grid Evaluation (EDGE) Tool (version 1.0). Available at: https://experience.arcgis.com/experience/6aaadc11586447aaaeab2a473947ad07#data_s=id%3AdataSource_2-189e1db67fd-layer-3%3A39

- **Action T-6f** which establishes an EV Monthly Bill Discount Program with additional discount opportunities for low-income households aimed at reducing cost barriers to EV adoption;
- **Action T-6g** which directs the Regional Climate Committee to work with RCEA to expand home and public ZEV fueling/charging infrastructure in alignment with goals established in RCEA's REPower Humboldt Plan; and
- **Action T-6j** which commits the Regional Climate Committee to lead the development of a Hydrogen Vehicle Infrastructure Implementation Plan for public access by 2030 in collaboration with HCAOG and the incorporated cities.

Action T-4g directs the jurisdictions to work with RCEA to install publicly accessible EV chargers needed to support RCEA's ZEV infrastructure goals. According to the REPower Plan, RCEA aims to install sufficient charging infrastructure to support 22,000 EVs by 2030.[100] This effort will be supported by RCEA's goals to increase regional electricity capacity and infrastructure discussed in Measure BE-1, as well as State strategies to build new, and upgrade aging, transmission and distribution infrastructure to support the transition to renewable energy.[101] This Action focuses on public EV chargers because studies have consistently found that limited charging infrastructure is one of the primary barriers to electric vehicle adoption.[102, 103] Publicly accessible EV chargers make owning an electric vehicle convenient for all drivers—including those who cannot charge at home or drive daily distances longer than their electric vehicle battery range. According to a recent study on public charging infrastructure needs, it is expected that 20 percent of EV charging nationally will occur at publicly accessible chargers in 2030.[104] This Action's quantification is based on the U.S. Department of Energy's Electric Vehicle Infrastructure Projection Tool outputs for the State of California.[105] The tool is used to calculate the number of publicly accessible EV chargers needed in the region to support a 15 percent passenger ZEV adoption in 2030 and a 100 percent passenger ZEV adoption in 2045. Though Measure T-6 seeks to establish a hydrogen industry in the region to support adoption of hydrogen fuel vehicles, further development needs to occur to develop infrastructure capacity targets before GHG reductions can be substantially quantified from hydrogen passenger vehicles. Currently, key components of this infrastructure in the region include the HTA hydrogen fueling station, contracted to supply fuel to the public but still awaiting construction,[106] and the hydrogen production facility to be constructed located in Red Bluff within the Redding

[100] Redwood Coast Energy Authority (RCEA). 2019. REPower Humboldt (2019 Update). Available at: https://redwoodenergy.org/wp-content/uploads/2020/06/RePower-2019-Update-FINAL-.pdf

[101] Governor Gavin Newsom. 2023. Building the Electricity Grid of the Future: California's Clean Energy Transition Plan. Available at: https://www.gov.ca.gov/wp-content/uploads/2023/05/CAEnergyTransitionPlan.pdf

[102] Kumar, Rajeev Ranjan and Kumar Alok. Adoption of Electric Vehicle: A Literature Review and Prospects for Sustainability (2020). Accessed at: https://www.sciencedirect.com/science/article/abs/pii/S095965261934781X.

[103] Winjobi, Olumide and Kelly, Jarod. Used Plug-in Electric Vehicles as a Means of Transportation Equity in Low-Income Households (2021). Accessed at: https://www.osti.gov/biblio/1658592.

[104] Kampshoff, Philipp et al. Building the Electric-Vehicle Charging Infrastructure America Needs (2022). Accessed at: https://www.mckinsey.com/industries/public-sector/our-insights/building-the-electric-vehicle-charging-infrastructure-america-needs.

[105] U.S. Department of Energy. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Accessed at: https://afdc.energy.gov/evi-pro-lite.

[106] Humboldt Transit Authority. 2024. Expanding Transit Services and Introducing Zero-Emission Fleets on the North Coast. Available at: https://hta.org/projects-tircp/

Rancheria.[107] Given these factors, the quantification assumes all ZEVs will be EVs to remain conservative.

Table 25 shows the parameters and data sources used to calculate the publicly accessible EV chargers needed in 2030 and 2045 with the Department of Energy's Electric Vehicle Infrastructure Projection Tool and Table 26 shows the calculations as outlined in Equations 9 through 9.2.

Publicly Accessible Electric Vehicle Chargers Equation

Equation 9 $PEV\ Chargers_y = Region\ PEV\ Chargers_y * (EVs_y/(Region\ EVs_y) - Existing\ PEV\ Chargers_{by}$

Equation 9.1 $EVs_y = Population_y * (Vehicles_{by}/Population_{by}) * EV\ Target_{Pass,y}$

Equation 9.2 $Region\ EVs_y = Region\ Vehicles_y * EV\ Target_{Pass,y}$

Table 25 Publicly Accessible Electric Vehicle Charger Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 9				
$PEV\ Chargers_y$	New publicly accessible electric vehicle chargers needed in Humboldt	See calculation table	chargers	Calculated
$Region\ EV\ Chargers_y$	Regional electric vehicle chargers needed	See calculation table	electric vehicles	Estimated using the Electric Vehicle Infrastructure Projection Tool public charger outputs for the State with the $Region\ EVs_{2030}$ value as the input.[1]
EVs_y	Electric vehicles targeted in Humboldt	See calculation table	electric vehicles	Calculated
$Region\ EVs_y$	Regional electric vehicles targeted	See calculation table	electric vehicles	Calculated
$Existing\ EV\ Chargers_{by}$	Existing publicly accessible electric vehicle chargers in Humboldt	127	chargers	PlugShare[2]
y	Year	2030 or 2045	year	–
by	Baseline year	2022	year	–
Equation 9.1				
$Population_y$	Forecasted population in region	See calculation table	people	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Vehicles_{by}$	Vehicles in baseline year in region	109,772	vehicles	California Department of Motor Vehicles[3]

[107] KRCR. 2024. Redding Rancheria to build green hydrogen facility off I-5. Available at: https://krcrtv.com/news/local/redding-rancheria-to-build-green-hydrogen-facility-off-i-5

Variable	Definition	Value	Unit	Data Source
$Population_{by}$	Population in baseline year in Humboldt	136,132	people	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$EV\ Target_{Pass,y}$	Electric vehicle adoption target	See calculation table	percentage	Targeted zero-emission vehicle adoption for Measure T-4.
Equation 9.2				
$Region\ Vehicles_y$	Regional vehicles	33,167,900	vehicles	Electric Vehicle Infrastructure Projection Tool value for the State[1]

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. U.S. Department of Energy. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Accessed at: https://afdc.energy.gov/evi-pro-lite.
2. PlugShare. EV Charging in Pinole, CA. Accessed at: https://www.plugshare.com/directory/us/california/pinole.
3. California Department of Motor Vehicles. 2022. Vehicles Registered By County. Accessed at: https://www.dmv.ca.gov/portal/dmv-research-reports/research-development-data-dashboards/vehicles-registered-by-county/

Table 26 Publicly Accessible Electric Vehicle Charger Parameters and Data Sources

Variable	Definition	Units	2030	2045
Equation 9.2				
$EV\ Target_{Pass,y}$	Zero-emission vehicle adoption target	percentage	15%	100%
$Region\ EVs_y$	Regional electric vehicles targeted	electric vehicles	4,975,185	33,167,900
Equation 9.1				
$Population_y$	Forecasted population in Humboldt	people	143,556	157,476
EVs_y	Electric vehicles targeted in Humboldt	electric vehicles	17,364	126,983
Equation 9				
$PEV\ Chargers_y$	New publicly accessible electric vehicle chargers needed in Humboldt	chargers	388	9,154

Through public-private funding and partnerships, the Humboldt jurisdictions will need to install a collective 388 publicly accessible EV chargers by 2030 and 9,154 publicly accessible EV chargers by 2045. This is estimated to support 17,364 EVs, a more conservative target installation compared to the goals defined by RCEA. These ZEVs will also be supported by private electric vehicle chargers in new developments and existing buildings.

While jurisdictions cannot require residents to buy and use ZEVs rather than gasoline or diesel-powered vehicles, the Regional Climate Committee will support each jurisdiction in the region of Humboldt to incentivize this behavior change and support this level of ZEV adoption. Providing 388 additional public electric vehicle chargers is in line with other counties in California, such as Alameda, Santa Clara, and Marin counties and consistent with state legislation assessing the gap to needed ZEV charging infrastructure.[108] Buildout of EV infrastructure will be further supported by Actions to identify and obtain funding for increasing publicly available charging stations and

[108] AB 2127 directs the CEC to assess needed charging infrastructure from which the number of chargers in the County was inferred. Accessed here: https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127

infrastructure, expand incentive programs for at home electric vehicle chargers, and streamline the installation permitting process. These local actions along with new federal and state funding will help cover the upfront costs to purchasing an electric vehicle and installing the equipment or infrastructure upgrades needed to charge an electric vehicle at home as high costs are one of the barriers to electric vehicle adoption for low-income households.[109]

Table 27 shows the parameters and data sources that support GHG emission reductions from the zero-emission vehicle adoption and Table 28 shows the calculations as outlined in Equations 10 through 10.2.

Passenger Zero-emission Vehicle Adoption Equations

Equation 10 $CO_2e\ Reduction_{VMT,i,y}=(VMT\ Reduced_{ICE,i,y}*EF_{VMT,i,y})-(Elec\ Converted_{i,y}*EF_{elec,i,y}*(1+L_{T\&D}))$

Equation 10.1 $Elec\ Converted_{i,y}=VMT\ Reduced_{ICE,i,y}*EPM_{ZEV,i,y}$

Equation 10.2 $VMT\ Reduced_{ICE,i,y}=(VMT_{i,y}-VMT_{alt,i,y})*(ZEV\ Adoption_{i,y}-ZEV\ Adoption\ Baseline_{i,y})$

Table 27 Passenger Zero-emission Vehicle Adoption Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 10				
$CO_2e\ Reduction_{VMT,I,y}$	VMT GHG emission reductions	See calculation table	MT CO_2e	Calculated
$VMT\ Reduced_{ICE,I,y}$	Internal combustion engine VMT reduced	See calculation table	miles	Calculated
$EF_{VMT,I,y}$	Forecasted VMT emission factor	See calculation table	MT CO_2e/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Elec\ Converted_{i,y}$	Electricity from zero-emission vehicle conversion	See calculation table	kWh	Calculated
$EF_{elec,I,y}$	Forecasted residential electricity emission factor	See calculation table	MT CO_2e/kWh	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$L_{T\&D}$	Electricity transmission and distribution loss percentage	5.10%	Percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
i	VMT type	Passenger	–	–
y	Year	2030 or 2045	–	–
Equation 10.1				
$EPM_{ZEV,I,y}$	Forecasted electricity usage per mile of zero-emission vehicles	See calculation table	kWh/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Equation 10.2				

[109] Gaillard, Isa. Ingredients for Equitable Electrification: Analyzing Equity in Statewide Electric Vehicle Rebate Programs (2022). Accessed at: https://greenlining.org/wp-content/uploads/2022/10/Greenlining-Ingredients-Equitable-Transportation-WebFINAL.pdf.

Variable	Definition	Value	Unit	Data Source
$VMT_{i,y}$	Forecasted total VMT	See calculation table	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$VMT_{alt,i,y}$	VMT reduction from alternative transit methods	See calculation table	miles	See Measures T-1 and T-2
ZEV Adoption$_{i,y}$	Zero-emission vehicle adoption target	See calculation table	percentage	Conservative based on RCEA goals[1] and enabled by 388 new publicly accessible chargers (Table 26).
ZEV Adoption Baseline$_{i,y}$	Zero-emission vehicle adoption baseline	See calculation table	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. Redwood Coast Energy Authority (RCEA). 2019. REPower Humboldt (2019 Update). Available at: https://redwoodenergy.org/wp-content/uploads/2020/06/RePower-2019-Update-FINAL-.pdf

Table 28 Passenger Zero-emission Vehicle Adoption GHG Emission Reduction Calculations

Variable	Definition	Units	VMT Type	2030	2045
Equation 10.2					
$VMT_{i,y}$	Forecasted total VMT	miles	Passenger	2,308,368,699	2,532,201,389
$VMT_{alt,i,y}$	VMT reduction from alternative transit methods	miles	Passenger	133,982,460	244,898,141
ZEV Adoption$_{i,y}$	Zero-emission vehicle adoption target	percentage	Passenger	15.00%	100.00%
ZEV Adoption Baseline$_{i,y}$	Zero-emission vehicle adoption baseline	percentage	Passenger	6.31%	9.54%
VMT Reduced$_{ICE,I,y}$	Internal combustion engine VMT reduced	miles	Passenger	188,954,164	2,287,303,248
Equation 10.1					
$EPM_{ZEV,I,y}$	Forecasted electricity usage per mile of zero-emission vehicles	kWh/mile	Passenger	0.3684	0.3692
Elec Converted$_{i,y}$	Electricity from zero-emission vehicle conversion	kWh	Passenger	69,610,147	844,504,381
Equation 10					
$EF_{VMT,I,y}$	Forecasted VMT emission factor	MT CO_2e/mile	Passenger	0.0003020	0.0002580
$EF_{elec,I,y}$	Forecasted electricity emission factor	MT CO_2e/kWh	Passenger	0.0000183	0.0000000
CO_2e Reduction$_{VMT}$	**VMT GHG emission reductions**	**MT CO_2e**	**Passenger**	**55,726**	**590,124**

Measure T-7: Increase commercial zero-emission vehicle use and adoption to 10% by 2030 and 100% by 2045 through a regional charging network and development of hydrogen hubs.

Measure T-7 aims to increase commercial ZEV adoption across the County through increased EV adoption and implementation of hydrogen hubs as an alternative to electric ZEVs. Commercial VMT includes medium- and heavy-duty (MDHD) vehicles and trucks. The primary Actions that are designed to drive these investments and enable this Measure include:

- **Action T-7a** which directs the Regional Climate Committee to work with RCEA and Schatz Energy Research Center (SERC) to refine and implement the North Coast Medium-Duty/Heavy-Duty Zero Emission Vehicle Readiness Blueprint for Humboldt County;
- **Actions T-7b** which involves engaging employers and business fleet owners regarding Advanced Clean Fleet requirements, funding opportunities, and identification of opportunities for accelerated conversion to ZEVs and ZEV infrastructure build-out; and
- **Action T-7e** which will secure funding from state and federal sources to increase ZEV procurement as well as expand charging/fueling infrastructure.

As the forecast included in the RCAP incorporates impacts from the Innovative Clean Transit regulation which requires 100 percent zero emission bus fleets by 2040, consideration of public transit ZEV targets and HTA's acquisition of 11 ZEV buses is not included in this Measure to avoid double counting of emissions reductions. These commercial VMT targets are in line with the State's goals and regulations for MDHD vehicles. California is working towards achieving Executive Order (EO) N-79-20, which aims to reach a 100 percent zero-emission drayage truck population by 2035 and 100 percent zero-emission MDHD vehicle population by 2045. To reach these goals, CARB has adopted the Advanced Clean Trucks regulation which regulates the sale of MDHD vehicles in California and the Advanced Clean Fleets regulation which regulates the purchase and use of zero-emission MDHD vehicles in public and private fleets in California. These regulations have increasing requirements for zero-emission MDHD vehicle sales and use to mandate the phase-in of commercial ZEVs. For example, by 2030, the Advanced Clean Fleets regulation requires 10 percent of sleeper cab tractors and specialty vehicles, 25 percent of pickup trucks and day cab tractors, and 50 percent of box trucks, vans, and package delivery vehicles in a fleet to be zero-emission.

According to the North Coast Medium-Duty and Heavy-Duty ZEV Blueprint Plan[110] developed by RCEA in collaboration with SERC, the target 10 percent commercial fleet ZEV adoption aligns the region to comply with the State's goals, with primary method of replacement being based on estimated end-of life. As part of the Blueprint, the energy required to achieve the States mandates through either electric charging stations or hydrogen fueling stations was estimated. The Blueprint recognizes that a major barrier in Humboldt County is electricity infrastructure but has identified several strategies to work with the utility to overcome this barrier. Working with PG&E to determine the necessary infrastructure needs to support a fully built-out fleet and planning ahead with interconnection applications will be necessary to accelerate utility interconnection. Further, Highway 101 that runs through Humboldt is a proposed electric fuel corridor for Round 2 eligibility of California's National Electric Vehicle Infrastructure (NEVI) Funding Program, a program funded by the Infrastructure Investment and Jobs Act to advance ZEV infrastructure along interstates and

[110] Redwood Coast Energy Authority (RCEA). 2023. North Coast Medium-Duty and Heavy-Duty ZEV Blueprint Plan. Provided by the County via SharePoint on March 15, 2023.

national highways.[111] If the portion of Highway that runs through Humboldt is eligible for California round 2 of NEVI funding, this would further support the transition of commercial vehicles to ZEVs in the region.

By also investing in hydrogen refueling infrastructure, the region is able to better diversify the fleets and continue to move towards fleet ZEV transition even with electricity infrastructure barriers. HTA is already working on building a new hydrogen fueling station that is expected to be operational in 2025.[110] To support this transition, Measure T-7 includes Actions that focus on funding for, and education of, commercial ZEVs, workforce development, and engaging with fleet owners and business owners that are subject to the States regulations. Table 29 shows the parameters and data sources that support the GHG emission reductions associated with commercial ZEVs and Table 30 shows the calculations as outlined in Equations 11 through 11.2.

Commercial Zero-emission Vehicle Adoption Equations

Equation 11 $CO_2e\ Reduction_{VMT,i,y}=(VMT\ Reduced_{ICE,i,y}*EF_{VMT,i,y})-(Elec\ Converted_{i,y}*EF_{elec,i,y}*(1+L_{T\&D}))$

Equation 11.1 $Elec\ Converted_{i,y}=VMT\ Reduced_{ICE,i,y}*EPM_{ZEV,i,y}$

Equation 11.2 $VMT\ Reduced_{ICE,i,y}=VMT_{i,y}*(ZEV\ Adoption_{i,y}-ZEV\ Adoption\ Baseline_{i,y})$

Table 29 Commercial Zero-emission Vehicle Adoption Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 11				
$CO_2e\ Reduction_{VMT,I,y}$	VMT GHG emission reductions	See calculation table	MT CO_2e	Calculated
$VMT\ Reduced_{ICE,I,y}$	Internal combustion engine VMT reduced	See calculation table	miles	Calculated
$EF_{VMT,I,y}$	Forecasted VMT emission factor	See calculation table	MT CO_2e/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Elec\ Converted_{i,y}$	Electricity from zero-emission vehicle conversion	See calculation table	kWh	Calculated
$EF_{elec,I,y}$	Forecasted residential electricity emission factor	See calculation table	MT CO_2e/kWh	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$L_{T\&D}$	Electricity transmission and distribution loss percentage	5.10%	Percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
i	VMT type	Nonresidential	–	–
y	Year	2030 or 2045	–	–
Equation 11.1				

[111] CalTrans, CEC. 2023. California's National Electric Vehicle Infrastrucutre (NEVI) Formula Program. Acccessed at: https://www.energy.ca.gov/programs-and-topics/programs/national-electric-vehicle-infrastructure-nevi-formula-program-0

Variable	Definition	Value	Unit	Data Source
$EPM_{ZEV,l,y}$	Forecasted electricity usage per mile of zero-emission vehicles	See calculation table	kWh/mile	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Equation 11.2				
$VMT_{i,y}$	Forecasted total VMT	See calculation table	miles	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
ZEV Adoption$_{i,y}$	Zero-emission vehicle adoption target	See calculation table	percentage	Targets that are consistent with state regulations and goals.
ZEV Adoption Baseline$_{i,y}$	Zero-emission vehicle adoption baseline	See calculation table	percentage	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

Table 30 Commercial Zero-emission Vehicle Adoption GHG Emission Reduction Calculations

Variable	Definition	Units	VMT Type	2030	2045
Equation 11.2					
$VMT_{i,y}$	Forecasted total VMT	miles	Commercial	297,601,835	326,459,019
ZEV Adoption$_{i,y}$	Zero-emission vehicle adoption target	percentage	Commercial	10.00%	100.00%
ZEV Adoption Baseline$_{i,y}$	Zero-emission vehicle adoption baseline	percentage	Commercial	4.51%	28.46%
VMT Reduced$_{ICE,l,y}$	Internal combustion engine VMT reduced	miles	Commercial	16,338,341	326,459,019
Equation 11.1					
$EPM_{ZEV,l,y}$	Forecasted electricity usage per mile of zero-emission vehicles	kWh/mile	Commercial	1.1953	1.1264
Elec Converted$_{i,y}$	Electricity from zero-emission vehicle conversion	kWh	Commercial	19,529,660	367,727,356
Equation 11					
$EF_{VMT,l,y}$	Forecasted VMT emission factor	MT CO_2e/mile	Commercial	0.0010910	0.0008570
$EF_{elec,l,y}$	Forecasted electricity emission factor	MT CO_2e/kWh	Commercial	0.0000187	0.0000000
CO_2e Reduction$_{VMT}$	**VMT GHG emission reductions**	**MT CO_2e**	**Passenger**	**17,441**	**279,775**

Measure T-8: Electrify or otherwise decarbonize 12% of applicable SORE off-road equipment by 2030 and 100% by 2045 and replace fossil diesel consumption with renewable diesel in 55% of applicable large diesel in alignment with EO N-79-20 by 2030.

Measure T-8 aims for the Humboldt region to decarbonize 12 percent of small off-road engine (SORE) use in the community by 2030 and 100 percent by 2045. Additionally, the Measure aims to replace 55 percent of fossil fuel consumption in large diesel off-road equipment with renewable diesel in alignment with recent CARB regulations. The primary Actions that enable this Measure are:

- **Action T-8a** which commits the jurisdictions to align with and support CARB's regulations requiring new sale small off-road equipment to be zero emission by 2024 in compliance with AB 1346, and phase 2 of the regulation affecting the manufacture and sale of larger scale equipment such as generators and pressure washers by 2028.
- **Action T-8b** which directs the Regional Climate Committee to establish a regulatory pathway to enforce CARB's In-Use Off-Road Diesel Fueled Fleets Regulation and Commercial Harbor Craft Regulation requiring that diesel vehicles over 25 horsepower to procure and only use R99 or R100 renewable diesel;
- **Action T-8d** which commits the Regional Climate Committee to developing and managing an Off-road Equipment Replacement Program and Outreach Campaign that provides information and technical assistance on complying with the regulations and identifies funding sources to aid residents in replacing existing off-road equipment with zero emission alternatives;
- **Action T-8f** which directs regional partners to develop private-public partnerships with renewable diesel producers and local fuel suppliers to bring more renewable diesel to the region to ensure there is enough fuel in the region to support compliance with the regulations.

The SORE regulation is phased such that it will impact the sale of most off-road vehicles and equipment with gasoline- and diesel-powered SOREs by no later than 2024. As defined by CARB, SORE are those equipment types with rated power at or below 19 kilowatts (i.e., 25 horsepower). Typical off-road vehicle and equipment types that use these engines include lawn and garden equipment, portable generators, and pressure washers.[112] In 2030, gasoline and diesel used by these SOREs will compromise over 12 percent of the off-road vehicle and equipment fuel used throughout Humboldt.[113] By promoting State regulations for limiting the sale of gasoline- and diesel-powered small off-road engines, and providing resources (i.e. information and incentives) for residents and businesses to replace their existing SORE equipment, the Actions have the potential to reduce approximately 12 percent of the community's off-road fuel usage.

In 2022, CARB also approved amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation that incorporates new requirements to use renewable diesel. Beginning January 1, 2024, all California fleets subject to this regulation are required to procure and only use R99 or R100 renewable diesel fuel in all vehicles subject to the Off-Road Regulation, with some limited exceptions. This regulation applies to all self-propelled off-road diesel vehicles 25 horsepower or greater used in California and applies to vehicles that are rented or leased. Exceptions to the

[112] California Air Resources Board (CARB). (2021) SORE Applicability Fact Sheet. Accessed at: https://ww2.arb.ca.gov/resources/fact-sheets/sore-applicability-fact-sheet.

[113] Humboldt region SORE fuel usage in 2030 was estimated based on attributions established in the Humboldt Regional 2022 GHG Inventory and by filtering CARB OFFROAD2021 model outputs for horsepower ratings less than or equal to 25. The results were divided by the total estimated off-road fuel usage in the Humboldt region in 2030 to estimate the share, or percentage, of fuel usage attributable to SOREs.

regulation include locomotives, commercial marine vessels, marine engines, recreational off-highway vehicles, combat and tactical support equipment, stationary equipment, portable engines, equipment used exclusively for agricultural operations, implements husbandry, and off-road diesel vehicles owned and operated by an individual for personal, non-commercial and non-governmental purposes.[114] Taking into account these exceptions, 72 percent of all diesel consumed in the County in 2030 and accounted for in the forecast as applicable equipment categories would be subject to the regulation. Further, amendments approved by CARB for the Commercial Harbor Craft Regulation in December of 2022 require that beginning in January 2023 all commercial harbor craft operated in the state must use R99 or R100 renewable diesel fuel.[115] Commercial harbor craft diesel consumption subject to this regulation is forecasted to make up approximately 7 percent of all diesel consumed in the County in 2030. In total, with full compliance, these two regulations would effectively replace 79 percent of fossil diesel consumption by off-road equipment with renewable diesel by 2030. Renewable diesel that meets the required standards has an emissions factor that is approximately 70 percent lower than fossil-fuel diesel.[116]

Action T-8b directs the Regional Climate Committee to establish a pathway for enforcing and tracking regulatory compliance and developing a strategy to ensure resources in the region are adequate to allow fleets to be in compliance. Compliance with the regulations will be further supported by a communication and outreach program (**Action T-8d**) and the development of public-private partnerships to bring more renewable diesel to the region to ensure local fuel suppliers are able to provide adequate amounts of renewable diesel to fleets subject to the regulation (**Action T-8f**). The program will raise awareness of the regulations, provide information to community members and businesses regarding the benefits of electrifying equipment or using renewable diesel, identify funding opportunities for offroad decarbonization (e.g., CARB's Clean Off-road Equipment Voucher Incentive Program), and provide information on local fuel suppliers with renewable diesel for sale.

Table 31 shows the parameters and data sources that support off-road ordinance GHG emission reductions and Table 32 shows the calculations as outlined in Equations 12 through 12.2.

Off-road Decarbonization Equations

Equation 12 $$CO_2e\ Reduction_y = (Fuel\ Avoided_{SORE,y} * Weighted\ EF_y) + (Fuel\ Replaced_{Diesel,y} * (Weighted\ EF_{Diesel} - EF_{RDiesel}))$$

Equation 12.1 $$Weighted\ EF_y = CO_2e\ Emissions_y / (Fuel_{Gas,\ y} + Fuel_{Diesel,\ y} + Fuel_{NG,\ y})$$

Equation 12.2 $$Fuel\ Avoided_{SORE,y} = (Fuel_{Gas,\ y} + Fuel_{Diesel,\ y} + Fuel_{NG,\ y}) * Target_{SORE,y}$$

Equation 12.3 $$Fuel\ Replaced_{Diesel,y} = (Fuel_{Diesel,\ y} * (1 - Target_{SORE,y})) * Target_{Diesel,y}$$

[114] California Air Resources Board (CARB). (2022). Final Regulation Order Amendments to Sections 2449, 2449.1, and 2449.2 Title 12, California Code of Regulations. Accessed at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/off-roaddiesel/froa-1.pdf

[115] California Air Resources Board (CARB). (2022) Commercial Harbor Craft Factsheet: Renewable Diesel (R100 or R99). Accessed at: https://ww2.arb.ca.gov/resources/fact-sheets/chc-factsheet-renewable-diesel-r100-or-r99

[116] CARB staff has reached out to several renewable diesel fuel producers and as of February 2023, is aware that renewable diesel produced by Neste meets the regulatory requirements and standards. Estimates in GHG emission reductions based on emission factors provided by Neste accessed at: https://www.neste.com/en-us/products-and-innovation/neste-my-renewable-diesel/product-information

Table 31 Off-road Decarbonization Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 12				
$CO_2e\ Reduction_{offroad,y}$	Offroad fuel GHG emission reductions	See calculation table	MT CO_2e	Calculated
$Fuel\ Avoided_{SORE,y}$	Off-road fuel avoided from applicable SORE equipment	See calculation table	gallons	Calculated
$Weighted\ EF_y$	Weighted emission factor for all off-road fuels	See calculation table	MT CO_2e/gallon	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Fuel\ Replaced_{Diesel,y}$	Off-road diesel replaced from applicable diesel equipment >25 hp	See calculation table	gallons	Calculated
$EF_{RDiesel}$	Emissions factor of renewable diesel	0.00308	MT CO2e/gallon	Neste (as recommended by CARB)[6]
$Weighted\ EF_{Diesel}$	Emissions factor of fossil fuel diesel	0.01050	MT CO2e/gallon	Inventory
y	Year	2030 or 2045	–	–
Equation 12.1				
$CO_2e\ Emissions_y$	Forecasted off-road GHG emissions	See calculation table	MT CO_2e	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Fuel_{Gas,y}$	Forecasted gasoline use	See calculation table	gallon	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Fuel_{Diesel,y}$	Forecasted diesel use	See calculation table	gallon	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Fuel_{NG,y}$	Forecasted natural gas use	See calculation table	gallon	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
Equation 12.2				
$Target_{SORE,y}$	Fuel use reduction target for all off-road fueles	See calculation table	percentage	–
$Target_{SORE,2030}$	Fuel use reduction target (2030)	12%	percentage	OFFROAD2021[1,2] and direction of state goals (i.e., EO N-79-20).[3]
$Target_{SORE,2045}$	Fuel use reduction target (2045)	100%	percentage	Based on compliance with state goals established by EO N-79-20.
Equation 12.3				
$Target_{Diesel,y}$	Fuel replacement target for diesel off-road fuels	See calculation table	percentage	–
$Target_{Diesel,2030}$	Fuel replacement target (2030)	55%	percentage	OFFROAD2021[1,4] and CARB applicable regulations requiring renewable diesel fuel use (i.e., In-Use Off-Road Diesel-Fueled Fleets Regulation and the

Variable	Definition	Value	Unit	Data Source
				Commercial harbor Craft Regulation)[5,6] and assuming 30% non-compliance
$Target_{Diesel,2045}$	Fuel replacement target (2045)	100%	percentage	Based on compliance with state goals established by EO N-79-20.

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. California Air Resources Board (CARB). 2024. Off-Road Emissions Inventory (OFFROAD2021). Available at: https://arb.ca.gov/emfac/offroad/emissions-inventory/3f377c1f45fef7c154509eac6354b9086be9cdd9
2. Humboldt region SORE fuel usage in 2030 was estimated based on attributions established in the Humboldt Regional 2022 GHG Inventory and by filtering CARB OFFROAD2021 model outputs for horsepower ratings less than or equal to 25. The results were divided by the total estimated off-road fuel usage in the Humboldt region in 2030 to estimate the share, or percentage, of fuel usage attributable to SOREs.
3. California Air Resources Board (CARB). SORE Applicability Fact Sheet (2021). Accessed at: https://ww2.arb.ca.gov/resources/fact-sheets/sore-applicability-fact-sheet.
4. Humboldt region diesel fuel usage in 2030 was estimated based on attributions established in the Humboldt Regional 2022 GHG Inventory and by filtering CARB OFFROAD2021 model outputs for horsepower ratings greater than or equal to 25 and for equipment categories subject to the In-Use Off-Road Diesel-Fueled Fleets Regulation. Commercial Harbor Craft was also included because it is also subject to renewable diesel usage under the Commercial Harbor Craft regulation. The results were divided by the total estimated off-road diesel usage in the Humboldt region in 2030 to estimate the share, or percentage, of fuel usage subject to the In-Use Off-Road Diesel-Fueled Fleets Regulation and Commercial Harbor Craft regulation which accounted for 79% of all diesel fuel use. It was assumed 30% non-compliance resulting in a target of 55%.
5. California Air Resources Board (CARB). (2022). Final Regulation Order Amendments to Sections 2449, 2449.1, and 2449.2 Title 12, California Code of Regulations. Accessed at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/off-roaddiesel/froa-1.pdf
6. California Air Resources Board (CARB). (2022) Commercial Harbor Craft Factsheet: Renewable Diesel (R100 or R99). Accessed at: https://ww2.arb.ca.gov/resources/fact-sheets/chc-factsheet-renewable-diesel-r100-or-r99

Table 32 Off-road Decarbonization GHG Emission Reduction Calculations

Variable	Definition	Units	2030	2045
Equation 12.1				
$CO_2e\ Emissions_y$	Forecasted off-road GHG emissions	MT CO_2e	129,836	139,645
$Fuel_{Gas,y}$	Forecasted gasoline use	gallons	3,202,801	3,625,989
$Fuel_{Diesel,y}$	Forecasted diesel use	gallons	9,348,454	9,908,708
$Fuel_{NG,y}$	Forecasted natural gas use	gallons	418,808	430,298
Weighted EFy	Weighted fuel emission factor	MT CO_2e/gallon	0.010010	0.010000
Equation 12.2				
$Target_{SORE,y}$	Fuel use reduction target for all off-road fuels	percentage	12%	100%
$Fuel\ Avoided_{SORE,y}$	Off-road fuel avoided from applicable SORE equipment	gallons	1,556,408	13,964,996
Equation 12.3				
$Target_{Diesel,y}$	Fuel use reduction target for all off-road fuels	percentage	55%	100%
$Fuel\ Replaced_{Diesel,y}$	Off-road fuel replaced from applicable diesel equipment >25 hp	gallons	4,524,652	0
Equation 12				
$CO_2e\ Reduction_{Fuel}$	**Fuel GHG emission reductions**	**MT CO_2e**	**49,143**	**139,645**

Measure T-9: Establish Humboldt as a pilot program for the decarbonization of the transportation sector to help drive State and philanthropic investment throughout Humboldt.

Measure T-9 aims to position the region as a pilot program for the decarbonization of rural transportation emissions by establishing a regional vision for rural transportation which incorporates relevant Measure efforts outlined in this report and attracting state[117] and philanthropic investment[118,119] to support this initiative. The decarbonization of rural transportation can pose a variety of challenges (e.g. longer average travel distances, more vehicles per household, lower average income, etc)[120] which are further exacerbated, or driven by, the long-term underinvestment in rural communities.[121] Establishing the region as a rural decarbonized transportation pilot program will drive increased investment in rural communities through a collaborative, county-wide approach to promote integrated solutions to Humboldt's transportation infrastructure. Furthermore, the pilot program would serve to position the Humboldt region as a leader in rural sustainability, attracting investments that can further enhance local and regional environmental efforts. As the parameters of the pilot program vision are not yet defined and would be based on other transportation Measures outlined in this report, GHG reductions are not quantified to avoid double counting of emissions.

[117] U.S Department of Transportation. 2024. Rural and Tribal Assistance Pilot Program. Available at: https://www.transportation.gov/buildamerica/RuralandTribalGrants

[118] Bezos Earth Fund. 2024. Our Programs. Available at: https://www.bezosearthfund.org/

[119] Bill & Melinda Gates Foundation. 2024. North America. Available at: https://www.gatesfoundation.org/our-work/places/north-america

[120] Smart Growth America. 2023. An Active Roadmap: Best Practices in Rural Mobility. Available at: https://smartgrowthamerica.org/wp-content/uploads/2023/07/SGA-Rural-Transportation-Field-Scan_Final_7.27.pdf

[121] U.S Department of Transportation. 2022. Building a Better America Fact Sheet for Rural Communities. Available at: https://transportation.gov/briefing-room/building-better-america-fact-sheet-rural-communities

Measure T-10: Work with the State and renewable fuel industry to establish a renewable fuel network within Humboldt thereby funding new green industry and job growth to support the decarbonization of the transportation sector.

Measure T-10 focuses on collaborating with the state and the biofuel industry (e.g. green hydrogen, renewable diesel, or renewable natural gas (RNG) production) to create a biofuel network within Humboldt to support transportation fuel decarbonization as well as fuel economic development. Humboldt faces significant challenges with electric infrastructure, limiting the region's ability to decarbonize through electricity as other parts of the state might. Biofuels serve as a transitional bridge, allowing the region to continue working towards its decarbonization goals despite challenges with electricity infrastructure. Bringing renewable diesel to the region is also a necessary step to support implementation of Measure T-8 and comply with a number of CARB's regulations on off-road equipment.

Moreover, the production of biofuels from biomass can help reduce wildfire risks by utilizing biomass that would otherwise fuel fires. Biofuels reduce emissions by substituting conventional fossil fuels with renewable organic materials which absorb CO_2 from the atmosphere during the growth phase of the organic material. Biogenic CO_2 refers to the carbon that was originally removed from the atmosphere by organic material and, under natural conditions, would eventually be released back into the atmosphere during degradation of the organic materials. When biofuels are combusted, the CO_2 released is considered biogenic, meaning it does not contribute to net atmospheric increase in carbon emissions. While biofuels do release other emissions that are not biogenic, these emissions are significantly lower compared to those from traditional fossil fuels. The production of biofuels can even facilitate carbon sequestration when paired with carbon capture technologies.[122] While the GHG emission reductions from this measure are not quantified in the RCAP due to the complexities in measuring industry-wide impacts, it is essential for driving alternative energy solutions and fostering economic growth.

This Measure primarily seeks to aid the development of hydrogen fuel in the region in support of Measures T-6 and T-7, particularly as an alternative solution for nonresidential vehicle decarbonization. Green hydrogen fuel provides a seamless, emissions free transition that can support a variety of light, medium, and heavy duty vehicle classes without needing to sacrifice travel range, an issue commonly faced by EVs in the nonresidential vehicle market.[123] For rural areas such as Humboldt County which experience greater travel distances on average compared to cities, hydrogen provides an attractive solution in addition to implementing EVs so that all travel needs are met in the community. Additionally, implementing a hydrogen network in Humboldt would serve to contribute to the State's goal to reach 200 hydrogen fueling stations by 2025.[124]

[122] U.S. Department of Energy. 2022. Bioenergy: A Pathway to Decarbonization. Available at: https://www.energy.gov/sites/default/files/2022-04/beto-decarbonizer-fs-04-2022.pdf

[123] FASTECH. 2023. Hydrogen vs. Electric: An Analysis for Long-Haul Trucking. Available at: https://www.fastechus.com/blog/hydrogen-vs-electric-for-trucking

[124] CA.gov. 2024. Hydrogen. Available at: https://business.ca.gov/industries/hydrogen/

Measure T-11: Lead by example and electrify or otherwise decarbonize 50% of the municipal fleet by 2030 in alignment with the State's Advanced Clean Fleet Rule

Measure T-11 commits each jurisdiction to lead by example by electrifying or otherwise decarbonizing its municipal fleet in line with the State's Advanced Clean Fleet Rule. Under the rule 50% of vehicles added to fleets subject to the regulation from 2024-2026 must be ZEVs with 100% of vehicles added to the fleet 2027 and after must be ZEV. Alternatively, fleets may opt-in to the Milestones Option. If the Milestone Option is selected, fleet owners must continuously meet or exceed the ZEV Fleet Milestone percentage as defined by the regulation. Compliance reporting would be required annually and within 30 days of adding vehicles to the fleet. This Measure aims to exceed State requirements by decarbonizing 50% of the municipal fleets by 2030. This measure will reduce GHG emissions from municipal operations and demonstrate the feasibility and benefits of transitioning to clean transportation technologies. While the strategies to decarbonize fleet vehicles will reduce GHG emissions, these emissions are already included as a subset of transportation sector emissions within the Humboldt Regional GHG Inventory. This means the associated GHG emission reductions are included within the community mitigation Measures (i.e., T-6 through T-7). Thus, to avoid double counting, this municipal mitigation measure is not counted towards the 2030 and 2045 targets.

5 Strategy SW: Solid Waste

The regional Solid Waste Strategy for Humboldt focuses on increasing diversion to reduce the amount of resources sent to the landfill and effectively using those diverted resources across the community. Currently, waste produced in the region is sorted and trucked long distances to processing facilities which are outside of county boundaries. This not only limits the community's influence over waste management, but also contributes to regional transportation emissions to haul waste outside of the County. The strategy aims to bolster regional infrastructure to allow for expanded organic and inorganic materials collection and separation services and providing local organic processing. In the landfill, organic waste decays without access to light or oxygen and produces methane (CH_4) gas. Diverting organic waste from the landfill reduces the occurrence of this anaerobic decomposition, providing the region with an important opportunity to reduce solid waste GHG emissions. Diverted organic waste can be further processed and repurposed into an array of different types of products, such as compost or renewable natural gas, which can serve to sequester or offset carbon emissions. Thus, managing organic waste provides an important opportunity to employ circular economy methods to reduce GHG emissions and sequester carbon. While diverting inorganic waste from the landfill does not provide direct GHG emission reductions, it does support indirect GHG emission reduction benefits outside the Humboldt region's jurisdiction.

Based on this solid waste strategy and current conditions of the region's solid waste infrastructure, the RCAP's Solid Waste Strategy consists of one primary Measure presented in Table 33. The following subsection details the substantial evidence and calculation methodology of the quantitative Measure.

Table 33 Strategy SW: Solid Waste GHG Emission Reduction Summary

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
SW-1	Establish a local waste separation facility and organics managements to be able to reduce waste sent to landfills by 75% by 2030. Reduce GHG emissions by limiting truck trips required to ship waste out of the County and import compost from out of the County.	29,689	32,568
Total		**29,689**	**32,568**

Measure SW-1: Establish a local waste separation facility and organics managements to be able to reduce waste sent to landfills by 75% by 2030. Reduce GHG emissions by limiting truck trips required to ship waste out of the County and import compost from out of the county.

Measure SW-1 aims for the region to meet SB 1383 requirements to recover 20 percent of disposed edible food for human consumption and reduce landfilled organic waste—and its associated GHG emissions—75 percent by 2025. The primary Actions that enable this Measure include:

- **Action SW-1a** which directs the Regional Climate Committee in partnership with Humboldt Waste Management and Recology to conduct an assessment of waste diversion needs, current capacity, and land-use opportunities for developing local waste processing facilities;
- **Action SW-1b** which directs HWMA to pursue green bond funding opportunities for the purpose of constructing local waste processing facilities in accordance with the assessment completed in SW-1a;
- **Action SW-1d** which commits regional jurisdictions to implement SB 1383 requirements by establishing incorrect sorting fees, improving bin signage, promoting organic collection services, establishing local compost hubs, and providing public access organics and recycling collection as applicable;
- **Action SW-1e** which commits jurisdictions to adopt a food recovery ordinance in compliance with SB 1383 and to support implementation of the ordinance by identifying the necessary infrastructure to recover 20% of edible food disposed and obtain funding to establish an edible food recovery program;
- **Action SW-1f** which commits jurisdictions to continue partnering with HWMA and Recology to implement structural changes or expand services to currently under-serviced regions, as applicable, to comply with SB 1383;
- **Action SW-1l** which directs jurisdictions, with support from the Regional Climate Committee, to provide targeted, multilingual education and technical assistance to communities based on results of regional waste characterization studies and waste monitoring programs which cover topics such as reuse, sustainable purchasing, and reducing food waste;

These Actions encompass the activities the California Department of Resources Recycling and Recovery (CalRecycle) requires jurisdictions to conduct to comply with SB 1383.[125] Humboldt faces challenges in solid waste management due to a lack of local processing infrastructure and solid waste management funding, hindering efficient diversion efforts. However, initiatives supported by green bonds have shown promise in promoting solid waste infrastructure and expansion in other regions, such as the Napa Solid Waste Project[126] and initiatives supported by RethinkWaste,[127] which have utilized green bonds to fund critical waste management infrastructure upgrades and expansions. Pursuing green bond funding and other applicable funding opportunties to allow

[125] CalRecycle. SB 1383 Jurisdiction Responsibilities. Accessed at: https://www2.calrecycle.ca.gov/Docs/Web/119160#:~:text=Beginning%20in%202022%2C%20SB%201383,is%20automatically%20provided%20the%20service.

[126] NHA Advisors. 2016. Napa Solid Waste Project/Green Bond Designation. Available at: https://nhaadvisors.com/portfolio-items/napa-solid-waste-project-green-bond-designation/

[127] ReThink Waste. 2019. RethinkWaste Issues almost $50 million in Green Bonds for environmental upgrades to reduce greenhouse gases, reduce waste and improve recycling revenue at the Shoreway Environmental Center. Available at: https://rethinkwaste.org/wp-content/uploads/legacy_media/070119-rethinkwaste-green-bonds-final.original.pdf

Humboldt to build out the necessary infrastructure for local waste processing is considered a key first step to the region being able to achieve compliance with SB 1383.

With adequate infrastructure for local waste processing in place, then, continuing and completing the activities that meet SB 1383 complaince obligations, like the establishment of an edible food recovery program and ensuring adequate organic waste collection services on a jursidictional level can be expected to achieve the levels of diversion needed to reduce Humboldt's landfilled organic waste 75 percent by 2030. This level of landfilled organic waste reduction is expected to directly reduce solid waste disposal GHG emissions by 75 percent because nearly all GHG emissions from the natural decay of solid waste in landfills come from organic waste.[128] This Measure also includes several Actions focused on education and outreach campaigns to influence consumer behavior to produce less waste to begin with and to promote reuse, repair, and composting when possible to further divert waste from the landfill. For the region to comply with SB 1383, it will take partnerships and obtaining funding to build out the necessary infrastructure, jursidcitional support to develop programs and polcies that support waste diversion, and community engagement to change consumer behavior.

Table 34 shows the parameters and data sources that support the landfilled organic waste reduction GHG emission reductions and Table 35 shows the calculations as outlined in Equation 17.

Landfilled Organic Waste Reduction Equations

Equation 13 $CO_2e\ Reduction_{LOW,y} = CO2e\ Emissions_y * Reduction\ Target_{LOW,\ y}$

Table 34 Landfilled Organics Reduction Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 13				
$CO_2e\ Reduction_{LOW,y}$	Landfilled organic waste GHG emission reductions	See calculation table	MT CO_2e	Calculated
$CO_2e\ Emissions_y$	Landfilled organic waste GHG emissions	See calculation table	MT CO_2e	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Reduction\ Target_{LOW,\ y}$	Landfilled organic waste reduction percent	75	percentage	Estimated based on compliance with CalRecycle's required activities for SB 1383 compliance and GHG emission factors for solid waste.[1, 2]
y	Year	2030 or 2045	–	–

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. CalRecycle. SB 1383 Jurisdiction Responsibilities. Accessed at: https://www2.calrecycle.ca.gov/Docs/Web/119160#:~:text=Beginning%20in%202022%2C%20SB%201383,is%20automatically%20provided%20the%20service
2. According to the ICLEI U.S. Community Protocol, Appendix E, GHG emissions are generated by non-biologic wastes only if they are combusted.

128 According to the Local Governments for Sustainability (ICLEI) U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Appendix E – Solid Waste Emission Activities and Sources, GHG emissions are generated by non-biologic wastes only if they are combusted.

Table 35 Landfilled Organics Reduction GHG Emission Reduction Calculations

Variable	Definition	Units	2030	2045
Equation 13				
CO_2e Emissions	Landfilled organic waste GHG emissions	MT CO_2e	39,585	43,424
Reduction Target$_{LOW, y}$	Landfilled organic waste reduction percent	percentage	75%	75%
CO_2e Reduction$_{LOW}$	**Landfilled organic waste GHG emission reductions**	**MT CO_2e**	**29,689**	**32,568**

6 Strategy WW: Water and Wastewater

The Humboldt Regional Water and Wastewater Strategy aims to identify and establish decarbonization technologies suitable to the region's varied wastewater management systems. In addition to decarbonizing the wastewater sector, the strategy aims to prioritize co-benefits of potential wastewater processing technologies, such as the production of renewable fuels. Although wastewater contributed just 1 percent of the community's regional GHG emissions in 2022, the ongoing decarbonization of other sectors will increase the need to address emissions from sectors like wastewater. Therefore, the Water and Wastewater Strategy aims to set the region up for success by identifying viable alternatives in this phase of RCAP implementation.

Based on this strategy, the RCAP's strategy to manage wastewater systems is presented in Table 36. The table also indicates that the Measure is supportive as it does not directly result in GHG reductions at this stage. The following subsections provide further information on the benefits of the wastewater strategy.

Table 36 Strategy WW: Water and Wastewater GHG Emissions Reduction Summary

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
WW-1	Expand regional opportunities for implementation of wastewater decarbonization technologies such as anaerobic digesters to reduce GHG and produce renewable fuel sources.	Supportive	Supportive
WW-2	Reduce per capita potable water consumption by 15% by 2030.	Supportive	Supportive
Total		**0**	**0**

Notes:

Measure WW-1: Expand regional opportunities for implementation of wastewater decarbonization technologies such as anaerobic digesters to reduce GHG and produce renewable fuel sources.

Measure WW-1 focuses on expanding regional opportunities for the implementation of wastewater decarbonization technologies, including anaerobic digesters, throughout the Humboldt region. This measure aims to reduce GHG emissions from wastewater treatment processes and generate renewable fuel sources that can be used to decarbonize wastewater facility building energy or provide a supply of decarbonized energy to the community. It also investigates opportunities for expanding wastewater treatment capabilities to process organic waste that would otherwise go to landfill, supporting solid waste diversion and GHG reduction efforts. As this measure seeks to scope and assess viable options for the variety of wastewater facilities throughout the County, GHG emissions reductions are not quantified in the RCAP. However, this Measure will aid the jurisdictions in identifying and implementing future solutions for reducing GHG emissions from wastewater in future RCAP updates.

Measure WW-2: Reduce per capita potable water consumption by 15% by 2030.

Measure WW-2 focuses on promoting water conservation by reducing per capita potable water consumption and increasing access to and use of recycled water. The State is currently finalizing the Making Water Conservation a Way of Life regulation, which will set water conservation standards and objectives for certain categories with targets set for each urban water retailer. This measure's primary focus is providing support to water retailers in the region to align with the regulation as well as providing educational and outreach materials to promote water conservation in the community and from large water users. Additionally, the Measure encourages local water providers and wastewater services to work together to identify opportunities for expanding the recycled water network in the region. While the region does not currently have issues with accessing water, continued climate conditions strain water resources in the state. Expanding recycled water resources allow for water reuse for certain applications such as agricultural land irrigation or for wildfires rather than potable water. All water providers for the region operate fully in county-boundaries and therefore GHG emissions associated with water conveyance are incorporated into the building energy sector under regional electricity use. As such, to avoid double counting of emission reductions associated with electricity use in the region, GHG emissions reductions associated with this Measure are not quantified in the RCAP.

7 Strategy CS: Carbon Sequestration

The Regional Carbon Sequestration Strategy aims to increase both nature-based and industrial carbon sequestration within the community. While most of the Humboldt region's mitigation strategies focus on reducing GHG emissions, the Carbon Sequestration Strategy capitalizes on Humboldt's strengths and opportunities, particularly its ample forested areas and natural working lands. This strategy supports the statewide objectives, as described in the 2022 Scoping Plan, to leverage natural working lands (NWL) to reduce potential carbon losses and support sequestration of GHG emissions. The State recognizes that while on-the-ground action for local carbon sequestration and NWL management will largely be executed and managed by the local government, state agencies must support these communities to implement such actions which includes providing resources, developing implementation frameworks, and providing the increased capacity and technical assistance to the local and regional partners. The State plans to support local governments and partners through various initiatives, including the development of funding programs such as the Regional Forest and Fire Capacity Program. This program provides funding to local and regional groups to enhance their organizational capacity, enabling them to plan and implement wildfire and forest management projects based on their local expertise.[129]

The Carbon Sequestration Strategy emphasizes the identification and funding of both industrial and nature based physical removal of carbon from the atmosphere to store it in long-term forms, playing a crucial role in achieving carbon neutrality by 2045. It focuses on obtaining resource support from the State to obtain NWL objectives and developing private partnerships to explore alternative solutions for carbon sequestration, such as direct air carbon capture and sequestration.

While the region will reduce GHG emissions across all sectors to achieve as close to zero GHG emissions as possible, some GHG emissions are expected to remain under each jurisdiction's control in 2045. These GHG emissions are expected to be from hard-to-decarbonize sectors, such as long-haul transportation, which have technological limitations or are costly to decarbonize. They can also be expected from sectors that require significant behavior change to decarbonize, such as VMT reduction, because it takes time to normalize new behaviors. Carbon sequestration will offset these remaining GHG emissions to help Humboldt achieve carbon neutrality. While most of these strategies are not quantified in this RCAP, they are important to implement now to begin setting the foundation and building the capacity for the Humboldt region to sequester carbon for long-term carbon neutrality. Based on this approach, the RCAP's Carbon Sequestration Strategy consists of the Measures presented in Table 37. Each Measure is supportive due to data limitations. The following subsections detail the role of these supportive Measures.

[129] California Air and Resources Board (CARB). 2022. 2022 Scoping Plan for Achieving Carbon Neutrality. Available at: https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf

Table 37 Strategy CS: Carbon Sequestration GHG Emissions Reduction Summary

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
CS-1	Research and implement feasible carbon sequestration technology opportunities to support growth and expansion of green jobs industry within the region.	Supportive	Supportive
CS-2	Offset fossil-based emissions and increase carbon sequestration in the community by achieving SB 1383 procurement requirements (0.08 tons recovered organic waste per person) by 2030.	1,532	1,681
CS-3	Develop a County-wide Natural and Working Lands GHG Inventory baseline by 2027 to better understand the existing and future GHG sequestration and help obtain resources to protect and increase natural carbon sequestration occurring in the region as well as promote biodiverse forests and wetlands resistant to wildfire.	Supportive	Supportive
Total		**1,532**	**1,681**

Notes:

Measure CS-1: Research and implement feasible carbon sequestration technology opportunities to support growth and expansion of green jobs industry within the region.

In 2022, the State updated GHG emissions reduction targets such that 15 percent of the State's GHG inventory would be addressed through man-made carbon sequestration solutions in order to reach carbon neutrality.[130] In alignment with the State objective, Measure CS-1 directs the Regional Climate Committee to research the viability of carbon sequestration technologies for future regional development to aid in the reduction of GHG emissions and stimulate the growth of the green jobs industry in the area, such as utilizing the Eel River Basin as a CO_2 sequestration site.[131] Artificial (i.e. non-biological processes) carbon capture and sequestration technologies typically capture CO_2 from the atmosphere, or from point source emissions, and store the captured CO_2 in the natural environment.[132] However, with advancing need for solutions, other methods of carbon capture have begun to emerge, such as CO_2 capture from seawater.[133]

By assessing the feasibility of the carbon capture technologies available, the region will set the groundwork for later implementation of technologies which suit the areas and the community's needs. While this Measure does not lead to direct GHG emissions reductions at this stage, it sets Humboldt on a path to successfully meeting, or exceeding, 2045 GHG reductions targets.

[130] LegiScan. 2022. California Assembly Bill 1279. Available at: https://legiscan.com/CA/text/AB1279/id/2606946

[131] California Geological Survey. 2006. An Overview of Geological Carbon Sequestration Potential in California. Available at: https://www.conservation.ca.gov/cgs/Documents/Publications/Special-Reports/SR_183-Carbon-Report.pdf

[132] Nationalgrid. 2024. Carbon capture technology and how it works. Available at: https://www.nationalgrid.com/stories/energy-explained/carbon-capture-technology-and-how-it-works

[133] Massachusetts Institute of Technology. 2023. How to pull carbon dioxide out of seawater. Available at: https://news.mit.edu/2023/carbon-dioxide-out-seawater-ocean-decorbonization-0216

Measure CS-2: Offset fossil-based emissions and increase carbon sequestration in the community by achieving SB 1383 procurement requirements (0.08 tons recovered organic waste per person) by 2030.

Measure CS-2 puts the region on a path to meeting the SB 1383 procurement targets by 2030 and maintain it thereafter. SB 1383 requires each jurisdiction in California to procure recovered organics waste products to meet annual procurement targets developed by CalRecycle.[134] Recovered organic waste products include compost, mulch, renewable energy generated from anaerobic digestion (e.g., transportation fuel, electricity, and gas for heating), and electricity generated from biomass conversion. While a jurisdiction has the option to procure any combination of recovered organic waste products to fulfill 100 percent of its procurement target, jurisdictions in Humboldt currently aim to meet their procurement targets primarily through sourcing of compost to leverage the carbon sequestration benefits it provides when applied to community lands. However, local jurisdictions have expressed interest in potentially expanding procurement options, though more research must be conducted before committing to alternative options. The primary Actions that enable this Measure include:

- **Action CS-2a** which commits applicable jurisdictions to enforce compliance with SB 1383 by establishing a minimum level of compost application per year;
- **Action CS-2b** which directs jurisdictions, with support from the Regional Climate Committee, central to the regional agriculture industry to establish a compost broker program which provides incentives to aid procurement and distribution of compost.
- **Action CS-2d** which commits all jurisdictions to provide free compost procurement services to low-income households and small businesses.
- **Action CS-2f** which directs a collaborative research effort to identify regionally viable opportunities for sourcing non-compost organics options to meet SB 1383 procurement requirements, such as renewable natural gas or use of organics to produce green hydrogen.

These Actions will allow the jurisdictions to establish the supply and procurement of recovered organic products to meet their annual procurement targets. These actions and the region's organics infastructure limitations will be further supported by the funding and construction of local waste and organic processing infrastructure discussed in Measure SW-1. Table 38 shows the parameters and data sources that support the annual procurement targets and landfilled organic waste reduction GHG emission reductions, assuming 100 percent SB 1383 compliance through compost, associated with this Measure. Table 39 shows the calculations as outlined in Equation 14 through 14.1.

Compost Procurement Equations

Equation 14 $CO_2e\ Sequestration_y = (Compost_y * CSF_{Compost}) * Compliance\ Target_y$

Equation 14.1 $Compost_y = Population_y * (Ratio_{procure} * CF_{compost})$

[134] CalRecycle. Procurement Targets and Recovered Organic Waste Products. Accessed at: https://calrecycle.ca.gov/organics/slcp/procurement/recoveredorganicwasteproducts/.

Table 38 Compost Procurement Parameters and Data Sources

Variable	Definition	Value	Unit	Data Source
Equation 14				
$CO_2e\ Sequestration_y$	Carbon sequestered from compost procurement and application	See calculation table	MT CO_2e	Calculated
$Compost_y$	Compost procurement required to meet organic waste procurement target	See calculation table	compost tons	Calculated
$CSF_{compost}$	Carbon sequestration factor for mixed organic compost application	0.23	MT CO_2e/ feedstock ton	CARB[1]
$Compliance\ Target_y$	Compliance target with procurement requirement	100%	percentage	State required compliance with SB 1383[2]
y	Year	2030 or 2045	–	–
Equation 14.1				
$Population_y$	Forecasted population	See calculation table	persons	See references in Appendix GHG Inventory, Forecast, and Targets Technical Report
$Ratio_{procure}$	Organic waste procurement required per capita	0.08	feedstock tons/person	CalRecycle's Procurement Calculator Tool[3]
$CF_{compost}$	Conversion factor of organics to compost tons	0.58	compost tons/organic waste tons	CalRecycle's Procurement Calculator Tool[3]

Notes: "-" means either reference not applicable or see references for disaggregated parameter in the following table rows

1. CARB. Method for Estimating Greenhouse Gas Emission Reductions from Diversion Of Organic Waste from Landfills to Compost Facilities (2017). Accessed at: https://ww2.arb.ca.gov/sites/default/files/classic/cc/waste/cerffinal.pdf.
2. CalRecycle. Procurement Targets and Recovered Organic Waste Products. Accessed at: https://calrecycle.ca.gov/organics/slcp/procurement/recoveredorganicwasteproducts/.
3. CalRecycle. Procurement Calculator Tool. Accessed at: https://calrecycle.ca.gov/organics/slcp/reporting/.

Table 39 Landfilled Organics Reduction GHG Emission Reduction Calculations

Variable	Definition	Units	2030	2045
Equation 14.1				
$Population_y$	Forecasted population	persons	143,556	157,476
$Ratio_{procure}$	Organic waste procurement required per capita		0.08	0.08
$CF_{compost}$	Conversion factor of organics to compost tons		0.58	0.58
$Compost_y$	Compost procurement required to meet organic waste procurement target	tons	6,661	7,307
Equation 14				
$Compliance\ Target_y$	Compliance target with procurement requirement	percentage	100%	100%
$CSF_{compost}$	Carbon sequestration factor for mixed organic compost application	MT CO_2e/ feedstock ton	0.23	0.23
$CO_2e\ Sequestration_y$	**Carbon sequestered from compost procurement and application**	**MT CO_2e**	**1,532**	**1,681**

Measure CS-3: Develop a County-wide Natural and Working Lands GHG Inventory baseline by 2027 to better understand the existing and future GHG sequestration and help obtain resources to protect and increase natural carbon sequestration occurring in the region as well as promote biodiverse forests and wetlands resistant to wildfire.

Measure CS-3 directs the County to build off of North Coast Resource Partnership's 2017 Northern California regional natural working lands study to establish an updated County-wide Natural and Working Lands GHG Inventory baseline by 2027. This initiative seeks to provide a comprehensive understanding of current and future potential GHG sequestration within the County's natural and working lands. The Natural and Working Lands inventory baseline will be folded into future RCAP updates and used to establish GHG sequestration tracking metrics and monitor resiliency efforts. Further this measure includes strengthening the partnership with the North Coast Resource Partnership (NCRP) that received a $13.5 million grant from the Regional Forest and Fire Capacity Program to refine and implement the North Coast Resilience Plan.[135] Developing and strengthening this partnership may provide opportunities for the region to better implement and track projects maintaining and improving regional carbon stock.

Developing this Natural and Working Lands inventory will identify key areas where natural carbon sequestration is occurring and highlight opportunities to protect and expand these areas. By promoting biodiverse forests and wetlands that are resilient to wildfire, Measure CS-3 supports the dual goals of enhancing carbon sequestration and mitigating climate risks. This measure will help the region obtain funding and resources necessary for conservation and restoration projects, ultimately contributing to long-term climate resilience, biodiversity, and the health of natural ecosystems. With a baseline established, carbon sequestration can be effectively tracked and reflected in updates to the RCAP's GHG reduction measures. The region is anticipated to contribute significantly to the State's carbon sequestration efforts and may even serve as a larger sink than contributor, but this cannot be verified without a comprehensive inventory of carbon stocks in the region. Through this comprehensive approach, Humboldt can better manage its natural resources to maximize GHG sequestration and safeguard against environmental threats.

[135] North Coast Resource Partnership (NCRP). 2023. A Vision for North Coast Resilience. Available at: https://northcoastresourcepartnership.org/resilience-plan/wp-content/uploads/2023/04/NorthCoastVision_2023.03.11.pdf

8 Strategy R: Refrigerants

The Refrigerants Strategy aims to assess the impact of hydrofluorocarbons (HFCs) in the community and establish effective approaches for reducing high-GWP refrigerant emissions. Although HFCs may currently represent a smaller fraction of overall community GHG emissions, their significant global warming potential underscores the importance of addressing them in a comprehensive GHG inventory. This strategy seeks to prepare a baseline analysis of the volume of HFCs released into the atmosphere, as well as to evaluate whether existing CARB measures are sufficiently mitigating these releases. If gaps in CARB's regulatory reach are identified, the strategy may recommend that the County supplement these efforts to safeguard that refrigerant emissions are minimized. The Refrigerants Strategy thereby aims to position the community for long-term success in reducing emissions across all sectors by preparing the County to address HFCs in future GHG reduction goals.

The RCAP's strategy to manage refrigerants is presented in Table 36. The table also indicates that the Measure is supportive as it does not directly result in GHG reductions at this stage. The following subsections detail the role of this supportive Measure in aiding RCAP goals.

Table 40 Strategy R: Refrigerants

Measure ID	Measure	2030 GHG Emission Reductions (MT CO_2e)	2045 GHG Emission Reductions (MT CO_2e)
R-1	Prepare a baseline analysis of the volume of HFCs released into the atmosphere and evaluate whether these releases are being adequately addressed by CARB or whether the County should supplement the work of CARB.	Supportive	Supportive
Total		**0**	**0**

Notes:

Measure R-1: Prepare a baseline analysis of the volume of HFCs released into the atmosphere and evaluate whether these releases are being adequately addressed by CARB or whether the County should supplement the work of CARB.

In light of the high GWP associated with HFCs and similar refrigerants, Measure R-1 directs the Regional Climate Committee to conduct a thorough analysis of these emissions within Humboldt County. This measure aligns with state-level climate goals by addressing the need to quantify and ultimately reduce harmful refrigerant emissions. A core challenge in addressing HFC emissions lies in the inherent difficulty of obtaining accurate, reliable data on refrigerant use and leakage on a community-wide scale due to a lack of centralized reporting and variations in HFC usage across sectors. Part of this measure's purpose is to identify pathways to overcome this data gap and establish a robust regional inventory of HFC emissions.

To address this, the Regional Climate Committee will initiate a comprehensive study to develop a baseline estimate of HFC emissions in the region, gathering available data sources and identifying key areas where data is lacking. Following the baseline analysis, the Committee will coordinate with CARB to review existing refrigerant tracking and reduction programs and assess their effectiveness within the local context. This collaboration will help identify any regulatory gaps where emissions are insufficiently managed and explore possible actions that the County could take to supplement CARB's efforts. While the study will not immediately result in direct GHG reductions, it establishes a foundational step in building an accurate and comprehensive refrigerant emissions inventory in the Humboldt region. This inventory will guide future measures to address HFC emissions, setting the stage for long-term climate progress.