



**Appendix
05**

**County of San Diego
Climate Action Plan Update:
Greenhouse Gas Reduction
Targets and Gap Analysis -
Technical Memorandum**



Memo

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Date: April 12, 2024
To: Meghan Kelly (County of San Diego)
From: Andrew Martin and Poonam Boparai (Ascent)
Subject: County of San Diego Climate Action Plan Update: Greenhouse Gas Reduction Targets and Gap Analysis – Technical Memorandum

1 INTRODUCTION

This technical memorandum describes the approach used to establish target levels for the reduction of greenhouse gas (GHG) emissions in the County of San Diego (County) Climate Action Plan Update (CAP Update).

2 REGULATORY CONTEXT

The County's GHG reduction targets were developed in the context of the County Board of Supervisors' Framework for the Future, and statewide plans, laws, and executive orders addressing statewide limits on levels of GHG emissions. This regulatory context for the County's GHG reduction targets is described further below.

2.1 FRAMEWORK FOR THE FUTURE

The County Board of Supervisors approved the Framework for the Future, "Actions to Achieve Bold Climate Action at the County of San Diego," on January 13, 2021, which created policy recommendations for the CAP Update, which include achieving at a minimum Senate Bill 32 GHG emissions reductions of 40% below 1990 levels by 2030 and establishing actions to meet a goal of net zero carbon emission by 2035-2045, in line with Executive Order (EO) B-55-18.

2.2 STATE EXECUTIVE ORDERS AND LEGISLATION

The State government has set forth statewide GHG emissions reduction targets through executive orders issued by the Governor and laws adopted by the Legislature. Executive orders and State laws most relevant to the established of GHG reduction targets for the County's CAP Update are described below.

2.2.1 Executive Order S-3-05 (2005)

EO S-3-05 of 2005 established near-, mid-, and long-term goals for reducing statewide GHG emissions to the following levels:

- ▶ By 2010: reduce GHG emissions to 2000 levels.
- ▶ By 2020, reduce GHG emissions to 1990 levels.
- ▶ By 2050, reduce GHG emissions to 80 percent below 1990 levels.

2.2.2 California Global Warming Solutions Act of 2006 (Assembly Bill 32, 2006)

Assembly AB 32 (Nunez, 2006) established the EO S-3-05 goal of reducing statewide emissions to 1990 levels by 2020 as State law. It required the California Air Resources Board (CARB) to approve a scoping plan at least every five years for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions by 2020.

2.2.3 California Global Warming Solutions Act of 2006: Emissions Limit (Senate Bill 32, 2016)

Senate Bill (SB) 32 (Pavley, 2016) revised State law to require that CARB, when adopting rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emissions reductions, ensure that statewide GHG emissions are reduced to at least 40 percent below 1990 levels by 2030. Before being codified into law by SB 32, the goal of reducing statewide GHG emissions to 40 percent below 1990 levels was established by EO B-30-15 in 2015. The text of EO-B-30-15 refers to its 2030 statewide emissions limit as an “interim target” needed to achieve the 2050 emissions target of EO-S-3-05.

2.2.4 Executive Order B-55-18 (2018) to Achieve Carbon Neutrality

EO B-55-18 established a new statewide goal to achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter. It explains that this carbon neutrality goal is in addition to the existing statewide GHG emissions reduction targets.

2.2.5 The California Climate Crisis Act (Assembly Bill 1279, 2022)

AB 1279 (Muratsuchi, 2022) revised State law by making it the policy of the State to do both of the following:

- ▶ Achieve net zero GHG emissions as soon as possible, but no later than 2045, and to achieve and maintain net negative emissions thereafter; and
- ▶ Ensure that by 2045, statewide anthropogenic GHG emissions are reduced to at least 85 percent below 1990 levels as a pathway for meeting the net zero goal.

AB 1279 defines net zero GHG emissions as a condition in which GHG emissions released into the atmosphere are balanced by removals of GHG emissions over a period of time. CARB uses the United States Environmental Protection Agency (USEPA) definition of anthropogenic GHG emissions, which refers to emissions that are a direct result of human activities or are the result of natural processes that have been affected by human activities. A further discussion on the specific activities and GHGs included in this definition can be found on pages ES-8 through ES-16 of the USEPA 2023 *Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2021* (USEPA, 2023).

These statewide GHG reduction targets set forth in the California Climate Crisis Act supersede the EO B-55-18 goal to achieve carbon neutrality no later than 2045 with a target of net zero GHG emissions no later than 2045 and expand upon them by requiring that anthropogenic GHG emissions (e.g., emissions associated with burning fossil fuels, waste generation) are reduced to at least 85 percent below 1990 levels by 2045.

AB 1279 requires that statewide emissions be reduced to lower levels (5% lower) and on a faster timeline (5 years sooner) than EO S-03-05, which established a goal of reducing statewide GHG emissions to 80 percent below 1990 levels by 2050. This statute also requires that updates to the scoping plan prepared by CARB achieve the statewide GHG emissions reduction targets set forth in AB 1279.

2.3 2022 SCOPING PLAN FOR ACHIEVING CARBON NEUTRALITY

The 2022 Scoping Plan addresses the AB 1279 emissions limits by identifying a technologically feasible, cost-effective scenario – referred to as the Scoping Plan Scenario – to achieve statewide carbon neutrality by 2045 and a reduction in anthropogenic emissions by 85 percent below 1990 levels. It also identifies a path to keep California on track to meet its SB 32 GHG reduction target of at least 40 percent below 1990 emissions by 2030 but concludes that additional reductions are needed by 2030 – to 48 percent below 1990 levels – for the state to stay on track to achieve net zero GHG emissions no later than 2045 pursuant to AB 1279 (CARB 2022a:108; 116). The 2022 Scoping Plan is the first scoping plan to consider natural and working lands (NWL) as part of the State’s strategy to reduce GHG emissions through increases in carbon storage.

2.3.1 2022 Scoping Plan Alternatives

The Scoping Plan development process included evaluation of the technological feasibility, cost-effectiveness, and equity-focused pathways for the state to achieve statewide carbon neutrality prior to 2045. In this process of evaluating alternatives, CARB modeled scenarios for economic GHG emission sectors and in four alternatives, including two alternatives for reaching carbon neutrality prior to 2035. The ability for NWL to sequester carbon was also evaluated in four separate alternatives to maximize effectiveness of natural carbon dioxide removal (CDR). Based on this information and a thorough stakeholder engagement process, CARB decided on a preferred “Scoping Plan Scenario” of achieving net zero emissions by 2045. The alternatives evaluated and the preferred Scoping Plan Scenario are discussed further below.

2022 SCOPING PLAN ALTERNATIVES EVALUATING STATEWIDE CARBON NEUTRALITY BY 2035

The draft version of the 2022 Scoping Plan (May 2022) considered two alternative scenarios that would achieve statewide carbon neutrality by 2035 (referred to as Alternatives 1 and 2) (CARB 2022d). Ultimately CARB adopted the final 2022 Scoping Plan using the Scoping Plan Scenario, which identifies a statewide pathway to carbon neutrality by 2045. CARB ultimately concluded that the Scoping Plan Scenario for 2045 carbon neutrality is more cost effective and technologically feasible than the 2035 carbon neutrality alternatives and identified “several feasibility concerns” with 2035 carbon neutrality. CARB performed analysis demonstrating that 2035 carbon neutrality alternatives 1 and 2 would have the following outcomes relative to the 2045 timeline of the Scoping Plan Scenario:

- ▶ 5 times and 3 times slower job growth in 2035,
- ▶ 7 times and 6 times higher direct costs in 2035, and
- ▶ 6 times and 5 times slower economic growth in 2035 (CARB 2022d:44), respectively.

THE SCOPING PLAN SCENARIO

The Scoping Plan Scenario shows that it is economically and technologically feasible to reduce emissions to at least 85 percent below 1990 levels by 2045 as called for by AB 1279. It also shows that mitigation of 100% of anthropogenic emissions by 2045 is not economically and technologically feasible and that CDR should be utilized to achieve California’s carbon neutrality target. In addition, the Scoping Plan Scenario shows that natural and working lands are projected to be a net emissions source of approximately 7 million metric tons of carbon dioxide equivalent per year (MMTCO_{2e}/year) in 2030 and 2045 (CARB 2022a:91), even with actions to preserve carbon storage potential. As a result, the Scoping Plan Scenario compensates for residual anthropogenic emissions and net emissions from natural working lands with additional CDR strategies, including mechanical direct air capture.

The actions included in the Scoping Plan Scenario to reduce anthropogenic emissions and manage carbon stocks in natural and working lands to achieve statewide net zero emissions by 2045 are summarized in Table 1. The table

shows the types of technologies and energy needed to drastically reduce anthropogenic GHG emissions. It also includes references to relevant statutes and Executive Orders, although it is not comprehensive of all existing new authorities for directing or supporting the actions described. The following actions of the Scoping Plan Scenario achieve the AB 1279 target of 85 percent below 1990 levels by 2045 and identify a need to accelerate the 2030 target to 48 percent below 1990 levels.

Table 1. Scoping Plan Scenario Actions to Reduce Anthropogenic Emissions and Manage Carbon Stocks in Natural and Working Lands

Sector	Actions Included in the Scoping Plan Scenario
Smart Growth / Vehicle Miles Traveled (VMT)	VMT per capita reduced 25% below 2019 levels by 2030, and 30% below 2019 levels by 2045
Light-duty Vehicle (LDV) Zero Emission Vehicles (ZEVs)	100% of LDV sales are ZEV by 2035
Truck ZEVs	100% of medium-duty (MDV)/HDV sales are ZEV by 2040 (AB 74 University of California Institute of Transportation Studies [ITS] report)
Aviation	20% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045. Sustainable aviation fuel meets most or the rest of the aviation fuel demand that has not already transitioned to hydrogen or batteries.
Ocean-going Vessels (OGV)	2020 OGV At-Berth regulation fully implemented, with most OGVs utilizing shore power by 2027. 25% of OGVs utilize hydrogen fuel cell electric technology by 2045.
Port Operations	100% of cargo handling equipment is zero-emission by 2037. 100% of drayage trucks are zero emission by 2035.
Freight and Passenger Rail	100% of passenger and other locomotive sales are ZEV by 2030. 100% of line haul locomotive sales are ZEV by 2035. Line haul and passenger rail rely primarily on hydrogen fuel cell technology, and others primarily utilize electricity.
Oil and Gas Extraction	Reduce oil and gas extraction operations in line with petroleum demand by 2045.
Petroleum Refining	CCS on majority of operations by 2030, beginning in 2028 Production reduced in line with petroleum demand.
Electricity Generation	Sector GHG target of 38 million metric tons of carbon dioxide equivalent (MMTCO _{2e}) in 2030 and 30 MMTCO _{2e} in 2035 Retail sales load coverage 20 gigawatts (GW) of offshore wind by 2045 Meet increased demand for electrification without new fossil gas-fired resources.
New Residential and Commercial Buildings	All electric appliances beginning 2026 (residential) and 2029 (commercial), contributing to 6 million heat pumps installed statewide by 2030
Existing Residential Buildings	80% of appliance sales are electric by 2030 and 100% of appliance sales are electric by 2035. Appliances are replaced at end of life such that by 2030 there are 3 million all-electric and electric-ready homes—and by 2035, 7 million homes—as well as contributing to 6 million heat pumps installed statewide by 2030.
Existing Commercial Buildings	80% of appliance sales are electric by 2030, and 100% of appliance sales are electric by 2045. Appliances are replaced at end of life, contributing to 6 million heat pumps installed statewide by 2030.
Food Products	7.5% of energy demand electrified directly and/or indirectly by 2030; 75% by 2045
Construction Equipment	25% of energy demand electrified by 2030 and 75% electrified by 2045
Chemicals and Allied Products; Pulp and Paper	Electrify 0% of boilers by 2030 and 100% of boilers by 2045. Hydrogen for 25% of process heat by 2035 and 100% by 2045 Electrify 100% of other energy demand by 2045.
Stone, Clay, Glass, and Cement	CCS on 40% of operations by 2035 and on all facilities by 2045

Sector	Actions Included in the Scoping Plan Scenario
	Process emissions reduced through alternative materials and CCS
Other Industrial Manufacturing	0% energy demand electrified by 2030 and 50% by 2045
Combined Heat and Power	Facilities retire by 2040.
Agriculture Energy Use	25% energy demand electrified by 2030 and 75% by 2045
Low Carbon Fuels for Transportation	Biomass supply is used to produce conventional and advanced biofuels, as well as hydrogen.
Low Carbon Fuels for Buildings and Industry	In 2030s biomethane ¹³⁵ blended in pipeline Renewable hydrogen blended in fossil gas pipeline at 7% energy (~20% by volume), ramping up between 2030 and 2040 In 2030s, dedicated hydrogen pipelines constructed to serve certain industrial clusters
Non-combustion Methane Emissions	Non-combustion Methane Emissions
High GWP Potential Emissions	Low GWP refrigerants introduced as building electrification increases, mitigating HFC emissions
Natural and Working Lands	
Natural and Working Lands	Conserve 30% of the state's NWL and coastal waters by 2030. Implement near- and long-term actions to accelerate natural removal of carbon and build climate resilience in our forests, wetlands, urban greenspaces, agricultural soils, and land conservation activities in ways that serve all communities—and in particular low-income, disadvantaged, and vulnerable communities.
Forests and Shrublands	At least 2.3 million acres treated statewide annually in forests, shrublands/chaparral, and grasslands, comprised of regionally specific management strategies that include prescribed fire, thinning, harvesting, and other management actions. No land conversion of forests, shrublands/chaparral, or grasslands.
Grasslands	At least 2.3 million acres treated includes increased management of grasslands interspersed in forests to reduce fuels surrounding communities using management strategies appropriate for grasslands. No land conversion of forests, shrublands/chaparral, or grasslands.
Croplands	Implement climate smart practices for annual and perennial crops on ~80,000 acres annually. Land easements/ conservation on annual crops at ~5,500 acres annually. Increase organic agriculture to 20% of all cultivated acres by 2045 (~65,000 acres annually).
Developed Lands	Increase urban forestry investment by 200% above current levels and utilize tree watering that is 30% less sensitive to drought. Establish defensible space that accounts for property boundaries.
Wetlands	Restore 60,000 acres of Delta wetlands.
Sparsely Vegetated Lands	Land conversion at 50% of the Reference Scenario land conversion rate.

Source: CARB 2022a.

Even with implementation of the above actions, the Scoping Plan Scenario shows that anthropogenic emissions will continue to be emitted and NWL will continue to serve as a net source of emissions; the Scoping Plan Scenario is estimated to result in additional NWL emissions of 7 MMTCO₂e/year from 2025-2045. The Scoping Plan Scenario aims to close the remaining emissions gap to reaching net zero emissions through the deployment of mechanical CDR technologies, such as direct air capture.

The 2022 Scoping Plan reports statewide GHG emissions under implementation of the above Scoping Plan Scenario actions for eight economic sectors: agriculture, residential and commercial, electric power, high global warming potential (GWP) gases, industrial, recycling and waste, transportation, and carbon dioxide removal (CARB 2022a).

Statewide emissions in 2030 and 2045 under implementation of the Scoping Plan Scenario, as well as assumptions for emissions removed from the atmosphere due to mechanical CDR strategies, are provided in Table 2 (CARB 2022b, CARB 2022c). Statewide emissions under the Scoping Plan Scenario would be -10.2 MMTCO₂e/year because emissions removed from the atmosphere through CDR Strategies (-74.99 MMTCO₂e/year) would exceed emissions from Agriculture, Residential and Commercial, Electric Power, High Global Warming Potential (GWP), Industrial, Recycling and Waste, and Transportation (64.79 MMTCO₂e/year).

Table 2. Emissions Reductions by Sector under the Scoping Plan Scenario

Sectors	CARB's Statewide GHG Inventory (MMTCO ₂ e/yr)	2022 Scoping Plan Scenario (MMTCO ₂ e/yr)			
	2019	2030	2035	2040	2045
Agriculture	31.40	20.10	18.34	16.56	15.30
Residential and Commercial	40.50	26.82	17.77	9.70	4.40
Electric Power	60.20	39.20	31.11	27.92	8.68
High Global Warming Potential (GWP)	20.70	9.90	9.80	9.70	9.00
Industrial	80.40	40.55	29.14	18.50	11.52
Recycling and Waste	8.80	9.18	8.72	8.34	7.99
Transportation	162.40	80.58	53.06	26.71	7.94
Carbon Dioxide Removal (CDR) (including NWL carbon sequestration, DAC, and BECCS)	0.00	-6.77	-35.11	-62.90	-74.99
Total	404.4	219.6	132.8	54.5	-10.2

Sources: CARB 2022a, CARB 2022b, CARB 2022c.

Notes: MMTCO₂e/yr = million metric tons carbon dioxide equivalent per year; NWL = natural and working lands; DAC = direct air capture; BECCS = bioenergy with carbon capture and storage.

3 ESTABLISHING TARGETS FOR THE CAP UPDATE

The target setting process for the CAP Update involves identifying the State laws and plans with the best available information on the timing and levels of GHG emissions reductions needed to address climate change, and then calculate specific emissions levels and reduction percentages for the unincorporated area that are in alignment with the statewide levels and percentages.

3.1 ALIGNING WITH STATEWIDE TARGETS AND THE FRAMEWORK FOR THE FUTURE

The first step in the target-setting process is to identify the relevant State laws and plans with which the CAP Update’s GHG reductions should be in alignment. The CAP Update’s GHG reduction targets and goals are informed by the following State plans and laws, as well as the County’s Framework for the Future:

- ▶ Reducing emissions to 48 percent below 1990 levels by 2030 (per the 2022 Scoping Plan),
- ▶ Reducing emissions to 85 percent below 1990 levels by 2045 (per AB 1279),
- ▶ Achieving net zero emissions no later than 2045 (per AB 1279),
- ▶ Achieving net zero carbon emissions by 2035-2045 (per the County’s Framework for the Future).

3.1.1 Basis for the 2030 GHG Reduction Target

For 2030, the CAP Update’s target is aligned with the 2022 Scoping Plan, which concludes that statewide GHG emissions levels need to be reduced to 48 percent below 1990 levels by 2030 for the state to stay on track to achieve net zero GHG emissions no later than 2045 (as required by AB 1279). This is a steeper reduction than set forth in SB 32, which establishes a statutory limit of reducing statewide emissions to 40 percent below 1990 levels by 2030.

The County’s Framework for the Future calls on the CAP Update to achieve at a minimum the SB 32 GHG emissions reductions of 40 percent below 1990 levels by 2030, and to meet a goal of net zero carbon emissions by 2035-2045.

To put the County on a path to achieve net zero emissions in alignment with the 2022 Scoping Plan, AB 1279, and the Framework for the Future, the CAP Update's 2030 target is developed in alignment with the steeper reductions of 48 percent below 1990 levels shown in the 2022 Scoping Plan.

3.1.2 Basis for the 2045 GHG Reduction Target

For 2045, the CAP Update's target is aligned with AB 1279, which requires that the State's target of net zero emissions by 2045 include reducing statewide anthropogenic emissions by at minimum 85 percent below 1990 levels by 2045. Anthropogenic emissions include the primary sources and activities within the County's GHG emissions categories: On-road Transportation, Electricity, Natural Gas, Waste, Agriculture, Propane, Off-road Transportation, Water, and Wastewater. To go beyond an 85 percent anthropogenic emissions reduction and achieve statewide net zero emissions by 2045, the 2022 Scoping Plan relies on large-scale deployment of CCS technologies and mechanical CDR strategies like direct air capture machines. The County government does not have the jurisdiction or other ability to construct and operate CCS and mechanical CDR strategies at the pace and scale needed to achieve net zero emissions by 2045. The 2022 Scoping Plan also assumes that additional reduction in anthropogenic emissions beyond 85% by 2045 would not be cost-effective or technologically feasible. As a result, the CAP Update's 2045 target is aligned with the AB 1279 target of reducing anthropogenic emissions to 85 percent below 1990 levels by 2045.

3.1.3 Basis for the 2045 Aspirational Goal

The CAP Update also includes an aspirational goal to achieve net zero carbon emissions by 2045, consistent with the Framework for the Future. This goal is in addition to the 2045 target aligned with reducing anthropogenic emissions to 85 percent below 1990 levels by 2045. By including an aspirational goal for net zero carbon emissions in the CAP Update, the County can demonstrate how it is going above and beyond reductions in anthropogenic emissions and working towards net zero emissions in the unincorporated area, for example through measures to increase carbon stored in natural and working (e.g., agricultural) lands, and actions that put the County on a path to net zero. The 2022 Scoping Plan concluded that achieving net zero emissions statewide by 2045 is cost effective and technologically feasible. Because the draft 2022 Scoping Plan demonstrates that 2035 carbon neutrality is not cost-effective or technologically feasible, the CAP Update aspirational goal to achieve net zero carbon emission is set for 2045.

3.2 DEVELOPING EMISSIONS REDUCTION LEVELS AND TARGET PERCENTAGES SPECIFIC TO THE UNINCORPORATED AREA

To develop community-specific target percentages for the CAP Update that align with statewide targets, the 2022 Scoping Plan was reviewed to identify the emissions sectors in this statewide plan that are relevant and applicable to the County of San Diego. The emissions reduction trajectory of each applicable sector in the 2022 Scoping Plan is then applied to the County's emissions levels to calculate reduction levels and target percentages for the CAP Update. The analysis performed to derive County-specific GHG reduction targets from State targets and applicable statewide sectors is provided in Appendix 7 to the CAP Update.

3.2.1 Statewide Sectors Applicable to the Unincorporated Area

Review of the 2022 Scoping Plan demonstrates that the County has direct or indirect jurisdiction over activities that generate emissions and contribute to reductions in six of the eight emissions sectors included in the statewide emissions inventory: agriculture, residential and commercial, electric power, industrial, recycling and waste, and transportation. This review is summarized in Table 3.

Table 3. 2022 Scoping Plan Emissions Sectors Applicable to the County of San Diego

Emissions Sectors – 2022 Scoping Plan	Applicable to County of San Diego?
Agriculture	Yes
Residential and Commercial	Yes
Electric Power	Yes
High Global Warming Potential (GWP)	No
Industrial	Yes
Recycling and Waste	Yes
Transportation	Yes
Carbon Dioxide Removal (CDR)	No

Source: Ascent 2023.

The high global warming potential (GWP) gases and carbon dioxide removal (CDR) sectors are excluded for the following reasons. First, the County has limited to no ability to control or influence emissions of high GWP gases because it has limited or no jurisdiction or influence over the following activities in the unincorporated area: substitution of ozone-depleting substances with high GWP gas substitutes; emissions of sulfur hexafluoride (SF₆) from electricity transmission lines; and semiconductor manufacturing processes. Second, the state's CDR sector identifies significant reductions from engineered strategies to remove significant levels of emissions from the atmosphere using technologies like direct air capture and carbon capture and storage (CCS). Constructing and operating direct air capture machines to remove GHG emissions from the atmosphere is outside the scope of local governments in California, including the County. In addition, the unincorporated area does not include large-scale petroleum refineries, GHG-emitting electric power plants, cement manufacturing facilities, or other large-scale industrial facilities that could have their GHG emissions reduced using CCS technologies.

By excluding these sectors under this approach, community GHG reduction targets for the County can be established in proportion with statewide reductions for all sectors relevant to County jurisdiction to the extent feasible using available data. This target setting approach is consistent with the California Supreme Court decision in *Center for Biological Diversity v. California Department of Fish and Wildlife and Newhall Land and Farming (2015) 62 Cal.4th 204*, which determined that the approach of assessing a project's consistency with statewide emissions reduction goals must include a "reasoned explanation based on substantial evidence" that links the project's emissions (in this case, the project is the CAP, which covers communitywide emission) to statewide GHG reduction goals.

3.2.2 Target Emissions Reductions Levels and Percentages for the Unincorporated Area

The next step is to translate the statewide target percentages to the unincorporated area. The analysis uses 2019 data from the State's emission inventory and future emissions reductions in 2030, 2035, 2040, and 2045 from the 2022 Scoping Plan (CARB 2022b and 2022c). The future emissions in the 2022 Scoping Plan are 48 percent below statewide 1990 levels in 2030 and 85 percent below 1990 levels in 2045.

Statewide emissions in future years from the applicable sectors are compared to 2019 statewide emissions from applicable sectors to determine the percentage reduction for the unincorporated area. Data for 2019 are used because 1990 emissions data are not available for the unincorporated county and because 2019 is the baseline year of the GHG emissions inventory prepared for the County's CAP. This analysis is summarized in Table 4.

Table 4. Application of Statewide Emissions Reductions by Sector to Applicable County Sectors

Year	All Statewide Sectors		Statewide Sectors Applicable to County of San Diego	
	Statewide Emissions (2019 Inventory and 2022 Scoping Plan Scenario) (MMTCO _{2e})	Percent Below 2019 levels	Statewide Emissions (2019 Inventory and 2022 Scoping Plan Scenario) (MMTCO _{2e})	Percent Below 2019 levels
2019	404.40	n/a	384	n/a
2030	219.56	46%	216	43.6%
2035	132.83	67%	158	58.8%
2040	54.53	87%	108	71.9%
2045	-10.16	103%	56	85.4%

Notes:

MMTCO_{2e} = million metric tons of carbon dioxide equivalent

Source: Ascent 2023.

Table 5 shows the GHG emissions reduction targets for the CAP Update, including the percentage reduction from 2019 levels (CAP GHG Reduction Target), the emissions levels needed to meet the reduction target (Target Emissions Levels), and the amount of GHG reductions needed to achieve the target (Reductions from GHG Emissions Forecast Needed to Achieve Target).

Table 5. County of San Diego Target Emissions and Target Percent Reduction from 2019 Emissions Levels

Year	CAP GHG Reduction Target (relative to 2019 levels)	Target Emissions Levels (MTCO _{2e} /yr)	Reductions from GHG Emissions Forecast Needed to Achieve Target (MTCO _{2e} /yr)
2019	--	2,984,000	--
2030	43.6%	1,683,156	713,844
2035	58.8%	1,229,840	717,160
2040	71.9%	837,806	855,194
2045	85.4%	434,185	1,243,815
2045	Net zero emissions	0 (net)	1,678,000

Notes:

MTCO_{2e}/yr = metric tons of carbon dioxide equivalent per year

Source: Ascent 2023.

4 ANALYSIS OF CAP TARGETS ATTAINMENT

Comparing the County's projected GHG emissions levels (from the community and County operations) with the CAP Reduction Targets demonstrates that additional emissions reductions are needed for the County to achieve its targets (Table 6). To meet the 2030 CAP Reduction Target, annual GHG emissions would need to be 713,844 MTCO_{2e} lower than projected 2030 levels. To meet the 2045 CAP Reduction Target, annual GHG emissions would need to be 1,243,815 MTCO_{2e} lower than projected 2045 levels. To meet the CAP's Aspirational Goal of net zero emissions in 2045, annual GHG emissions would need to be 1,678,000 lower than projected 2045 levels.

Table 6. Comparison of GHG Emissions Projections to CAP Reduction Targets

Emissions Category	GHG Emissions (MTCO ₂ e)				
	2019	2030	2035	2040	2045
On-road Transportation	1,331,000	1,033,000	756,000	513,000	512,000
Electricity	599,000	202,000	38,000	20,000	0
Natural Gas	478,000	540,000	561,000	579,000	597,000
Solid Waste	193,000	219,000	206,000	194,000	184,000
Agriculture	134,000	127,000	124,000	122,000	120,000
Propane	121,000	127,000	129,000	131,000	132,000
Off-road Transportation	71,000	99,000	106,000	110,000	114,000
Water	39,000	31,000	8,000	4,000	0
Wastewater	18,000	19,000	19,000	19,000	19,000
Total Emissions	2,984,000	2,397,000	1,947,000	1,693,000	1,678,000
Percent Reduction from 2019 levels under GHG Emissions Projections		-19.7%	-34.8%	-43.3%	-43.8%
CAP Targets (percent reduction from 2019 levels)		-43.6%	-58.8%	-71.9%	-85.4%
CAP Targets (MTCO ₂ e)		1,683,156	1,229,840	837,806	434,185
Reductions from 2019 levels to meet CAP Targets (MTCO ₂ e)		1,300,844	1,754,160	2,146,194	2,549,815
Reductions from GHG Emissions Projections to meet CAP Targets (MTCO ₂ e)		713,844	717,160	855,194	1,243,815

Source: Ascent 2023.

4.1 ACHIEVING THE CAP REDUCTION TARGETS

The CAP establishes nine strategies, 21 measures, and 70 actions that the County will take to achieve the 2030 and 2045 targets and make progress towards the net zero emissions goal. These actions reduce GHG emissions from five emissions reduction sectors through:

- ▶ Built Environment and Transportation: Increased mobility options and transitions to efficient and zero-emission vehicles and equipment
- ▶ Energy: Increased energy efficiency, electrification, and renewable energy use in buildings
- ▶ Solid Waste: Increased waste diversion and improved waste management practices
- ▶ Water and Wastewater: Increased water efficiency, recycling, and reuse to reduce potable water consumption
- ▶ Agriculture and Conservation: Increased preservation and restoration of natural and working lands and transitions to efficient and zero-emission agricultural equipment

Strategies describe the measures and actions within each sector and how they will help achieve the County's vision for net zero within each sector. Measures describe the County's policy goals and include actions that outline the steps the County will carry out to achieve quantified GHG reductions that contribute towards the 2030 and 2045 targets and put the County on a path to reaching the net zero emissions goal. Quantified GHG reductions are achieved through implementing actions outlined under each measure.

Two types of implementing actions are quantified: (1) actions that reduce GHG emissions from anthropogenic or human-caused activities, such as consuming fossil fuels like gasoline, diesel, and natural gas, using electricity generated from fossil fuels, and generating and disposing of organic waste in landfills; and (2) carbon storage actions that remove emissions from the atmosphere and store them in soil and vegetation. Each of the five emissions reductions sectors include quantified actions to reduce anthropogenic emissions, while the Agriculture and Conservation sector also includes reductions from carbon storage actions.

As shown in Table 7, the CAP reduction targets for 2030 and 2045 would be achieved by the implementing actions that reduce anthropogenic GHG emissions; carbon storage actions that remove emissions from the atmosphere are

counted separately for their contribution towards the County's Aspirational Goal of net zero emissions by 2045. The relative contribution of actions within each emissions reduction sector to achieving the CAP reduction target for 2030 is shown in Figure 1.

Table 7. Analysis of CAP Target Achievement with CAP Strategies, Measures, and Actions to Reduce Anthropogenic GHG Emissions

Strategies, Measures, Actions to Reduce Anthropogenic GHG Emissions	Annual GHG Emissions Reductions (MTCO ₂ e/year)	
	2030	2045
Built Environment and Transportation		
Strategy: Decarbonize the On-Road and Off-Road Vehicle Fleet	236,498	396,815
Measure T-1: Reduce fleet and small equipment emissions from County Operations		
<i>Action T-1.1 Implement the County's 2019 Electric Vehicle Roadmap and 2023 Green Fleet Action Plan to reduce fleet emissions 35% by 2030 and 100% by 2045.</i>	7,900	13,250
<i>Action T-1.2 Amend Board policy to require 100% of landscaping equipment used on County property to be zero-emissions by 2030.</i>	5	5
Measure T-2: Increase the use of low-carbon and zero-emission landscaping and off-road construction equipment in the unincorporated area		
<i>Action T-2.1 Develop a program by 2026 to provide residents and businesses incentives to purchase alternative fuel and/or zero-emission construction and landscaping equipment to reduce emissions 3% by 2030.</i>	2,072	-
<i>Action T-2.2 Develop and adopt a landscaping equipment ordinance to require the use of zero emission landscaping equipment by 2030 and zero emission construction equipment by 2045 in the unincorporated area.</i>	7,638	86,376
Measure T-3: Install electric vehicle charging stations and provide incentives for zero-emissions vehicles in the unincorporated area		
<i>Action T-3.1 Increase the use of electric and other zero-emission vehicles in the unincorporated area by:</i> <ul style="list-style-type: none"> ▶ <i>Installing 2,040 publicly available electric vehicle charging stations by 2028.</i> ▶ <i>Requiring the electrification of loading docks and idling reduction in new commercial and industrial development by 2030.</i> ▶ <i>Amending the County's Code of Regulatory Ordinances by 2026 to require (Tier 2) CALGreen or similar electric vehicle charging infrastructure installations and preferential parking for ZEVs for new multi-family residential and non-residential construction.</i> ▶ <i>Developing a program to incentivize EV purchases and school bus electrification</i> 	218,884	297,184
Strategy: Support Active Transportation and Reduce Single-Occupancy Vehicle Trips	32,333	51,926
Measure T-4: Reduce emissions from County employee commutes		
<i>Action T-4.1 Expand County Benefit Program to provide County employees with tax-free transportation benefits, alternative work schedules, and expand part-time or full-time teleworking options to reduce vehicle miles traveled from employee commutes by 40% in 2030 and 64% in 2045.</i>	12,800	8,960
<i>Action T-4.2 Develop a rebate program for County employees to purchase electric vehicles, bicycles, and scooters for commute use.</i>	903	1,448
Measure T-5: Improve County roadways to encourage walking, biking, rolling to/from transit and destinations and increase transportation efficiency		
<i>Action T-5.1 Implement the County's Active Transportation Plan to install 345 miles of sidewalk and 315 miles of bikeways by 2030 to encourage alternative modes of transportation in the unincorporated area.</i>	1,756	2,800
<i>Action T-5.2 Develop a countywide Safe Routes to Schools program to reduce vehicle miles traveled to schools by 1.2% by 2030.</i>	214	82
Measure T-6: Support transit and transportation demand management to reduce single occupancy vehicle trips in the unincorporated area		

Strategies, Measures, Actions to Reduce Anthropogenic GHG Emissions	Annual GHG Emissions Reductions (MTCO ₂ e/year)	
	2030	2045
<i>Action T-6.1 Develop a program to provide free transit passes and/or free trips in the unincorporated area to reduce vehicle miles traveled in the unincorporated area by 1.2% by 2030.</i>	3,051	2,146
<i>Action T-6.2 Increase access to Transit Priority Areas by 5% in the unincorporated area and implement transit-supportive roadway treatments such as traffic signal communication and curb extensions along County-maintained roadways to optimize traffic flow for transit and pedestrians by 2030.</i>	12,615	35,198
<i>Action T-6.3 Increase access to first/last mile transportation services and connections (e.g., neighborhood electric vehicles, microtransit, bike/scooter-share) to reduce vehicle miles traveled by 7% within the unincorporated area by 2030.</i>	994	1,292
Energy		
Strategy: Increase Building Energy Efficiency, Renewable Energy, and Electrification in the Unincorporated Area and County Operations	333,097	536,299
Measure E-1: Develop policies and programs to increase energy efficiency, renewable energy use, and electrification in County Operations		
<i>Action E-1.1 Implement the County Facilities Zero Carbon Portfolio Plan to achieve 90% reduction in operational carbon emissions by 2030 through building electrification and zero net energy construction, energy efficiency, energy management, and renewable energy use and generation.</i>	13,715	16,858
Measure E-2: Develop policies and programs to increase energy efficiency and electrification in the unincorporated area		
<i>Action E-2.1 Amend the County's Code of Regulatory Ordinances by 2026 to require all-electric new residential, commercial, and industrial construction to reduce energy emissions from new development in the unincorporated area.</i>	17,734	80,358
<i>Action E-2.2 Increase energy efficiency and reach 30% electrification in residential and 17% electrification in non-residential existing development in the unincorporated area by 2030 by:</i> <ul style="list-style-type: none"> ▶ Amending the County's Code of Regulatory Ordinances by 2026 to require (Tier 2) CALGreen or similar energy efficiency requirements for existing development projects with qualifying improvements. ▶ Adopting a Building Energy Performance Standard by 2026 for commercial and multi-family residential properties. ▶ Developing a program by 2026 to incentivize building electrification and energy efficiency (e.g., electrically powered appliances, heat pumps). 	124,742	439,082
Measure E-3: Develop policies and programs to increase renewable energy use, generation, and storage in the unincorporated area		
<i>Action E-3.1 Amend the County's Code of Regulatory Ordinances by 2026 to require (Tier 2) CalGreen CALGreen or similar renewable energy requirements for new residential and non-residential construction to increase renewable energy generation in new development.</i>	252	0
<i>Action E-3.2 Expand and implement the County's streamlined solar permitting process to install 5,002 kW of renewable energy on existing development by 2030 and 12,505 kW by 2045.</i>	29	0
<i>Action E-3.3 Develop a program to provide 100% renewable energy to residents and businesses participating in San Diego Community Power by 2030 in the unincorporated area.</i>	176,625	0
Solid Waste		
Strategy: Increase Solid Waste Diversion in the Unincorporated Area and County Operations	<u>39,109</u> 38,852	<u>60,258</u> 59,351
Measure SW-1: Achieve zero waste in County operations		
<i>Action SW-1.1 Adopt a County Operations zero waste policy by 2030 to achieve zero waste (90% diversion).</i>	<u>1,305,048</u>	<u>2,479,571</u>
Measure SW-2: Achieve zero waste within the unincorporated area		

Strategies, Measures, Actions to Reduce Anthropogenic GHG Emissions	Annual GHG Emissions Reductions (MTCO ₂ e/year)	
	2030	2045
<i>Action SW-2.1 Update the County's Strategic Plan to Reduce Waste by 2028 to include strategies to achieve 80% diversion by 2030 and zero waste (90% diversion) by 2045.</i>	37,804	57,779
Strategy: Increase Availability of Sustainable Solid Waste Facilities in the Unincorporated Area and County Operations	1,373	69,448
Measure SW-3: Improve waste management practices at County-owned solid waste facilities to reduce emissions		
<i>Action SW-3.1 Expand landfill gas systems at County-owned landfills to exceed State requirements by 10% by 2045.</i>	0	9,283
Measure SW-4: Improve waste management practices in the unincorporated area to reduce emissions and increase waste diversion		
<i>Action SW-4.1 Conduct a feasibility study by 2027 and implement a landfill gas system pilot project at privately managed landfills by 2030 to exceed State requirements by 10% by 2045 in the incorporated area.</i>	1,373	60,164
Water and Wastewater		
Strategy: Decrease Potable Water Consumption in the Unincorporated Area and County Operations	445	0
Measure W-1: Develop policies and programs to increase water efficiency, retention, recycling, and reuse to reduce potable water consumption in County operations		
<i>Action W-1.1 Implement the County's Water Efficiency Plan to require water-efficiency measures in new and existing County buildings/operations to reduce potable water use intensity by 28%^{19%} by 2030.</i>	3	0
Measure W-2: Develop policies and programs to increase indoor and outdoor water conservation (including water efficiency, retention, recycling, and reuse) in new and existing development in the unincorporated area		
<i>Action W-2.1 Amend the County's Code of Regulatory Ordinances by 2026 to require (Tier 2) CALGreen or similar water efficiency requirements and reduced outdoor water use for landscaping requirements for new development to reduce potable water consumption from new development by 17% in the unincorporated area.</i>	37	0
<i>Action W-2.2 Amend the County's Code of Regulatory Ordinances by 2026 to require (Tier 2) CALGreen or similar water efficiency requirements for existing development projects with qualifying improvements.</i>	320	0
<i>Action W-2.3 Update the Green Building Incentive program by 2026 to include incentives for water efficiency, conservation, and reuse improvements for new and existing development to reduce potable water consumption in the unincorporated area.</i>	64	0
<i>Action W-2.4 Implement the Waterscape Rebate Program to incentivize water efficiency and conservation to reduce outdoor water consumption in the unincorporated area.</i>	21	0
Strategy: Increase Stormwater Collection, Water Pumping, and Wastewater Treatment Efficiency	10,046	1,869
Measure W-3: Develop programs to increase stormwater and wastewater treatment efficiency to reduce imported potable water use in the unincorporated area		
<i>Action W-3.1 Increase wastewater treatment efficiency through the East County Advanced Water Purification Program to produce 12,900 acre feet of water each year by 2030.</i>	10,046	1,869
Agriculture and Conservation		
Strategy: Preserve Natural Lands and Improve Land Management Practices to Protect Habitat and Increase Carbon Storage	63,242	91,218
Measure A-1: Acquire and manage conservation lands to preserve natural lands and maximize carbon storage potential in the unincorporated area		
<i>Action A-1.1 Acquire 11,000 acres of conservation lands by 2030 and 1,000 acres per year thereafter to preserve land in perpetuity.</i>	63,242	91,218

Strategies, Measures, Actions to Reduce Anthropogenic GHG Emissions		Annual GHG Emissions Reductions (MTCO ₂ e/year)	
		2030	2045
Strategy: Support Climate-Friendly Farming Practices and Preserve Agricultural Land		11,258	36,965
Measure A-3: Preserve agricultural lands to prioritize carbon storage and balance economic and development goals			
Action A-3.1 Implement the Purchase of Agricultural Conservation Easement (PACE) Program to preserve 6,058 acres of agricultural land by 2030 and 400 acres per year thereafter.		9,699	17,327
Measure A-5: Reduce greenhouse gas emissions from agricultural operations			
Action A-5.1 Develop a program to incentivize a transition to cleaner fuels and the efficient use of energy to reduce agricultural operations emissions in the unincorporated area.		1,559	19,638
CAP Strategies	Total Annual Reductions (MTCO ₂ e/year)	<u>727,400</u> <u>727,142</u>	<u>1,244,798</u> <u>1,243,891</u>
	Percent Reduction (from 2019 levels)	-44.0%	-85.5%
CAP Targets	Total Annual Reductions Needed (MTCO ₂ e/year)	713,844	1,243,815
	Percent Reduction Needed (from 2019 levels)	-43.6%	-85.4%
CAP Target Achieved?		Yes	Yes

Source: Ascent 2023.

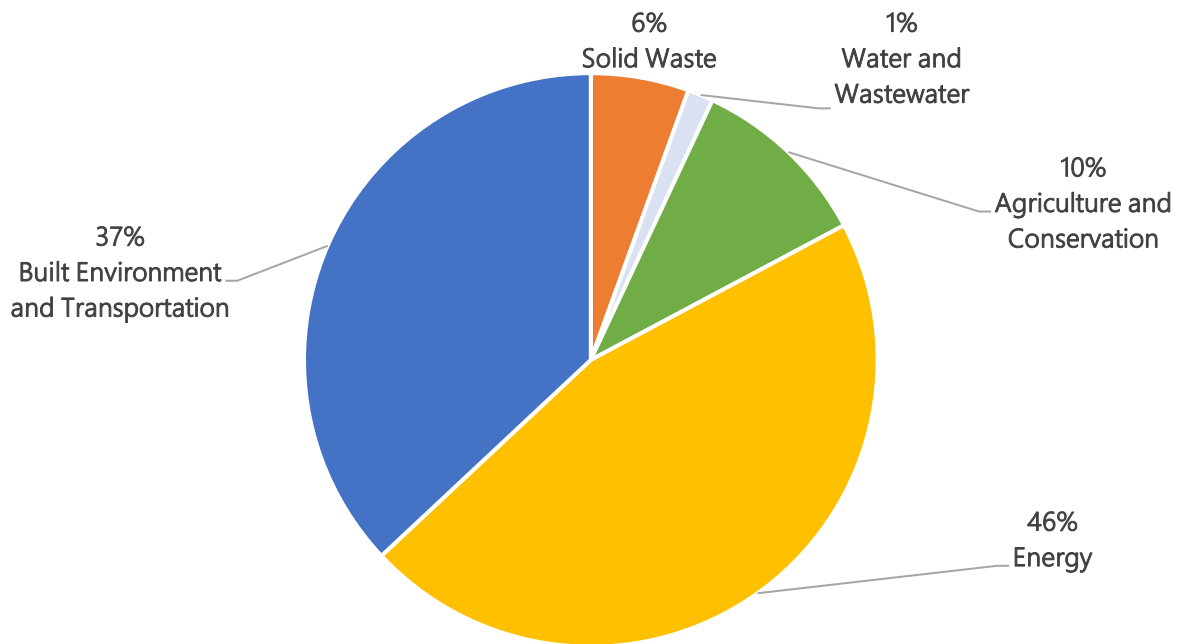


Figure 1 Relative Contribution of Actions within Each Emissions Sector to Achieving the 2030 CAP Reduction Target

Table 8 shows annual emissions that would be removed from the atmosphere by the four quantified implementing actions that increase carbon storage. These actions would increase the amount of carbon stored in soils and vegetation in the unincorporated area through habitat restoration, tree-planting, and carbon farming.

Table 8. GHG Emissions Removed from the Atmosphere by Carbon Storage Strategies, Measures, Actions

Carbon Storage Strategies, Measures, Actions to Remove Emissions from the Atmosphere	Annual GHG Emissions Removed from Atmosphere (MTCO ₂ e/year)	
	2030	2045
Agriculture and Conservation		
Strategy: Preserve Natural Lands and Improve Land Management Practices to Protect Habitat and Increase Carbon Storage	3,013	8,000
Measure A-1: Acquire and manage conservation lands to preserve natural lands and maximize carbon storage potential in the unincorporated area		
<i>Action A-1.2 Develop a Habitat Restoration Resource Management Framework for County-owned land and restore 480 acres by 2030 and 80 acres per year thereafter to increase carbon storage.</i>	76	1,223
Measure A-2: Develop a tree planting program that expands canopy across the unincorporated area and prioritizes underserved communities		
<i>Action A-2.1 Expand the County's existing tree planting initiative and implement an Equity Driven Tree Planting Program to plant 70,560 trees by 2030 and 6,650 trees per year thereafter on County property and in the unincorporated area.</i>	2,498	6,029
<i>Action A-2.2 Implement the County's Landscaping Ordinance to require tree planting in new single family residential development in the unincorporated area.</i>	439	747
Strategy: Support Climate-Friendly Farming Practices and Preserve Agricultural Land	10,758	121,556
Measure A-4: Incentivize carbon farming to expand carbon storage capacity on agricultural land and support climate-friendly farming practices in the unincorporated area		
<i>Action A-4.1 Develop a Climate Smart Land Stewardship Carbon Farming Program by 2026 to increase carbon sequestration on 3,000 acres by 2030 and 36,214 acres by 2045.</i>	10,758	121,556
Total Carbon Storage	13,771	129,556

Source: Ascent 2023.

As shown in Table 9, the annual removal of 13,771 MTCO₂e from the atmosphere by 2030 and 129,556 MTCO₂e by 2045 by the carbon storage actions would result in the County further exceeding its CAP reduction targets for 2030 and 2045 and making substantial progress towards its aspirational goal of achieving net zero emissions by 2045. The carbon storage actions would reduce annual emissions levels in 2030 from 44.0% to 44.5% below 2019 levels and reduce annual emissions levels in 2045 from 85.5% to 89.8% below 2019. To achieve net zero emissions the County would need to reduce or store an additional [1,655,829](#) MTCO₂e by 2030 and an additional [303,646](#) MTCO₂e by 2045.

Table 9. Summary of CAP Targets Achievement and Progress toward Aspirational Goal with Anthropogenic GHG Emissions Reductions and Carbon Storage

	Annual GHG Emissions (MTCO ₂ e)	
	2030	2045
Total GHG Emissions with Anthropogenic GHG Emissions Reductions	1,669,600 1,669,858	433,202 434,109
Percent reduction below 2019 levels	-44.0%	-85.5%
CAP Targets Achieved?	Yes	Yes
GHG Emissions Removed By Carbon Storage	13,771	129,556
Total GHG Emissions with Anthropogenic GHG Emissions Reductions and Carbon Storage Measures	1,655,829 1,656,086	303,646 304,553
Percent reduction below 2019 levels with anthropogenic GHG emissions reduction and carbon storage measures	-44.5%	-89.8%

Additional Reductions/Storage Needed to meet Aspirational Goal: Net Zero (MTCO _{2e})	<u>1,655,829</u> 1,656,086	<u>303,646,304,553</u>
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Source: Ascent 2023.

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