SANDAG

San Diego Regional Priority Climate Action Plan

MARCH 1, 2024

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The United States Environmental Protection Agency's (EPA) Climate Pollution Reduction Grant (CPRG) program was created as part of the Inflation Reduction Act, which represents one of the largest climate investments in history. The San Diego Regional Priority Climate Action Plan (PCAP) was generously funded through the EPA's CPRG Program under assistance agreement 98T73501 to the San Diego Association of Governments (SANDAG).

The PCAP was developed by SANDAG with key analytical support from the Energy Policy Initiatives Center (EPIC) at the University of San Diego School of Law. The PCAP was also developed in partnership with several local governments, regional agencies, and Tribal Nations (see Interagency Coordination and Community and Stakeholder Engagement sections), and through contributions of dozens of community-based organizations, environmental organizations, equity organizations, and other stakeholder groups.

List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AR5	Fifth Assessment Report (By IPCC)
CARB	California Air Resources Board
CBO	Community-Based Organization
CCAP	Comprehensive Climate Action Plan
CEJST	EPA's Climate and Economic Justice Screening Tool
CMAQ	Congestion Mitigation & Air Quality Improvement
CPRG	Climate Pollution Reduction Act
EPA	U.S. Environmental Protection Agency
EPIC	Energy Policy Initiatives Center
EV	Electric Vehicle
FSP	Freight Signal Prioritization
GHG	Greenhouse Gases
GWP	Global Warming Potential
IPCC	International Panel on Climate Change
LIDAC	Low-Income and Disadvantaged Communities
MSA	Metropolitan Statistical Area
MTS	San Diego Metropolitan Transit System
NCTD	North County Transit District
PCAP	Priority Climate Action Plan
QAPP	Quality Assurance Project Plan
RDF	Regional Decarbonization Framework
SANDAG	San Diego Association of Governments
SCS	Sustainable Communities Strategy
SDAPCD	San Diego County Air Pollution Control District
SIS	Smart Intersection Signals
VMT	Vehicle Miles Traveled
ZEV	Zero-Emissions Vehicle

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Executive Summary

The San Diego region is situated in the southwest corner of the United States and shares a border with Mexico, giving it a dynamic binational economy. The region is home to 3.3 million residents and has a rich diversity of peoples and cultures, including 17 federally recognized Tribal Nations with jurisdiction over 18 reservations – the most of any county in the United States (U.S.). The consequences of climate change are increasingly affecting this unique region year after year, with sea level rise, more frequent and severe weather events, and wildfires.

Widespread regional action and coordination are necessary to implement the climate mitigation measures necessary to significantly reduce the emission of greenhouse gases (GHGs) into the atmosphere that are driving the climate crisis. This Priority Climate Action Plan (PCAP) was informed by data and deep knowledge of local communities across the San Diego region to identify actionable strategies and measures to reduce regional GHG emissions by 2030.

The San Diego Association of Governments (SANDAG) prepared the PCAP in accordance with the U.S. Environmental Protection Agency's (EPA) guidance for Phase 1 of the Climate Pollution Reduction Grant (CPRG) Program. The scope of the San Diego Regional PCAP comprises the San Diego-Chula Vista-Carlsbad Metropolitan Statistical Area (MSA) and covers San Diego County. The PCAP includes actions that will significantly reduce GHG emissions, that can be implemented before 2030, and that benefit low-income and disadvantaged communities (LIDACs) in the San Diego region.

Due to historic disinvestment and under-resourcing, many LIDACs in the San Diego region are disproportionately impacted by and have a compromised ability to adapt to the effects of climate change. The PCAP prioritizes actions that will benefit LIDACs in the San Diego region vulnerable to climate impacts to ensure they are not left behind in the transition to a decarbonized transportation, building, and energy future.

While stakeholders in the region are working to reduce GHG emissions from all sectors, the PCAP focuses on specific measures where stakeholders and partners have the authority and jurisdiction for implementation. As such, the focus of GHG reduction strategies in the PCAP is in the transportation, building energy, energy supply, and water sectors.

Transportation - With transportation representing over 50% of emissions – the largest source of GHG emissions in the San Diego region – it is critical to increase zero-emission vehicle (ZEV) adoption, increase public transit use, and expand active transportation opportunities.

Building Energy - On-site fossil fuel combustion in buildings provides energy for space heating, water heating, cooking, and other functions, which accounts for 12% of GHG emissions in the San Diego region. Switching to high-efficiency electric appliances and equipment will both improve indoor air quality and reduce the GHG emissions from buildings as the electric grid continues its transition to 100% renewable resources.

Clean Energy - Electricity emissions account for about 20% of the San Diego region's GHG emissions. Increasing onsite clean energy supply through solar and battery storage will help reduce GHG emissions, provide localized energy redundancy to the grid, and accelerate the electrification of the transportation and building energy sectors.

Water - Water sector emissions occur during extracting, treating, transferring, and distributing water to the region's communities, businesses, and agricultural lands. More efficient treatment of stormwater and wastewater reduces the need for imported potable water and decreases GHG emissions associated with treating and storing wastewater.

The San Diego Regional PCAP builds on the climate leadership of many partner agencies, including for instance the Climate Action Plans (CAPs) adopted by local jurisdictions and the Regional Decarbonization Framework (RDF) developed by the County of San Diego. It also draws on the knowledge in communities gathered through stakeholder engagement and assessments from SANDAG's past Regional Plans. The result is a PCAP that recognizes the need for not only significantly lessening of GHG emissions, but also reducing the emission of harmful air pollutants which are overburdening many communities. To support the transition to a decarbonized economy, it also highlights the importance of addressing workforce development needs and providing technical assistance, particularly in LIDACs to ensure effective deployment of and participation in GHG reduction programs. SANDAG is committed to continued coordination with other climate, housing, transportation, and equity efforts to advance this vision for near-term climate action in the region.

Introduction

Climate change is already impacting the San Diego region, where communities are experiencing more severe and deadly climate-related events that require more rigorous and accelerated actions. These events include wildfires, sea level rise, extreme heat, extreme drought, and dangerous levels of flooding and storm surges, among other impacts. Historic disinvestment and under-resourcing have left many low-income and disadvantaged communities in the San Diego region overburdened by the impacts of climate change and with fewer resources to cope with or adapt to these impacts. As communities face more extreme weather events and threats to public health, nearly all local jurisdictions in the region have adopted local climate action plans (CAPs) to reduce climate pollution and plan for the impacts of a changing climate.

California has a statutory goal to reduce anthropogenic (man-made) greenhouse gas (GHG) emissions by at least 85% below 1990 levels and achieve carbon neutrality by 2045. Through this EPA grant, SANDAG aims to accelerate the San Diego region's achievement of federal, state, and local climate goals, prioritize GHG reductions that can be achieved before 2030, and provide maximum benefits to low-income and disadvantaged communities (LIDACs). This Priority Climate Action Plan (PCAP) outlines measures to significantly reduce GHG emissions over the next 5 years that respond to the local context and balance diverse needs across the region. The PCAP is focused on creating and fostering opportunities to work together at every scale to make quick and efficient progress on reducing GHG emissions.

SANDAG serves as both a metropolitan planning organization (MPO) and a council of governments for the San Diego region. The agency works with local governments and organizations to address regional issues including transportation, air quality, energy, economic development, goods movement, public health, public safety, and housing, while ensuring that these services and benefits are distributed equitably. SANDAG is governed by a Board of Directors made up of elected officials from the region's 18 city councils (cities of Carlsbad, Chula Vista, Coronado, Del Mar, El Cajon, Encinitas, Escondido, Imperial Beach, La Mesa, Lemon Grove, National City, Oceanside, Poway, San Diego, San Marcos, Santee, Solana Beach, and Vista) and the County Board of Supervisors. Additionally, representatives from Imperial County, Caltrans, the U.S. Department of Defense, the Port of San Diego, San Diego County Water Authority, San Diego Metropolitan Transit System, North County Transit District, the San Diego County Regional Airport Authority, the Southern California Tribal Chairmen's Association, and Mexico serve on the Board of Directors as advisory members.

This PCAP builds on SANDAG's nearly 15-year history of collaboration with local jurisdictions to advance climate action planning. SANDAG has provided tools and resources to aid local governments in climate action and adaptation planning such as the Regional Climate Action Planning (ReCAP) Framework, Climate Action Data Portal, and Regional Resilience Framework. It covers the San Diego-Chula Vista-Carlsbad Metropolitan Statistical Area (MSA) and encompasses the entire county of San Diego, referred to as the "San Diego region" in this PCAP.

Climate Pollution Reduction Grant Overview

The U.S. Environmental Protection Agency (EPA) Climate Pollution Reduction Grant (CPRG) program provides $5 billion in grants to states, local governments, Tribes, and territories to develop and implement ambitious plans for reducing GHG emissions and other harmful air pollutants. Authorized under Section 60114 of the Inflation Reduction Act, this two-phase program provides $250 million for noncompetitive planning grants (including the PCAP) and approximately $4.6 billion for competitive implementation grants.

This historic and unprecedented climate investment will significantly reduce GHG emissions and air pollutants, providing public health benefits to communities most vulnerable to the impacts of climate change. By providing resources to plan for and implement measures that will reduce near-term GHG emissions – particularly those that will benefit low-income and disadvantaged communities (LIDACs) – the CPRG program will enable regions to take aggressive action now to combat climate change. SANDAG identified the tremendous positive impact that participation in this program could have for the San Diego region in terms of moving forward critical near-term climate mitigation efforts that significantly reduce GHGs. The agency recognized that the region was well positioned to deliver on near-term programs and projects, given the strong track record of regional collaboration on climate action, and was awarded a $1 million regional planning grant which the Board of Directors accepted in September 2023. The Planning grants require three deliverables over four years:

- Priority Climate Action Plan (PCAP), due March 1, 2024.
- Comprehensive Climate Action Plan (CCAP), due in July 2025.
- Status Report at the end of the grant period, due in July 2027.

Implementation grants are made available by the EPA's CPRG program through a competitive process where eligible applicants may only apply for funding to implement measures included in an applicable PCAP.

Priority Climate Action Plan Overview

The San Diego Regional PCAP leverages past and ongoing climate action planning by local governments, Tribal Nations, regional agencies, and SANDAG; with a focus on measures that can be implemented before 2030 to reduce GHG emissions and advance climate and pollution reduction goals.

The PCAP is different from a typical CAP as it focuses on near-term priorities that can cover one or more emissions sectors and can rely on existing GHG inventories, measures, and actions from adopted plans in the region. The PCAP also focuses on measures and actions that will maximize benefits to LIDACs.

Scope of the Priority Climate Action Plan

The San Diego Regional PCAP covers the San Diego-Chula Vista-Carlsbad MSA and encompasses the entire county of San Diego. It outlines GHG reduction measures in the transportation, building energy, energy supply, and water sectors. These measures were identified as top priorities by stakeholders through input from local governments, regional agencies, Tribal Nations, community-based organizations, and environmental and equity stakeholder groups. Most local governments and community groups identified transportation and buildings as their top two priorities. These priorities align with the emissions data from the most recent regional GHG inventory, as almost 50% of GHG emissions in the San Diego region come from the transportation sector, followed by electricity, and natural gas from buildings.

While many local governments, Tribal Nations, and agencies are actively working to reduce GHG emissions from all sectors, this PCAP focuses on specific measures that SANDAG and partner agencies have the authority and jurisdiction to implement and are confident that implementation can be achieved before 2030 if awarded PCAP implementation funding. The GHG reduction measures in the PCAP will inform the development of a regional implementation grant proposal to be submitted to EPA by April 1, 2024.

After the PCAP, SANDAG will begin the development of the Comprehensive Climate Action Plan (CCAP), which will include an updated regional GHG inventory, forecast, and reduction measures for all emissions sectors. More information on the CCAP can be found in the Next Step sections.

Approach to Developing the Priority Climate Action Plan

To prepare the PCAP, SANDAG first assessed all past and ongoing relevant climate-planning activities in the region both at SANDAG and conducted by other local jurisdictions and agencies.

SANDAG has been coordinating climate action planning efforts in the San Diego region for years. In 2016, SANDAG began offering climate action planning services to its member agencies (local governments) and developed a framework for the development, implementation, and update of local CAPs. SANDAG's coordination enabled the development of CAPs that reflect a consistent approach to quantifying GHG emissions.

In addition to assisting local agencies, SANDAG developed a Sustainable Communities Strategy (SCS) as part of the adopted 2021 Regional Plan that outlines how regional GHG emissions will be reduced through the implementation of SANDAG programs, policies, and projects.

SANDAG contracted the Energy Policy Initiatives Center (EPIC) at the University of San Diego to assist with multiple components of the CPRG planning grant including preparation of the Quality Assurance Project Plan (QAPP) and quantification of the GHG emissions reductions for the PCAP measures. EPIC is a research center of the University of San Diego School of Law that studies energy policy issues affecting California and the San Diego region. The mission of EPIC is to increase awareness and understanding of energy and climate-related policy issues

by conducting research and analysis to inform decision-makers and educate law students. EPIC has been a trusted resource for quantifying local and regional GHG inventories for many years. They developed the first San Diego Regional GHG Inventory in 2008, prepared the regional GHG inventories for SANDAG's last three Regional Plans, and conducted the data gathering and analysis for many of the local government CAPs in the region.

EPIC developed the 2016 GHG Inventory for San Diego region used in the PCAP. To the extent possible, they followed the same methods used in developing the 2012 GHG emissions inventory as were used for San Diego Forward: The 2015 Regional Plan.[1] The 2016 GHG inventory includes 15 categories of emissions calculated based on the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions and California Air Resources Board (CARB) California statewide GHG inventory methodology. Building on past community and stakeholder outreach efforts, EPIC also worked closely with the SANDAG team on the refinement of priority measures that would achieve significant GHG reductions for the PCAP. EPIC developed processes to gather data needed from local jurisdictions to develop the GHG emissions reduction quantification calculations. They then quantified the GHG emissions reductions by measure through 2030 and 2050 using local data and evaluated the impact of local, state, and federal regulations on the eligibility of these reductions as part of the CPRG program, per EPA guidance.

Equity

Another key element of the approach to developing the PCAP is equity. SANDAG strives to advance regional equity goals through every project and plan, and, in 2021, published the following "Commitment to Equity" statement:

> *We hold ourselves accountable to the communities we serve. We acknowledge we have much to learn and much to change, and we firmly uphold equity and inclusion for every person in the San Diego region. This includes historically underserved, systemically marginalized groups impacted by actions and inactions at all levels of our government and society.*
>
> *We have an obligation to eliminate disparities and ensure that safe, healthy, accessible, and inclusive opportunities are available to everyone. The SANDAG equity action plan will inform how we plan, prioritize, fund, and build projects and programs; frame how we work with our communities; define how we recruit and develop our employees; guide our efforts to conduct unbiased research and interpret data; and set expectations for companies and stakeholders that work with us.*
>
> *We are committed to creating a San Diego region where every person who visits, works, and lives can thrive.*

[1] https://www.sandag.org/-/media/SANDAG/Documents/PDF/regional-plan/2015-regional-plan/2015-regional-plan-appendix-d.pdf

Several sections throughout this PCAP illustrate this value, particularly the community and stakeholder engagement described below as well as the LIDAC Benefits Analysis. Based on SANDAG's commitment to equity and input gathered through outreach and engagement, the PCAP reflects community priorities. It also aligns with the Justice40 Initiative, the federal government's goal of having 40% of the overall benefit of certain Federal investments flow to disadvantaged communities that have been marginalized by underinvestment and are overburdened by pollution.[2]

Building on Regional Climate Action Progress

The PCAP draws on the climate action efforts of several partner agencies in the region. For instance, many local jurisdictions, regional agencies, Tribal Nations, and other public entities have developed CAPs and are responsible for their implementation. Nearly all – 18 out of 19 – municipal governments in the San Diego region have adopted CAPs that they are using to guide local planning efforts (see Table 1). Tribal Nations in the region have also produced climate resilience reports, such as the Manzanita Band of the Kumeyaay Nation's Tribal Resilience Project. Another important advancement for climate action in the region was the development of the Integrated San Diego Regional Decarbonization Framework (RDF) by the County of San Diego, a science-based, holistic approach to guide the region's decarbonization efforts. The purpose of the RDF is to provide a coordinated response to climate change, which includes pathways to decarbonize the region and achieve zero carbon emissions. Decarbonization involves reducing the gases in the atmosphere that trap heat. The goal is to achieve a balance of the carbon cycle in nature so that the planet stops warming.[3]

Table 1: Climate Action Plans by Jurisdiction

Jurisdiction	Climate Action Plan
Carlsbad	Yes
Chula Vista	Yes
Coronado	Yes
Del Mar	Yes
El Cajon	Yes
Encinitas	Yes
Escondido	Yes
Imperial Beach	Yes
La Mesa	Yes
Lemon Grove	Yes
National City	Yes
Oceanside	Yes
Poway	No
San Diego	Yes

[2] https://www.whitehouse.gov/environmentaljustice/justice40/
[3] https://www.sandiegocounty.gov/content/sdc/sustainability/regional-decarbonization.html

Jurisdiction	Climate Action Plan
San Marcos	Yes
Santee	Yes
Solana Beach	Yes
Vista	Yes
County of San Diego	Yes

To ensure the PCAP is reflective of the region's goals and priorities, SANDAG has held monthly interagency coordination meetings with PCAP stakeholders starting in July 2023. The following entities have been engaged in the PCAP planning process:

Local Governments

- City of Carlsbad
- City of Chula Vista
- City of Coronado
- City of Del Mar
- City of El Cajon
- City of Encinitas
- City of Escondido
- City of Imperial Beach
- City of La Mesa
- City of Lemon Grove
- City of National City
- City of Oceanside
- City of Poway
- City of San Diego
- City of San Marcos
- City of Santee
- City of Solana Beach
- City of Vista
- County of San Diego

Regional Agencies

- California Department of Transportation (Caltrans), District 11
- Metropolitan Transportation System (MTS)
- North County Transit District (NCTD)
- Port of San Diego
- San Diego County Air Pollution Control District
- San Diego County Water Authority (SDCWA)
- East County Advanced Water Purification Joint Powers Authority
- San Diego County Regional Airport Authority
- San Diego Community Power/ San Diego Regional Energy Network (SDREN)

Tribal Governments

The Pala Band of Mission Indians and the La Jolla Band of Luiseño Indians were awarded planning grants from EPA to develop Tribal PCAPs. The planning grant led by the Pala Band of Mission Indians was on behalf of the Pala Band of Mission Indians, Jamul Indian Village of California, Viejas Band of Kumeyaay Indians, and La Posta Band of Mission Indians.

SANDAG coordinated PCAP development with Tribal governments through the agency's Interagency Technical Working Group on Tribal Transportation Issues (Tribal Technical Working Group) which includes representation from all 17 sovereign Tribal Nations in the region, as well as through the agency's Tribal Task Force that convenes regional agencies and the planning staff from Tribal governments. Moreover, the Manzanita Band of the Kumeyaay Nation and the La Posta Band of Mission Indians participated in SANDAG's interagency meetings with local governments and agencies to develop the San Diego Regional PCAP.

The project team also reviewed the Intraregional Tribal Transportation Strategy (ITTS) that was updated in 2021.[4] The ITTS is the result of a collaborative effort between SANDAG and the Southern California Tribal Chairmen's Association (SCTCA) to address the tribal transportation needs in the San Diego region in an effective and innovative way. The ITTS includes priority projects identified by Tribal governments. For the PCAP, SANDAG reviewed these projects to identify opportunities for collaboration on near-term GHG reduction measures.

Additionally, in October 2023, SANDAG participated in the Tribal/U.S. EPA Region 9 Annual Conference hosted by the Viejas Band of Kumeyaay Indians at the Viejas Casino and Resort. In November 2023, SANDAG hosted a Tribal Symposium, which was a joint meeting with Tribal Technical Working Group and SANDAG Borders Committee. In February 2024, staff presented the draft San Diego Regional PCAP to the Tribal Technical Working Group.

State Government

At the state level, CARB received a CPRG planning grant for the state of California. Throughout the development of this plan, SANDAG and CARB staff have met on a regular basis to facilitate effective coordination and ensure that measures covered in both PCAPs meet state and regional needs and that future implementation of measures in these PCAPs is not duplicative. Specifically, CARB staff participated in the first Climate Table workshop described below, and SANDAG staff have attended state workshops and coordination meetings, in addition to individual meetings with CARB.

[4] https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/borders-and-interregional-collaboration/tribal-governments/final-intraregional-tribal-transportation-strategy-2021-update-2022-03-01.pdf

Community and Stakeholder Engagement

SANDAG leveraged relationships with local jurisdictions, regional agencies, Tribal governments, and community-based organizations to build upon recent climate-related outreach and engagement that has taken place in the region. The goal of this approach was to value and utilize the input community members have already provided, and to reduce any undue burden on community members by learning from their previous feedback. SANDAG gathered outreach reports from several local jurisdictions associated with CAP development as well as outreach and engagement materials from Tribal nations and other public agencies. SANDAG reviewed these materials and used relevant information to develop the Outreach and Engagement Plan.[5]

The Outreach and Engagement Plan lists key stakeholders, establishes messaging for the PCAP, CCAP, and Status Report, and identifies five strategies for SANDAG to use throughout the duration of the CPRG. The strategies are:

1. Leverage existing relationships and activities to conduct equity-focused community outreach and engagement.
2. Gather public input on climate action planning to document community-defined priorities and inform the development of the PCAP, CCAP, and Status Report.
3. Collaborate with interagency stakeholders to build and maintain relationships.
4. Engage Tribal governments in the region to understand the climate needs of their communities and identify opportunities for alignment.
5. Consult with Non-Governmental Organizations (NGOs) and advocacy groups who are involved in climate planning in the San Diego region to leverage their expertise.

Based on these strategies, the project team presented updates on the PCAP to Community-Based Organizations (CBOs) through SANDAG's CBO partner network, which represents various underserved and underrepresented communities throughout the San Diego region.[6] The CBOs were engaged at both SANDAG Social Equity Working Group meetings and CBO Outreach Team meetings, where they received updates on the process of developing the PCAP as well as its content. SANDAG also conducted outreach and engagement to numerous equity and environmental nonprofit organizations through two Climate Table workshops that focused on gathering input on the priority GHG reduction measures to include in the PCAP. These workshops served as listening sessions and community sharing sessions for regional stakeholders, including a mix of local governments, CBOs, nonprofit organizations, Tribal governments, and more. At the first workshop on December 6, 2023, SANDAG provided an overview of the PCAP and facilitated discussions about the building and transportation sectors, as well as considerations for prioritizing different types of programs and projects to reduce GHG emissions. The second workshop, held on January 25, 2024, covered a broader set of PCAP measures, including energy efficiency, energy supply, vehicle miles traveled (VMT) reduction, building electrification, and transportation

[5] https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/environment/climate/priority-climate-action-plan/outreach-engagement-plan.pdf
[6] https://www.sandag.org/-/media/SANDAG/Documents/PDF/meetings-and-events/working-groups/social-equity/cbo-membership-map.pdf

electrification. SANDAG received over 100 comments with project ideas, potential agencies/organizations responsible for implementation, and other feedback on the PCAP at this workshop.

Across the two Climate Table workshops, there were clear, reoccurring themes that have informed the GHG reduction measures and actions in this PCAP. For example, the most frequent comments were requests for broader incentives for transportation and building electrification, increasing active transportation options, and expanding programs that have already been successfully implemented, such as transit incentive programs and neighborhood micromobility services. Additionally, participants continually stressed the importance of prioritizing equity in project development and implementation, especially through investments in education, outreach, technical assistance, and workforce development. Summary reports for both Climate Table workshops are included in Appendix A, along with a full list of all community and stakeholder outreach conducted. Ultimately, the measures included in this PCAP reflect the input gathered through this community and stakeholder engagement process.

San Diego Metropolitan Statistical Area Context

The PCAP covers the San Diego-Chula Vista-Carlsbad MSA and encompasses the entire county of San Diego, referred to as the "San Diego region" in this PCAP. It is one of the most populated MSAs in the nation, home to more than 3.3 million people and that number is expected to grow. Part of the region's challenge is to accommodate this population growth while preserving the natural environment, reducing GHG emissions, and adapting and building resilience to climate change. The San Diego region is home to diverse landscapes, politics, economies, languages, cultures, and a dynamic binational economy. It enjoys a special place on the North American continent. Located in the southwest corner of the United States, the region's 70-mile coastline stretches from the Mexican border in the south to Marine Corps Base Camp Pendleton in the north (see Figure 1 below). To the west is the Pacific Ocean, and to the east lies mountains, the Anza-Borrego Desert, and Imperial County's agricultural fields. The region also has the largest number of military personnel in the country; in addition to Camp Pendleton, bases include Miramar Marine Corps Air Station, Marine Corps Recruit Depot San Diego, North Island Naval Base, Naval Base Point Loma, Naval Base San Diego, and U.S. Coast Guard Station San Diego.

A Binational Region

The shared border with Mexico and close ties between the San Diego and Tijuana metropolitan areas are unique features of the region. For many people in the San Diego and Baja California, Mexico areas, cross-border travel is essential for visiting friends and relatives, shopping, receiving medical care, working, vacationing, and going to school. The San Ysidro border crossing is the busiest Land Port of Entry in the Western Hemisphere, with an average of 70,000 vehicles and 20,000 pedestrians entering the San Diego region each day.[7] The historic, familial, cultural, linguistic, culinary, and educational connections between people on both sides of the border have grown stronger by the economic ties between the two regions. Mexico is California's number one trading partner, fueling commerce and economic opportunity throughout a binational region that encompasses the Tijuana and San Diego metropolitan areas.

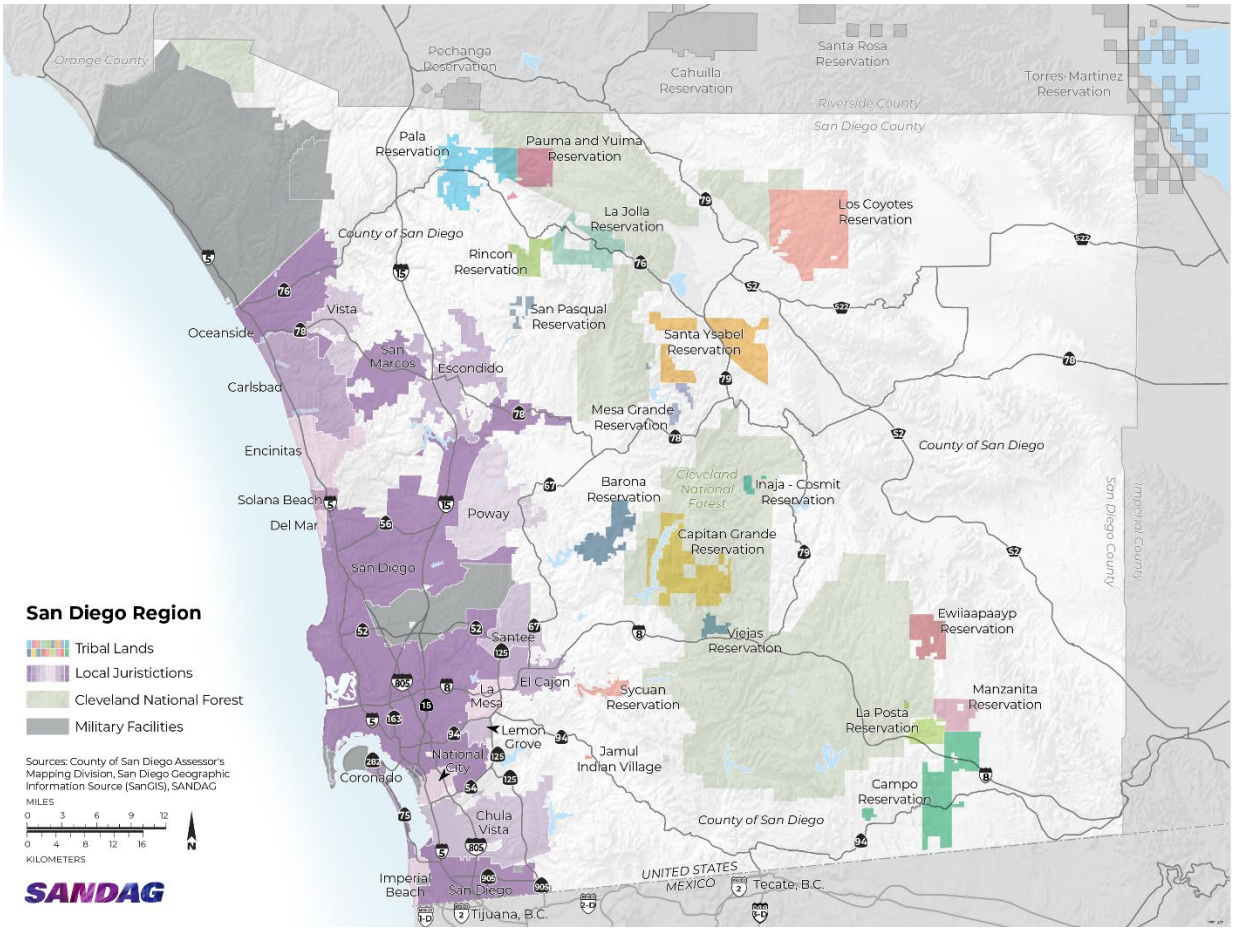
The San Diego Region's Native American Heritage

The San Diego region has been inhabited for at least 12,000 years. Before Europeans arrived, Native Americans thrived in the region by harvesting food from the sea; maximizing resources in inland, mountain, and desert landscapes throughout the year; and establishing close bartering relationships among different geographic groups to sustain themselves. Some of our region's most prominent roadways found their origins in ancient trade routes connecting Tribal groups. Today the Kumeyaay, Cupeño, Cahuilla, and Luiseño comprise the four most prominent ethno-linguistic groups of Native Americans that span the region. There are 17 sovereign Tribal Nations with jurisdiction over 18 reservations, the most in any county in

[7] https://www.gsa.gov/about-us/gsa-regions/region-9-pacific-rim/land-ports-of-entry/san-ysidro-land-port-of-entry

the United States. Conservation efforts by individuals, advocacy groups, government agencies, businesses, and other organizations in our region have often found their inspiration in the region's Native American culture and history. Governmental agencies, meanwhile, have increasingly sought the partnership and knowledge of Tribal communities to better plan for development and increased mobility, conservation, equity, and environmental sustainability.

Figure 1. San Diego Regional Map



Priority Climate Action Plan Elements

Greenhouse Gas Inventory

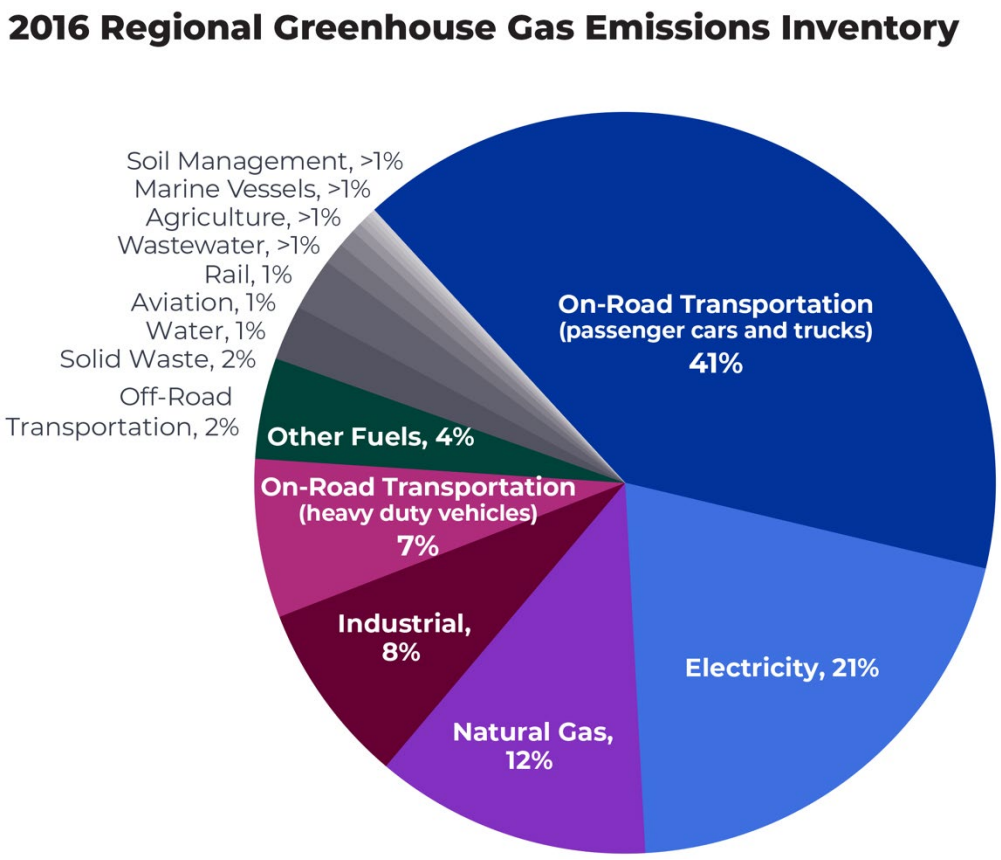
2016 Regional Inventory

A GHG inventory is a tool that is used to quantify the heat-trapping gases released within a defined boundary over the course of a year. SANDAG has published a regional GHG inventory as part of its last 3 Regional Transportation Plans (Regional Plans), beginning in 2011, and most recently for our 2021 Regional Plan and associated Environmental Impact Report. SANDAG contracted with the Energy Policy Initiatives Center (EPIC) at the University of San Diego (USD) to prepare these regional GHG inventories and methodology reports detailing how each inventory and forecast to 2050 were estimated.

The 2016 Greenhouse Gas Emissions Inventory for the San Diego Region (see Appendix B) is the most recently published and currently adopted regional GHG inventory which SANDAG completed as part of its 2021 Regional Plan. The San Diego regional GHG inventory will be updated periodically; the next update to the GHG inventory will be completed in 2025. The inventory includes 15 categories of emissions based on the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions and the California Air Resources Board (CARB) statewide (California) GHG inventory methodology. Appendix B provides the full 2016 GHG Inventory methodology for all sectors shown below in Figure 2. The inventory identifies contributions by each sector so that strategies can be put in place to monitor and reduce emissions in the near- and long-term.

The 2016 inventory found that transportation was the largest contributor to GHG emissions, accounting for over 50% of emissions for the San Diego region. Passenger cars and trucks accounted for 41%, heavy-duty vehicles 7%, and off-road transportation 2%. The second largest contributing sector in the region is electricity, representing 21% of total emissions. The combustion of natural gas from buildings accounts for 12% of total emissions in the region.

Figure 2. 2016 Regional Greenhouse Gas Emissions Inventory from SANDAG's 2021 Regional Plan



The 2016 Inventory provides background on individual sources and assumptions, a summary of the results, as well as the methodology used to develop and calculate the emissions by category. The primary GHGs included in this document are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O); others are included where data is available. Each GHG has a different capacity to trap heat in the atmosphere, known as its global warming potential (GWP), which is normalized relative to CO_2 and expressed in carbon dioxide equivalents (CO_2e).

Methodology for Emissions Calculations

The inventory was prepared by EPIC at the University of San Diego. EPIC used the global warming potential values from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). The methods used to quantify regional GHG emissions in the 2016 inventory are consistent with state and national best practices and meet CPRG requirements. Regional emissions were calculated by EPIC using several different data sources. The detailed methodology, including data sources and supporting documentation, can be found in Appendix B.

Table 2. Summary of 2016 Greenhouse Gas Inventory

Greenhouse Gas Emissions (Million Metric Tons [MMT] CO_2e)	
Emissions Category	**2016**
Passenger Cars and Light-Duty Vehicles	10.4
Electricity	5.3
Natural Gas	3.1
Industrial	2.1
Heavy-Duty Trucks and Vehicles	1.8
Other Fuels	1.1
Off-Road Transportation	0.62
Solid Waste	0.59
Water	0.24
Aviation	0.21
Rail	0.11
Wastewater	0.07
Agriculture	0.05
Marine Vessels	0.05
Soil Management	0.05
Total	**26**

MMT – million metric tons.

Greenhouse Gas Reduction Measures

The following table identifies priority measures that would reduce GHG emissions, would benefit LIDACs, and put the San Diego region on an accelerated path toward decarbonization. These measures were identified as top priorities through input from local governments, regional agencies, Tribal Nations, community-based organizations, and environmental and equity stakeholder groups. Measures focus on reducing emissions from transportation (vehicle and rail electrification programs, and VMT reduction programs), buildings (residential and municipal building energy efficiency and electrification programs), energy (solar and battery storage programs) and the water and wastewater systems (wastewater and energy recovery project). These measures illustrate the near-term vision for climate pollution reduction in the San Diego region.

Table 3. Greenhouse Gas Reduction Measures and Actions

Greenhouse Gas Reduction Measures and Actions	
Program	**Description**
Transportation	
T.1. Increase Adoption of Zero-Emission Vehicles	
T-1.1 Zero-Emission Light-Duty Vehicle Incentive Program*	Implement a regional light-duty zero-emission vehicle (ZEV) incentive program with an emphasis on low- and moderate-income populations in coordination with the Air Pollution Control District (SDAPCD).
T-1.2 Zero-Emission Medium and Heavy-Duty Vehicle Incentive Program*	Implement an incentive program for electric trucks in coordination with SDAPCD and the Port of San Diego (Port).
T-1.3 Electric Bus Program	Implement an incentive program for transit operators and school districts for electric buses in coordination with SDAPCD.
T-1.4 Zero-Emission Vehicles in Municipal Fleets*	Implement a regional incentive program to fund fleet electrification for local governments, Tribal governments, and public agencies in coordination with SDAPCD.
T-1.5 Zero-Emission Rail*	Provide funding to the North County Transit District (NCTD) to electrify rail cars for use on the Sprinter Line.
T.2. Increase Zero-Emission Vehicle Charging Infrastructure	
T-2.1 Public Light-Duty Zero-Emission Vehicle Charging Infrastructure Program*	Implement an incentive program for local governments, Tribal governments, and public agencies to install public and fleet charging stations in coordination with SDAPCD.
T-2.2 Zero-Emission Medium and Heavy-Duty Vehicle Charging Infrastructure Program*	Implement an incentive program to purchase and install publicly accessible truck and/or bus charging stations in coordination with SDAPCD, the Port, and transit operators.
T.3 Expand Active Transportation Opportunities	

Greenhouse Gas Reduction Measures and Actions	
Program	**Description**
T-3.1 Active Transportation Program*	Implement a grant program for local governments and Tribal governments to construct bike lanes in underserved areas and provide direct funding to SANDAG to construct bike lanes that complete the regional bike network.
T.4. Increase Use of Public Transit	
T-4.1 Transit Incentive Programs*	Extend the Youth Opportunity Pass (YOP) pilot program to provide free transit to all youth aged 18 and under in coordination with the San Diego Metropolitan Transit System (MTS) and NCTD. Restart the Try Transit pilot program to provide free 30-day transit passes to commuters to take transit instead of driving to work.
T-4.2 Bus Rapid Transit Projects*	Provide direct funding to implement up to 3 new rapid bus routes with more frequent service that move people faster by making fewer stops, using designated bus lanes (where needed), and green light priority at intersections to travel quicker through traffic.
T-4.3 Flexible Fleets Program*	Implement a regional program that enables local governments and Tribal governments to utilize on-demand transportation services in local communities to provide affordable transportation choices for all users while helping to reduce air pollution and congestion. Flexible Fleets include micromobility, rideshare, microtransit and last mile delivery.
T.5 Improve Transportation System Efficiency	
T-5.1 Freight Signal Prioritization Project*	Implement smart intersection signals (SIS) for freight traffic between the Port's two marine terminals, Tenth Avenue Marine Terminal and National City Marine Terminal as part of Harbor Drive 2.0 and in coordination with the SANDAG Advancing Border Connectivity Project. Freight Signal Prioritization (FSP) technology evaluates real-time traffic conditions and gives signal priority to trucks traveling along designated freight routes to reduce tailpipe emissions and truck idling and increase fuel and trip efficiency.
Building Energy Use	
B.1 Improve Energy Efficiency in Buildings	
B-1.1 Municipal Energy Efficiency Program	Implement a regional municipal energy efficiency program to undertake energy-saving and bill-reducing projects at local government, Tribal government, and public agency sites.

Greenhouse Gas Reduction Measures and Actions	
Program	**Description**
B-1.2 Residential Energy Efficiency Program	Implement a regional residential energy efficiency program that saves energy, reduces energy bills, and prioritize program offerings in LIDACs.
B-1.3 Non-Residential Energy Efficiency Program	Implement regional non-residential energy efficiency programs that prioritize GHG reductions, outreach, technical assistance, and incentives in LIDACs.
B.2 Electrify Buildings	
B-2.1 Municipal Building Electrification Program*	Through SDREN, implement a regional program to provide technical assistance, financial incentives, and replace municipal gas storage water heaters, boilers, and traditional HVAC systems with heat pump and other advanced electrification technologies.
B-2.2 Residential Building Electrification Program*	Through SDREN, develop a regional program to provide technical assistance, financial incentives, and potentially direct installation to replace residential gas storage water heaters and traditional HVAC systems with residential heat pump technologies, with an emphasis on LIDACs.
B-2.3 Non-Residential Building Electrification Program	Develop a regional program to provide technical assistance and financial incentives to replace nonresidential gas storage water heaters and traditional HVAC systems with heat pump water technologies, with an emphasis on LIDACs.
Clean Energy	
CE.1 Increase Solar and Energy Storage	
CE-1.1 Municipal Solar and Energy Storage	Develop a regional program to support local government, Tribal government, and public agency solar and storage projects.
CE-1.2 Solar and Storage on Residential Buildings*	Through SDREN, implement a regional program to provide technical assistance, financial incentives, and partnerships with industry to install residential solar and storage systems, with an emphasis on LIDACs.
CE-1.3 Solar and Storage on Non-Residential Buildings	Implement a regional non-residential program that prioritizes outreach, technical assistance, and solar and energy storage incentives in LIDACs.
Water	
W.1 Improve Water and Wastewater System Efficiency	

Greenhouse Gas Reduction Measures and Actions	
Program	**Description**
W-1.1 Wastewater and Energy Recovery Project*	Support implementation of the East County Advanced Water Purification (AWP) Project to provide new, local, and sustainable drinking water supply through the development of a water, wastewater, and energy recovery project. The project is managed through a Joint Powers Authority (JPA) including County of San Diego, Padre Dam Municipal Water District, City of El Cajon, and Helix Water District.

* Programs listed with an asterisk are further detailed in the section below.

Also, please note that for the geographic location of many projects listed, the term "regional" is used to refer to San Diego County in addition to the 17 sovereign Tribal Nations.

Greenhouse Gas Reduction Measure Details

The following section further details the measures in Table 3 that were listed with an asterisk, which will be evaluated for inclusion in the proposal that SANDAG will submit on behalf of the San Diego region to the EPA CPRG's competitive implementation grant program for PCAP measures. To put the region in the best position to be selected for implementation funding, the team will weigh the multiple factors that will be considered by the EPA in evaluating whether to fund the proposal, such as the cumulative GHG reductions, cost-effectiveness, benefits to LIDACs, and potential for transformative impact. Measures listed in Table 3 *without* an asterisk are not further detailed below but were included in the PCAP to recognize the priorities voiced by stakeholders but that may not be eligible or competitive for various reasons for the EPA CPRG implementation grants. For instance, energy efficiency programs were described in Table 3 above, because many regional stakeholders voiced the need for residential and commercial energy efficiency programs, especially for LIDACs. However, it was not described in more detail in the section below because the SDREN already has an application under review at the California Public Utilities Commission (CPUC) for $120 million in program funds to implement regional energy efficiency programs. For each measure below, programs and projects have an associated implementing agency with both the capacity and authority to implement the measure before 2030. GHG reduction estimates are included for both 2030 and 2050, as well as a high-level implementation schedule and milestones, geographic location, metrics for tracking progress, and described benefits to LIDACs. More information about the methodology for the GHG quantifications and further technical background is provided in Appendix C. Measures would be delivered through regional programs or direct project funding.

Transportation

Transportation represents over 50% of GHG emissions – the largest source of emissions in the San Diego region. To reduce emissions at a scale that will make a difference, it will be critical to implement measures that will increase zero-emission vehicle (ZEV) adoption, increase public transit use, and expand active transportation opportunities.

T-1 Increase Adoption of Zero-Emission Vehicles

A key action to reduce GHG emissions and improve overall health impacts in the region is to accelerate the adoption of ZEVs. ZEVs use cleaner sources of power such as electricity and hydrogen, and unlike vehicles that use internal combustion engines to burn fossil fuels, ZEVs do not produce harmful exhaust gases such as CO_2 and ozone. ZEV technologies are becoming more popular and affordable, with new models appearing on the roads every year. ZEVs include battery electric vehicles and hydrogen fuel cell vehicles and come in the form of passenger vehicles, light- and medium-duty vehicles (e.g., pickup trucks and delivery vehicles), and heavy-duty vehicles (e.g., semi-trucks and buses). The region will prioritize increased adoption of clean transportation by supporting and incentivizing access to ZEVs. This measure includes the following ZEV adoption-related programs:

T-1.1: Zero-Emission Light-Duty Vehicle Incentive Program

Implement a regional light-duty ZEV incentive program with an emphasis on low- and moderate-income populations in coordination with the SDAPCD.

Estimated GHG Emissions Reductions by 2030: 238,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 615,000 MT CO_2e

Implementing Agency: SANDAG in coordination with the SDAPCD

Authority To Implement: SANDAG has the authority to implement incentive programs. SANDAG has already received grant funding to research and design a regional light-duty ZEV incentive program.

Implementation Schedule and Milestones: In Year 1, conduct targeted outreach and engagement to LIDAC communities and launch the program. Continue incentive processing and distribution of funds through Year 5.

Geographic Location: Regional with an emphasis on low-income and disadvantaged communities.

Tracking Metric(s): Number of applications/incentives requested, number of zero-emission vehicle purchases/leases supported by incentives, percentage of funds distributed to LIDACs, number of outreach and engagement events.

Benefits to LIDACs: The light-duty ZEV incentive program would focus specifically on supporting ZEV adoption in LIDACs to reduce GHG emissions and improve air quality and public health in these areas. The proposed program would also include an outreach and education component to empower LIDACs with financial literacy tools and resources to inform potential ZEV adopters about the benefits and considerations when purchasing a ZEV.

T-1.2 Zero-Emission Medium and Heavy-Duty Vehicle Incentive Programs

Expansion of the Zero-emission Truck Pilot program to provide incentives to purchase or lease zero-emission trucks.

Estimated GHG Emissions Reductions by 2030: 29,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 76,000 MT CO_2e

Implementing Agency: SDAPCD in coordination with the Port of San Diego

Authority To Implement: SDAPCD has the authority to administer incentives for infrastructure for mobile equipment through existing incentive programs. The Port has the authority to incentivize the acquisition of zero-emission trucks pending Board approval.

Implementation Schedule and Milestones: In Year 1, establish funding agreements. Operate program, including application processing and contracts for projects in Years 2-4. Trucks in service starting in Year 3.

Geographic Location: Regional with a focus on disadvantaged communities that are Portside (Port of San Diego Marine Cargo Terminals) and along the International Border (Otay Mesa and San Ysidro communities).

Tracking Metric(s): Number of trucks purchased.

Benefits to LIDACs: There are numerous communities near the Port of San Diego and U.S./Mexico international border that are recognized as LIDACs due to the disproportionate amount of GHG emissions, diesel particulate matter, and $PM_{2.5}$ resulting from heavy-duty freight operations. By increasing the number of zero-emission freight vehicles through incentives, the program will reduce air pollution and improve public health in these LIDACs.

T-1.4: Zero-Emission Vehicles in Municipal Fleets

Implement a regional incentive program to fund fleet electrification for local governments, Tribal governments, and public agencies in coordination with SDAPCD.

Estimated GHG Emissions Reductions by 2030: 29,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 75,000 MT CO_2e

Implementing Agency: SANDAG in coordination with SDAPCD

Authority To Implement: SANDAG has the authority to implement incentive programs.

Implementation Schedule and Milestones: Subset of light duty zero-emission vehicle incentive program, the municipal program will launch in Year 1 and operate through Year 5. Conduct outreach and engagement to local governments, Tribal governments, and public agencies in Year 1.

Geographic Location: Regional

Tracking Metric(s): Number of project applications, number of vehicles purchased, number of Tribal/LIDAC applications, amount budget reserved/expended.

Benefits to LIDACs: Like the residential light-duty ZEV incentive program described above, a ZEV incentive program for municipal fleets will support ZEV adoption. Given that municipal fleets travel throughout the region, LIDACs could see improved air quality and public health from reduced GHG emissions of municipal fleet vehicles. Program would be available to Tribal governments in the region, which are designated as disadvantaged communities.

T-1.5: Zero-Emission Rail

Provide funding to NCTD for the transition to electric rail cars for use on the Sprinter Line.

Estimated GHG Emissions Reductions by 2030: 11,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 75,000 MT CO_2e

Implementing Agency: NCTD

Authority To Implement: NCTD has the authority to implement the procurement process for electric rail cars.

Implementation Schedule and Milestones: In Year 1, conduct market outreach and procurement process. In Year 2, complete vehicle and infrastructure design and start of construction. Year 3, continued construction and the start of testing and commissioning. Year 4, first vehicle begins operation, and in Year 5 second vehicle begins operations. Both vehicles in consistent operation by Year 5.

Geographic Location: New zero-emission trains would operate along the length of the SPRINTER line,[8] roughly parallel to State Route (SR) 78, passing through Areas of Persistent Poverty and Historically Disadvantaged Communities[9] in the cities of Oceanside, Vista, San Marcos, and Escondido.

Tracking Metric(s): Number of vehicles in service; number of trips completed by those vehicles, rail ridership.

Benefits to LIDACs: As mentioned in the project location above, rail electrification would benefit LIDACs in Oceanside, Vista, San Marcos, and Escondido that exist along the East-West railway corridor. Electrification of railways leads to reductions in GHG emissions and diesel particulate matter, which improves air quality and public health in these communities.

[8] https://gonctd.com/wp-content/uploads/2023/09/NCTD-System-Map-Only-October-2023.pdf
[9] https://www.transportation.gov/RAISEgrants/raise-app-hdc

T-2 Increase Zero-Emission Vehicle Charging and Fueling Infrastructure

As the region transitions from fossil-fuel based vehicles to ZEVs, it is critical that ZEV charging and fueling infrastructure is simultaneously prioritized. In conjunction with measure T-1, this measure supports the deployment of additional ZEV charging and fueling infrastructure throughout the region. Past EV charging infrastructure programs have supported the installation of charging and fueling stations, but gaps remain, notably in LIDACs, for drivers without access to home charging, and for the nascent medium- and heavy-duty vehicles market. Increasing ZEV charging and fueling stations enables a faster transition to ZEVs, and addresses drivers' concerns about range and access to charging.

T-2.1 Public Light-Duty EV Charging Infrastructure Program

Implement an incentive program to install workplace, public, and/or fleet charging stations in coordination with SDAPCD and build on the previous regional EV charger program that ends in 2025.

Estimated GHG Emissions Reductions by 2030: 8,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 20,000 MT CO_2e

Implementing Agency: SANDAG in coordination with the SDAPCD

Authority To Implement: SANDAG has authority to implement incentive programs. SANDAG has co-funded and oversees an existing EV charging infrastructure incentive program and would take lessons learned to implement this proposed program.

Implementation Schedule and Milestones: In Year 1, develop updated program. Launch by Year 2 and conduct outreach. Accept applications through Year 4 and continue processing applications and complete charger installations in Year 5. Conduct review of applications, distribution of incentive funds, and performance monitoring through the program.

Geographic Location: Regional

Tracking Metric(s): Number of chargers funded/installed, number of chargers installed in LIDACs.

Benefits to LIDACs: Approximately 40% of San Diegans live in multi-family housing and only 55% of housing is owner-occupied in the region, making it difficult for many to have access to home charging—a key factor in replacing a gas-powered vehicle with a ZEV. Increased access to public and workplace chargers, as well as charging at public facilities, will enable more drivers in LIDACs to switch to ZEVs, which also improves air quality and public health.

T-2.2 Medium and Heavy-Duty EV Charging Infrastructure Program

Implement an incentive program to purchase and install heavy-duty charging infrastructure as an expansion of SDAPCD's local incentive program.

Estimated GHG Emissions Reductions by 2030: 4,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 10,000 MT CO_2e

Implementing Agency: SDAPCD

Authority To Implement: SDAPCD has the authority to administer incentives for infrastructure for mobile equipment through existing incentive programs.

Implementation Schedule and Milestones: In Year 1, establish a funding agreement. In Years 2-4, accept applications and contracts for projects. In Years 3-5 install charging infrastructure.

Geographic Location: Regional with a focus on Portside and International Border communities within the San Diego region.

Tracking Metric(s): Number of installations, increase adoption of zero-emission trucks.

Benefits to LIDACs: Heavy-duty vehicle electrification is key to improving air quality and public health in communities disproportionately burdened by GHG emissions, diesel particulate matter, and $PM_{2.5}$ resulting from freight and other heavy-duty vehicle operations. By transitioning these vehicles to electric technologies, LIDACs in the Portside area, near the U.S./Mexico international border, and throughout the region will benefit from reduced air pollution. Additionally, incentivizing the deployment of EV charging infrastructure supports workforce development, especially for electricians and other trade careers. For example, many EV infrastructure incentive programs require Electric Vehicle Infrastructure Training Program (EVITP) certification for electricians. Incorporating funding and opportunities to receive this training helps to advance the local workforce.

T-3 Expand Active Transportation Opportunities

Biking, walking, and micromobility options help residents and visitors live healthier lifestyles and provide a broader array of travel options. Bikes, pedestrian-friendly spaces, and shared bike services have transformed the idea of personal mobility in recent years. Constructing and expanding these centers of activity to a broad regional network including smart roadways, makes riding a bike a safer and more convenient form of transportation for everyday travel. The following program will help expand the region's bike network and contribute to GHG reduction goals.

T-3.1 Active Transportation Program

Implement a regional grant program for local governments and Tribal governments to build facilities that promote multiple travel choices and increase connectivity to transit, schools, retail centers, parks, work, and other community gathering places. Program to be based on SANDAG's previously funded Active Transportation Grant Program. Additionally, provide direct funding to SANDAG to construct bike lanes that connect the regional bike network.

Estimated GHG Emissions Reductions by 2030: 34,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 182,000 MT CO_2e

Implementing Agency: SANDAG

Authority To Implement: SANDAG has authority to implement grant programs for local jurisdictions to construct active transportation infrastructure. SANDAG also has the authority to design and construct bike lanes in coordination with local jurisdictions as part of the regional bike network.

Implementation Schedule and Milestones: Year 1, develop grant program and issue call for projects, review applications, make recommendations for funding, and award grants. In Years 2-5, subrecipients complete their projects and provide final deliverables and performance measures. For SANDAG bikeway construction, on a rolling basis, projects will go out to bid, and construction to be completed by Year 5.

Geographic Location: Regional, with an emphasis on projects located in the safety focus network and/or in LIDACs for the grant program.[10]

Tracking Metric(s): Number of miles of bike facilities implemented by type (Class I through Class 4), and number of users post-construction compared to pre-construction for grant program. "Before and after" data for mobility, access, safety, and experience. Outreach to LIDAC communities for SANDAG bikeway construction projects.

Benefits to LIDACs: The SANDAG bikeway construction projects intersect or facilitate a network connection to LIDACs in the cities of San Diego, Vista, Oceanside, and La Mesa. Access to biking infrastructure provides more transportation choices to communities, offers healthier mobility options, and can replace trips that would otherwise be done with cars. Additionally, bike lanes provide more protection for cyclists, improving public health, safety, and quality of life.

T-4 Increase Use of Public Transit

Public Transit, including bus and rail systems and microtransit, are essential to a transportation future in which people can move around the region efficiently and safely while reducing the impact of vehicle miles traveled on the environment. Significant progress has been made in recent years to expand the light rail system and bus routes, advance alternatives to driving alone, and promote the benefits of using public transit. In May of 2022, SANDAG launched the Youth Opportunity Pass (YOP) pilot program which provides fare-free public transportation to all youth ages 18 and under on all transit services in the region operated by MTS and NCTD. The YOP has been a successful pilot, nearly doubling the average number of monthly riders and tripling the number of youths regularly riding transit, with disadvantaged communities and routes near schools seeing the largest increases in youth ridership[11]. However, the program currently relies on temporary funding; so SANDAG, MTS and NCTD must work to identify a renewable funding source that will continue the program and support the creation of any additional incentive programs to increase public

[10] Safety focus network to be finalized in 2024 as part of SANDAG's Vision Zero Action Plan.
[11] https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/regional-initiatives/transit-equity-pilot/youth-opportunity-pass/yop-comprehensive-program-report.pdf

transit ridership in the region.

Flexible Fleets is another program that has been introduced to the region that aims to reduce single-occupancy vehicles. Flexible Fleets offer a variety of on-demand services through shared vehicles, including microtransit, bikeshare, scooters, and other modes of transportation that will connect people to transit and make travel easy. Microtransit options can include smaller electric shuttles or neighborhood electric vehicles that are used for pooled trips within a community. Although the region has successfully obtained a limited amount of funding to launch pilots, funding is needed to supplement some of the underfunded services, continue successful pilots, and introduce new service areas throughout the region.

T-4.1 Transit Incentives Program

Extend the Youth Opportunity Pass (YOP) pilot program to provide free transit to all youth aged 18 and under in coordination with MTS and NCTD. Restart the Try Transit pilot program to provide free, 30-day transit passes to commuters to take transit instead of driving to work.

Estimated GHG Emissions Reductions by 2030: 11,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 11,000 MT CO_2e

Implementing Agency: SANDAG, in coordination with MTS and NCTD for YOP; SANDAG for Try Transit program.

Authority To Implement: Implementing agencies have the authority to implement. SANDAG has co-funded and oversees the YOP program in coordination with transit agencies. Additionally, SANDAG has historically funded and managed the Try Transit program.

Implementation Schedule and Milestones: In Year 1, extend Youth Opportunity Pass program within six months of receiving funding, restart Try Transit program as offering in the Sustainable Transportation Program, hold outreach events in transit-oriented areas within three months of receiving funding. In Years 2-5, continue operation of programs and monitor program performance.

Geographic Location: Regional, with Youth Opportunity Pass Program outreach focused on LIDACs in partnership with Title I schools & nonprofit community organizations. Try Transit Program's focus is on residents living in LIDACs in transit-oriented development areas.

Tracking Metric(s): Number of transit trips taken, and survey reports of program users for both transit incentive programs. For the Youth Opportunity Pass, also track the number of active youth transit accounts and Try Transit surveys to capture user intent to continue use of public transit.

Benefits to LIDACs: These programs provide direct access to transit for people belonging to LIDACs who may not be able to afford personal vehicles or other transportation options. This program also enables people to choose to use transit for a trip in place of a personal vehicle, which reduces GHG emissions and improves air quality. Transit incentive programs also enable youth and other community members' connections to school, medical care, workplaces, etc., fostering educational attainment, public health, and workforce development and/or growth.

T-4.2 Bus Rapid Transit Project(s)

Provide direct funding to implement up to 3 new rapid bus routes that would provide more frequent transit service that moves people faster by making fewer stops, using designated bus lanes (where needed), and green light priority at intersections to travel quicker through traffic.

Estimated GHG Emissions Reductions by 2030: 71,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 240,000 MT CO_2e

Implementing Agency: SANDAG

Authority To Implement: SANDAG has authority to implement BRT project through planning, design, and construction of BRT infrastructure in coordination with transit agencies.

Implementation Schedule and Milestones: Initial route planning already underway to be completed in first 1-2 years (depending on route). Project implementation is to occur in Years 2-4 with completion by Year 5. Bus service to start by Year 5.

Geographic Location: Routes under consideration would operate in the cities of San Diego, El Cajon, Santee, Poway, San Marcos, Escondido, Carlsbad; and unincorporated Ramona in the County of San Diego.

Tracking Metric(s): Ridership, farebox recovery, improved trip times, transit network connections

Benefits to LIDACs: The cities listed above include many of the LIDACs in the San Diego region, and as mentioned above, some of these community members may rely on transit due to the expense of owning a personal vehicle or other reasons. Improvements to transit through bus rapid projects not only improve the user experience and quality of life for LIDAC riders but can entice other residents to choose transit. Rapid bus projects reduce VMT and GHG from single occupancy vehicles and improve air quality and public health. Additionally, the project supports workforce development through job creation as more drivers, maintenance workers, etc. are needed to operate the new routes.

T-4.3 Flexible Fleets Program

Implement a regional program that enables local governments and Tribal governments to utilize on-demand transportation services in local communities to provide affordable transportation choices for all users while helping to reduce air pollution and congestion.

Flexible Fleets include micromobility, rideshare, microtransit, and last-mile delivery.

Estimated GHG Emissions Reductions by 2030: 300 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 300 MT CO_2e

Implementing Agency: SANDAG

Authority To Implement: SANDAG has the authority to implement Flexible Fleets throughout the region in coordination with local jurisdictions, including planning and management of the project.

Implementation Schedule and Milestones: In Year 1, launch program, and continue operation through final year.

Geographic Location: Regional with priority for expansion in low-income and disadvantaged communities.

Tracking Metric(s): Number of flexible fleet services launched, number of community projects, number of trips provided, trip replacement from single occupancy vehicles (VMT reduction).

Benefits to LIDACs: This program prioritizes affordable transportation options for residents in LIDACs to reach different areas of their communities more easily, including transit stations, commercial centers, medical offices, etc. Enabling this connection to transit and other amenities supports access for those in LIDACs who rely on public transit and helps reduce VMT. In turn, this reduces GHG emissions and improves air quality and public health in these communities. Additionally, the implementation of more Flexible Fleets supports workforce development through job creation in LIDACs where drivers, maintenance, etc. are needed to support the fleets.

T-5 Improve Transportation System Efficiency

Technology serves as a backbone to the transportation system. A variety of tools and strategies can be used to improve the San Diego region's transportation system efficiency with the goal of ensuring people and goods safely arrive at their destination in a timely manner and with reduced environmental impacts. As a border region that experiences heavy freight traffic, it is important to implement technology investments that support streamlined approaches to improving traffic conditions for all while reducing tailpipe emissions.

T-5.1 Freight Signal Prioritization Project

Implement smart intersection signals (SIS) for freight traffic between the Port of San Diego's two marine terminals, Tenth Avenue Marine Terminal and National City Marine Terminal, as part of Harbor Drive 2.0 project, and in coordination with the SANDAG Advancing Border Connectivity Project. Freight Signal Prioritization (FSP) technology evaluates real-time traffic conditions and gives signal priority to trucks traveling along designated freight routes to reduce tailpipe emissions and truck idling and increase fuel and trip efficiency.

Estimated GHG Emissions Reductions by 2030: 2,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 10,000 MT CO_2e

Implementing Agency: Multi-Agency Effort via Memorandum of Agreement that includes Caltrans, City of San Diego, Port of San Diego, and SANDAG

Authority To Implement: The project would be implemented by a multi-agency effort (listed above) via an established Memorandum of Agreement as part of Harbor Drive 2.0.

Implementation Schedule and Milestones: FSP is an unfunded component of a larger freight corridor project called Harbor Drive 2.0 that is anticipated to be completed in 2028. Technology needs will be informed by the Advancing Border Connectivity Pilot that is anticipated to be completed in June 2026.

Geographic Location: Cities of San Diego and National City; Regional

Tracking Metric(s): Reduction in the number of collisions, number of freight/commercial vehicle driver interactions, improved travel times, increased fuel economy by reducing stops and idling at traffic signals, and reduced GHG emissions

Benefits to LIDACs: Freight Signal Prioritization at the Port of San Diego directly benefits Portside communities (San Diego and National City) that are designated LIDACS due to their disproportionate air pollution burden caused by nearby trucking operations. As described above, FSP reduces truck idling and tailpipe emissions including GHGs and particulate matter, benefiting these LIDACs through improved air quality and public health.

Building Energy

On-site fossil fuel combustion from natural gas in buildings provides energy for space heating, water heating, cooking, and other functions. Natural gas accounts for about 12% of regional GHG emissions. Switching to high-efficiency electric appliances and equipment can reduce the GHG emissions from fossil fuel combustion while improving indoor air quality. As the renewable energy content powering the electric grid increases to 100% by 2045, the transition to electric appliances and equipment further supports regional decarbonization.

B-2 Electrify Buildings

Gas burning appliances contribute to poor indoor air quality, negatively impact human health and emit GHG emissions. Incentives can be provided to building owners and occupants to encourage the transition from older gas appliances to new, high-efficiency electric equipment and appliances that reduce emissions and improve indoor air quality.

B-2.1 Municipal Building Electrification Program

Through the San Diego Regional Energy Network (SDREN)[12] implement a regional program for local governments, Tribal Nations, and public agencies to provide technical assistance and financial incentives to replace municipal gas storage water heaters, boilers, and traditional HVAC systems with heat pump and other advanced electrification technologies.

Estimated GHG Emissions Reductions by 2030: 13,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 49,000 MT CO_2e

Implementing Agency: SDREN

Authority To Implement: SDREN has the authority to implement incentive programs and provide technical assistance.

Implementation Schedule and Milestones: The program will launch in Year 1, with continued incentive processing and distribution through Year 5.

Geographic Location: Regional

Tracking Metric(s): Number of buildings retrofitted, number of equipment installations, number of Tribal/LIDAC applications.

Benefits to LIDACs: Municipal building electrification applies to all types of municipal-owned, publicly accessible buildings including those in LIDACs. This program would improve air quality in and around these buildings, supporting public health in LIDACs.

B-2.2 Residential Building Electrification Program

Through SDREN, develop a regional program to provide technical assistance, financial incentives, and potentially direct installation to replace residential gas storage water heaters and traditional HVAC systems with residential heat pump water technologies, with an emphasis on low-income and disadvantaged communities.

Estimated GHG Emissions Reductions by 2030: 31,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 122,000 MT CO_2e

Implementing Agency: SDREN

Authority To Implement: SDREN has the authority to implement incentive programs and provide technical assistance.

Implementation Schedule and Milestones: The program will launch in Year 1, with continued incentive processing and distribution through Year 5. Targeted outreach and engagement to low-income and disadvantaged communities beginning year 1.

[12] SDREN is led by San Diego Community Power and the County of San Diego with representation countywide. SANDAG collaborated with San Diego Community Power as an implementing agency through SDREN.

Geographic Location: Regional, including Tribal communities.

Tracking Metric(s): Number of residential buildings and homes retrofitted, number of equipment installations, dollar amount distributed to LIDACs.

Benefits to LIDACs: The residential building electrification program would directly benefit LIDACs by providing incentives, technical assistance, and in some cases, direct install of electric home appliances to reduce GHG emissions around their homes. This program could also support workforce development for trade workers in the region who can install electric appliances in retrofitted buildings. Lastly, this program could also result in energy cost savings and other economic benefits for residents.

Clean Energy

Electricity emissions account for 21% of the region's GHG emissions. Transitioning to clean onsite energy sources will help reduce emissions and ensure that the electrification of the transportation and building energy sectors also rely on clean energy.

CE-1 Increase Solar and Energy Storage

Generating onsite renewable energy through solar and storage reduces demand on the electric grid, expands access to reliable clean energy sources, and reduces GHG emissions. Increasing onsite solar energy generation and storage also expands the green economy, reduces utility bills, and improves energy resilience.

CE-1.2 Solar and Storage on Residential Buildings

Through SDREN, implement a regional program to provide technical assistance, financial incentives, and partnerships with the solar/storage industry to install residential solar and storage systems, with an emphasis on low-income and disadvantaged communities.

Estimated GHG Emissions Reductions by 2030: 67,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 215,000 MT CO_2e

Implementing Agency: SDREN

Authority To Implement: SDREN has the authority to implement incentive programs and provide technical assistance.

Implementation Schedule and Milestones: The program currently exists as a pilot project of San Diego Community Power, the Lead Program Administrator of SDREN. The program will launch in Year 1, with continued incentive processing and distribution through Year 5. Targeted outreach and engagement to low-income and disadvantaged communities beginning in Year 1.

Geographic Location: Regional, including Tribal communities.

Tracking Metric(s): Number of systems installed, dollar amount distributed to LIDACs.

Benefits to LIDACs: Through this program, which specifically targets LIDACs, residents would benefit from energy cost savings resulting from the use of solar and storage systems. Additionally, this program supports workforce development in the region as the demand for electricians and other workers involved in solar and storage installations increases.

Water

Water sector emissions occur during extracting, treating, transferring, and distributing water to the region's communities, businesses, and agricultural lands. Delivering water to the San Diego region and treating it are very energy-intensive processes. While direct water emissions account for only 1% of overall regional GHG emissions, water is integral to human life, and it is critical to ensure equitable access to clean water and increase cleaner water reuse.

W-1 Improve Water and Wastewater System Efficiency

More efficient treatment of stormwater and wastewater reduces the need for imported potable water and decreases emissions associated with treating and storing wastewater while providing valuable co-benefits, including reducing ocean discharge, and adding to the region's water supply.

W-1.1 Wastewater and Energy Recovery Project

Support implementation of the East County AWP Project to provide new, local, and sustainable drinking water supply through the development of a water, wastewater, and energy recovery project. The project is managed through a Joint Powers Authority (JPA) including County of San Diego, Padre Dam Municipal Water District, City of El Cajon, and Helix Water District.

Estimated GHG Emissions Reductions by 2030: 15,000 MT CO_2e

Estimated GHG Emissions Reductions by 2050: 77,000 MT CO_2e

Implementing Agency: Padre Dam MWD

Authority To Implement: The East County AWP JPA has regulatory authority to implement the project. Padre Dam MWD is implementing the project on behalf of the JPA.

Implementation Schedule and Milestones: AWP pipelines, pump station upgrades are anticipated to be completed in Year 2. The Water Recycling Facility, Solids Handling Facility, AWP Facility, Energy Recovery Facilities, regional pipeline, and upgrades to the existing force main are anticipated to be completed in Year 3.

Geographic Location: The project will benefit communities in the East County of San Diego. The facilities will be in the City of Santee.

Tracking Metric(s): Gallons of wastewater treated locally, kW of energy recovered.

Benefits to LIDACs: LIDACs in East County will benefit from this project through water and wastewater improvements due to the reduced GHG emissions, as well as potential energy cost savings derived from the energy recovery aspect of the project. Additionally, it may support workforce development through job creation and/or training in relation to the project facilities.

Benefits Analysis

SANDAG, partner agencies, and stakeholders in the San Diego region recognize the importance of not only reducing GHGs that are driving climate change, but also reducing air pollutants that are negatively impacting public health, particularly in LIDAC communities. Sectors such as transportation, buildings, and energy, which account for the majority of GHG emissions, are also the source of many harmful air pollutants. Implementing measures to reduce emissions in these sections will have significant co-benefits to air quality and human health. In the transportation sector, for example, medium- and heavy-duty vehicles emit diesel particulate matter, a known carcinogen. PCAP measures, such as incentives to replace these gas-powered vehicles with electric alternatives, will reduce GHG emissions while accelerating actions to reduce harmful air pollutants in overburdened LIDACs. These measures will build on efforts of partner agencies already underway in the region including the SDAPCD's Regional Air Quality Strategy (RAQS), Community Emissions Reduction Plan in Portside Environmental Justice Neighborhoods, and International Border Communities San Ysidro and Otay Mesa Community Emissions Reduction Program. A full assessment of air pollutant reductions for each measure is forthcoming and will be developed for the CCAP.

Low-Income and Disadvantaged Communities Benefits Analysis

LIDACs in the San Diego region are disproportionately impacted by several climate impacts, including extreme heat, flooding, coastal erosion, drought, and wildfires. The historic heavy rainfall that the region experienced in January 2024 and subsequent flooding in LIDAC communities was a stark example of this. While most residents across the San Diego region experienced some amount of rainfall during the storm, for many residents in LIDAC communities, the effects were disastrous. The storm resulted in three deaths and damage or destruction to more than 800 homes in the San Diego region.[13] The storm was especially damaging in southeast San Diego, an area with a high concentration of LIDACs. Due to historic disinvestment and under-resourcing, many LIDACs have a compromised ability to combat and recover from the effects of climate change. Communities hit hardest by the January 2024 flooding are still feeling its effects. In response to the devastation left by the storm, President Biden approved a Major Disaster Declaration through FEMA to provide much-needed assistance to San Diego communities impacted by the storm.[14]

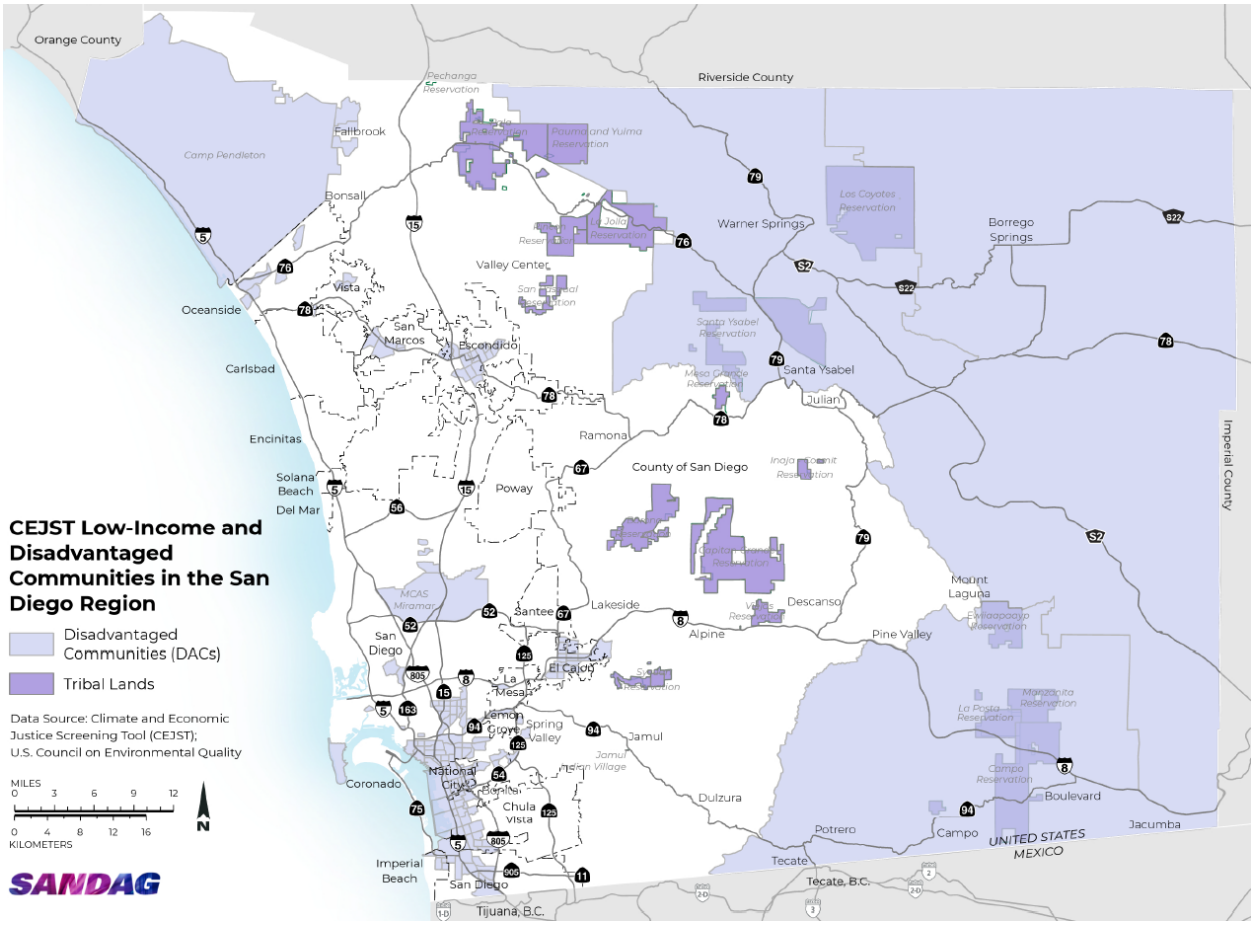
[13] https://www.sandiegouniontribune.com/news/public-safety/story/2024-02-19/biden-approves-major-disaster-federal-funding-san-diego-storm
[14] https://www.fema.gov/press-release/20240220/president-joseph-r-biden-jr-approves-major-disaster-declaration-california

As exemplified by the recent storm, not all communities are impacted the same way by climate risks. The severity and types of climate change impacts vary across communities in the region, as does the ability to cope with these burdens. This section addresses the importance of addressing these inequities and engaging with communities to implement measures that are responsive to the diverse needs of and contexts in LIDACs in the region.

Identifying Low-Income and Disadvantaged Communities and Climate Risks

SANDAG used the U.S. Council on Environmental Quality's Climate and Economic Justice Screening Tool (CEJST) to identify LIDACs in the San Diego region. Both CEJST and the U.S. EPA's Environmental Justice Screening Tool (EJScreen) were used to assess climate risks and burdens on these LIDACs. In total, there are 159 census tracts designated as low-income and/or disadvantaged across the San Diego region (for the full list of LIDAC census tracts, see Appendix C). Figure 3 below spatially shows the location of the San Diego region LIDAC census tracts. This represents 25% of all census tracts in the region. Notably, all census tracts that include land within the boundaries of 17 Federally Recognized Tribes are also identified in the map and considered disadvantaged by CEJST.[15] The San Diego region is also home to several military bases, which are also identified as LIDACs by CEJST.

Figure 3. CEJST Low-Income and Disadvantaged Communities in the San Diego Region



[15] https://screeningtool.geoplatform.gov/en/methodology

The CEJST tool organizes various criteria into categories of burden, including data on climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. While there are specific datasets that fall within each of these categories, all are based on demographic, socioeconomic, and/or environmental indicators which are compared to the tract's income level. For instance, a census tract is considered disadvantaged by CEJST if the community is at or above the 90th percentile for an environmental indicator, such as proximity to hazardous waste facilities, in addition to being at or above the 65th percentile for low-income.

Categories of Burdens

According to CEJST, housing, and workforce development are by far the most common categories of burden for LIDACs in the San Diego region. Table 4 below illustrates the conditions that result in housing and workforce development burdens, respectively.

Table 4. CEJST Housing and Workforce Development Burdens

CEJST Burden	If the census tract is/has:	And:	Then the census tract is:
Housing Burden	- Historic underinvestment - At or above the 90th percentile for housing cost OR lack of green space OR lack of indoor plumbing OR lead paint	- Is at or above the 90th percentile for low-income	- Disadvantaged by a housing burden
Workforce Development Burden	- At or above the 90th percentile for linguistic isolation OR low median income OR poverty OR unemployment	- More than 10% of the people ages 25 years or older whose high school education is less than a high school diploma	- Disadvantaged by a workforce development burden

The two most common indicators cited as part of the housing burden for San Diego LIDACs are the cost of housing and the lack of green space. The cost of housing is particularly challenging in the region, with San Diego ranking as one of the most expensive areas to live in the nation in 2023.[16] In many parts of the region, such as southwest San Diego near the Barrio Logan neighborhood, for example, historic underinvestment is another significant issue contributing to the housing burden. CEJST evaluates historic underinvestment through an analysis of the discriminatory redlining maps used starting in the 1930s to cut off low-income and minority communities from lending and investment opportunities. The legacy of these policies continues to negatively affect San Diego area LIDACs today.

[16] https://www.kpbs.org/news/local/2023/10/26/national-report-says-san-diego-is-the-most-expensive-city-in-the-u-s

Indicators used to estimate workforce development burden include linguistic isolation, unemployment, low median income, and poverty. In many census tracts identified as having a workforce development burden, more than one of these indicators are present. For example, a tract might have linguistic isolation, low median income, and low rates of high school education. Given the San Diego region's proximity to the U.S./Mexico border, the percentage of the population that speaks another language is higher than the U.S. average. SANDAG's Language Assistance Plan published in 2022 identifies Spanish, Tagalog, Vietnamese, Chinese (Mandarin and Cantonese), and Arabic as the five most common languages spoken in the region after English. Nearly 400,000 individuals in the San Diego region have Limited English Proficiency,[17] adding to the workforce development burden in the form of linguistic isolation.

While housing and workforce development were the two most frequent categories of burden found across LIDACs in the San Diego region, these communities are commonly overburdened in more than one CEJST category, such as transportation, water and wastewater, legacy pollution, health, climate change, or energy. For example, many census tracts are in close proximity to hazardous waste facilities or have a higher number of leaking storage tanks than other communities, meaning that they are burdened by legacy pollution in addition to other burdens. Understanding the different types and layers of burdens is key to addressing climate risks facing communities across the San Diego region.

The climate risks, impacts, and vulnerabilities vary considerably across LIDACs in the San Diego region. For example, the climate change burden in many southern and eastern county census tracts is driven by higher wildfire risk, while in coastal areas to the west, coastal erosion is the major driver. For other communities across the region, climate change burdens are instead associated with higher flood risk or anticipated increased building loss. Many communities along the coastline are overburdened in the water/wastewater category, caused by wastewater discharge. For instance, residents on both sides of the U.S./Mexico international border, in the Cities of Imperial Beach and Tijuana, are exposed to severe pollution from raw sewage runoff and failing wastewater infrastructure. Recent storms, such as the historic rainfall in January 2024 mentioned earlier in this section, which are expected to increase in intensity and frequency due to climate change exacerbate these existing public health and environmental challenges.[18] Another burden on census tracts near the U.S./Mexico international border is in the transportation category, given the passenger vehicle and truck traffic congestion at the border. Similarly, communities near the Port of San Diego experience high traffic volume associated with medium- and heavy-duty freight operations, also resulting in a transportation burden.

LIDACs have diverse histories, geographies, assets, and socioeconomic characteristics that influence their ability to cope with the disproportionate impacts of the climate burdens they face. Continuing to engage with and value the knowledge of these communities will be essential to ensuring that GHG reduction measures are implemented in a manner that is responsive to the diverse contexts of LIDACs in the region.

[17] https://www.sandag.org/LAP
[18] https://www.theguardian.com/environment/2024/feb/15/us-mexico-california-tijuana-river-illness-public-health

Engagement with Low-Income and Disadvantaged Communities

As mentioned in the Approach to Developing the PCAP section of the Introduction, community and stakeholder engagement was critical in the development of the PCAP. One strategy used to reach LIDACs in the region was to solicit feedback on the PCAP content and process from CBO representatives of these communities through SANDAG's Social Equity Working Group and CBO Outreach Team meetings. Additionally, SANDAG invited numerous CBOs and other local nonprofits to both Climate Table workshops, where they voiced community priorities for GHG reduction measures and suggested relevant projects. SANDAG will build on this momentum when developing the CCAP to continue building relationships and gathering key input from LIDACs.

For more information regarding engagement with communities, see the section "Approach to Developing the Priority Climate Action Plan" above.

Benefits to Low-Income and Disadvantaged Communities from Priority Climate Action Plan Measures

The measures in this PCAP are directly informed by community and stakeholder priorities and aim to improve public health and reduce air pollution through GHG emission reductions. Additionally, based on the PCAP measure categories of transportation, building energy use, clean energy, and water, some of the wider potential co-benefits to LIDACs from the PCAP measures include energy cost savings, economic development, job creation (see Workforce Planning Analysis below), and community capacity building.

Specific benefits to LIDACs associated with each PCAP measure are listed in the section titled "Greenhouse Gas Reduction Measures" above.

Review of Authority to Implement

The "Greenhouse Gas Reduction Measure Details" section above reflects the subset of measures prioritized by stakeholders in the region that either SANDAG or partner agencies have the capacity and authority to implement before 2030. Please refer to the section titled "Greenhouse Gas Reduction Measure Details" above for the review of the authority to implement each GHG reduction measure.

Workforce Planning Analysis

Many of the measures outlined in this PCAP will result in new projects and programs for the region and will impact the workforce needs and opportunities. As the region takes action to meet ambitious GHG reduction goals, workforce training will be needed for emerging skills and occupations. To analyze the workforce development activities needed to implement the priority measures included in this PCAP, SANDAG leveraged a workforce development study called *Putting San Diego County on the High Road: Climate Workforce Recommendations for 2030 and 2050*,[19] developed by the County of San Diego to support the San Diego RDF. It includes three of the four sectors covered in this PCAP (transportation, building energy use,

[19] https://www.sandiegocounty.gov/content/dam/sdc/lueg/regional-decarb-frameworkfiles/Putting%20San%20Diego%20County%20on%20the%20High%20Road_June%202022.pdf

and clean energy), which are described below.

Transportation:

- The current workforce related directly to transportation including vehicle mechanics, gas station operators, and freight movers would need re-training but are not expected to experience net loss through 2030.
- The electrification of transportation will require a shift towards more specifically certified electricians which will entail further training.
- VMT reduction through increased public transportation and new infill development will require ensuring continue high quality labor standards through 2050.

Buildings and Energy:

- There will be a need for training that helps prepare contractors and technicians for the installation and maintenance of electric appliances and equipment including heat pumps.
- For hard-to-electrify industrial sectors, there's a need to enhance workforce readiness to expand the use of renewable gas and hydrogen.
- Training will be needed for solar installation, geothermal heat pumps, hydrogen energy solutions, and other clean energy technologies.

Water, the fourth and final sector covered in this PCAP is not specifically addressed by the County of San Diego's workforce development study, however SANDAG will conduct a full workforce planning analysis as part of the upcoming Comprehensive Climate Action Plan. The County of San Diego's workforce development study also analyzed opportunities for the creation of new high-quality jobs resulting from decarbonization measures across the multiple sectors including transportation, buildings, and energy as well as lands (which is not included in this PCAP). The study found the San Diego region could generate an average of 27,000 green jobs per year through 2030 considering all decarbonization sectors covered in the RDF.[20]

[20] https://www.sandiegocounty.gov/content/dam/sdc/lueg/regional-decarb-frameworkfiles/Putting%20San%20Diego%20County%20on%20the%20High%20Road_June%202022.pdf

Next Steps

The PCAP identifies near-term regional priorities for reducing GHG emissions and it is the first of the three deliverables that SANDAG is required to submit to EPA as part of the CPRG planning grant. Following submission of the PCAP, SANDAG will coordinate with partner agencies to prepare a regional application for the competitive implementation grants made available through the EPA's CPRG program to fund measures identified in PCAPs. To determine which measures included in the PCAP will be included in the regional grant proposal and put the San Diego region in the best position to be selected for implementation grant funding, the project team will weigh multiple factors that are part of the EPA evaluation process. These include cumulative GHG reductions, cost-effectiveness, benefits to LIDACs, potential for transformative impact, and whether other funding sources are available to implement measures.

The near-term vision for the San Diego region described in this PCAP can be used by local governments, regional agencies, Tribal Nations, community-based organizations, and other stakeholders to support effective regional collaboration to combat climate change and reduce air pollutants. The PCAP can also serve as supporting documentation for regional stakeholders to pursue additional funding opportunities outside of EPA CPRG.

Following completion of the PCAP and regional grant proposal, SANDAG will begin development of the CCAP, the second deliverable of the EPA CPRG planning grant. The CCAP will be a holistic plan to reduce GHG emissions in the region between now and 2050, and it will support the San Diego region in meeting the State's ambitious goals of net zero emissions by 2045. It will address elements not found in the PCAP such as GHG emissions projections and reduction targets and will include a more comprehensive benefits and workforce planning analysis. As part of the CCAP development, SANDAG will also update the regional GHG inventory. Building on community and stakeholder engagement conducted for this PCAP, the CCAP will include additional outreach and engagement efforts, including future Climate Table workshops and CBO engagement activities. SANDAG anticipates completing the CCAP by Summer 2025 and plans to incorporate it into the 2025 Regional Plan.

Finally, SANDAG will prepare a Status Report as the third and final deliverable of the EPA CRPG planning grant by mid-2027. It will include updates on the implementation status of the quantified GHG reduction measures included in the PCAP and CCAP, as well as any relevant updates to GHG analyses or projections. Additionally, the Status Report will discuss the next steps and future budgeting or staffing needs necessary to implement the CCAP.

Appendices

Appendix A: Outreach and Engagement Documentation

Summary of First Climate Table Workshop

Overview and Purpose

The first workshop, on December 6, 2023, focused on the first deliverable of the Climate Pollution Reduction Grant (CPRG): the Priority Climate Action Plan (PCAP). This workshop served to establish the Climate Table and gain important input on the PCAP, while the long-term vision is for the Climate Table to meet regularly to discuss a wide range of regional climate topics.

Background

On September 7, 2023, the SANDAG Board of Directors and staff received a letter from Climate Action Campaign, along with 13 other advocacy groups and non-profit organizations in the region, calling for SANDAG to establish a Regional Climate Readiness Table "where local governments, private business, frontline communities and community-based organizations can work in partnership to attract more state and federal funding for regional projects that further climate resilience and create a more healthy environment for generations to come."

SANDAG Board of Directors Chairwoman Nora Vargas consequently directed staff to plan and host workshops focused on the CPRG awarded to SANDAG by the U.S. Environmental Protection Agency (EPA), as part of our outreach and engagement.

Participants

SANDAG assembled a database of environmental advocacy groups, Community-Based Organizations and equity groups, non-profit organizations, local governments and public agencies, and tribal nations that could have interest in participating. More than 70 organizations were invited, and 27 attended the workshop. See Attachment A for a list of all organizations invited and attended. Due to space constraints of the SANDAG Board Room, the number of participants for this first workshop was limited to two people per organization. For future Climate Table meetings, SANDAG will seek larger venues to allow more participants to attend.

Process

The workshop consisted of two main parts: presentations and breakout sessions. The workshop began with opening remarks from regional leaders in the climate space, including:

- Maykent Salazar, Climate Policy Advisor, Office of Chairwoman Nora Vargas, County Supervisor and SANDAG Board of Directors Chair
- Antoinette Meier, Senior Director of Regional Planning, SANDAG
- Darbi Berry, Director, San Diego Regional Climate Collaborative
- Nicole Capretz, Founder and CEO, Climate Action Campaign

Following these opening remarks, SANDAG Climate Planning Manager Susan Freedman presented an overview of the CRPG and the process of developing a PCAP for the San Diego region, including collaborative efforts, outreach, and upcoming funding for PCAP implementation. Next, Sarah Jo Szambelan, International Advisor and California CPRG Project Manager at the California Air Resources Board gave a presentation on the State's plans to address the Climate Crisis, developing the statewide PCAP, and coordination with regional efforts.

After the presentations and Q&A session, attendees were invited to join one of four breakout session groups to participate in focused discussions regarding climate action in the transportation and building sectors. Each group included a moderator and notetaker from SANDAG, and all groups were asked the following questions:

1. Based on what we've learned from past engagement (local governments Climate Action Plans and the Regional Decarbonization Framework), and the direction from EPA for what the PCAP can be, what are your top priorities for transportation?
2. How should the region prioritize actions in the transportation space, given the goals of the PCAP (largest GHG reductions, support Air Quality improvements and EJ communities), quick turnaround time for the PCAP, and the ability to include more in the comprehensive CAP that comes next?
3. Based on what we've learned from past engagement (local governments Climate Action Plans and the Regional Decarbonization Framework), and the direction from EPA for what the PCAP can be, what are your top priorities for building decarbonization?
4. How should the region prioritize actions in the building decarbonization space, given the goals of the PCAP, quick turnaround time for the PCAP, and the ability to include more in the comprehensive CAP?

Every group also had access to several supporting materials, including informational maps about housing occupancy by tenure (i.e., renter- versus owner-occupied units), EV charging infrastructure, and a blank regional map that participants could write on and/or add sticky notes to, reflecting their ideas and priorities. At the end of the breakout sessions, moderators reported out to all attendees to share what was discussed by their respective group.

After the workshop, SANDAG staff conducted a thematic analysis of the notes and annotated maps from each group to create this memo.

<u>Feedback Themes</u>

The following section shows overarching themes from the workshop discussions, as well as sections for both the transportation and building sectors. Each theme includes a brief

description as well as key points or pieces of feedback transcribed from the discussion notes and/or annotated maps.

OVERARCHING THEMES:

Provide Education, Outreach, and Technical Assistance

Throughout the meeting, attendees stressed the importance of reaching out to the communities these climate projects and policies are meant to serve. Specifically, many people discussed ways to address barriers to equitable clean energy/energy efficiency deployment, such as establishing a central information office to provide education about incentives and funding and partnering with communities to conduct outreach.

- *"Outreach - educate the community more about solar equity programs for their homes"*
- *"Increasing public knowledge with energy education programs"*
- *"Education + outreach programs around decreasing energy demand. Energy efficiency"*
- *"Partner with the CCAs for more education and grants"*
- *"Central office to help with people electrifying homes"*
- *"Central office/info for incentives (car/truck/infrastructure)"*
- *"'One stop shop' tech assistance – incentives and contracts"*
- *"Connecting with non-profits to enhance EV education and disadvantaged communities"*

Continue to Prioritize Equity

Across the board, workshop attendees emphasized the importance of continuing to prioritize equity in projects. This included discussion about structuring programs or incentives so that renters can also receive benefits, rather than only property owners. Also, attendees mentioned the need for more funding set aside specifically for equity.

- *"Increased public subsidies for LIDAC that need $ to improve buildings to building standards"*
- *"Develop a regional fund to increase solar PU installation either through a regional lease program or to partially fund direct purchase"*
- *"Implement energy justice workbook"*
- *"Electrify and weatherize existing buildings. Ensure renters and non-owners also receive benefits"*
- *"Incentives for electrification from gas appliances for LMI single, duplex, garden style"*
- *"EV charging infrastructure in neighborhoods and for renters"*

Invest in Workforce Development

For both transportation and building electrification, many participants advocated for training programs to be to help build out the local workforce. Some examples include expanding training for electric vehicle infrastructure and conducting outreach to unions, business networks, etc.

- *"EV - zero emission infrastructure w/ skilled electricians EVITP certified - light med. heavy duty"*
- *"Building electrification ordinances should have workforce language that those along the original work + maintenance are C-10 certified and EVITP certified. Any incentives should have this"*
- *"Work w/electrical training facilities w/joint apprenticeships, local hire, job creation"*

- *"Outreach using existing union apprenticeships to electrify, train, and educate low-income communities about these opportunities"*
- *"Provide additional funding for the San Diego Regional Green Business Network Certification Program"*

TRANSPORTATION:

Support the Transition to Zero-Emission Vehicles

Many workshop participants expressed support for a regional transition to zero-emission technologies across all sizes and types of vehicles, including passenger vehicles and medium- and heavy-duty vehicles. Several participants specifically mentioned the need for additional incentives and funding to enable the purchase to zero-emission vehicles.

- *"EV school buses"*
- *"Incentivize ZE trucks/buses/personal vehicles"*
- *"Educating the community about access to EVs + incentives*

Expand EV Charging Infrastructure

In addition to supporting ZEV adoption, many attendees followed those comments with support for expanding charging infrastructure throughout the region. Generally, suggestions centered on closing gaps in access to charging, such as multi-unit dwellings, near/across the international border, and streamlining payment systems for easier use.

- *"EV infrastructure in people's home + incentives for multi-family complexes"*
- *"Connecting with non-profits to enhance EV education and disadvantaged communities"*
- *"Regionwide ease of access to transit payments, charging infrastructure, useability for unbanked families"*
- *"Encourage binational charger installations to support heavy duty adoption"*

Improve Transit to Provide Higher Quality Service

Transit was one of the most frequently mentioned topics at the workshop; several people requested not only more transit, but also making improvements to existing services and routes. For example, calls for higher frequency, streamlined payment/free transit, and a safer experience were popular.

- *"Expand bus rapid transit"*
- *"Increasing safety of public transit, [lower] crime"*
- *"Increase public transit options from back country to cities"*
- *"Free public transit youth up to age 24"*
- *"Increase bus capacity to hold more than 2 bikes. Ensure light rail accommodates increased bike capacity"*
- *"Single-use payment method (transit pass)"*
- *"Fully fund and construct the purple line"*
- *"Trees at all bus stops" and "tree covered trails"*
- *"Revise bike racks on buses for fat tires e-bikes - more capacity"*

Embrace Active Transportation and Microtransit for First/Last Mile Connections

Active transportation (i.e., biking and walking) infrastructure and microtransit services are key to creating first/last mile connections to existing bus and light rail transit. Participants

stressed the need to embrace these to make transit an accessible and appealing choice to move around the region.

- *"Microtransit - last mile to public transit"*
- *"Regional bike share (so it's not different brands/apps)"*
- *"Strengthening 1st mile + last mile for transit"*
- *"Quick builds for bike infrastructure"*
- *"Native plant tree cover along bike lanes - safe pathways to schools"*
- *"People powered transport - walk/bike trails"*
- *"Active Transportation projects connected to existing transit"*

Replicate Successful Mobility Pilots Regionwide

Building on calls for microtransit and first/last mile connections, workshop participants also suggested that existing mobility pilots and programs that have been successfully implemented should be replicated and expanded to other areas of the region. Namely, attendees supported more neighborhood electric vehicles and microtransit shuttle services.

- *"Rentable EVs, EV rideshare, EV access for areas that lack it"*
- *"Develop and implement workable micro mobility services within all urban areas to integrate with smart mobility hubs"*
- *"County wide micro transit incorporated into flexible fleets"*
- *"Ride share services"*
- *"Neighborhood electric vehicles (micro transit)"*

BUILDINGS:

Offer Local Incentives in Addition to State/Federal Incentives

Another common theme was support for local incentives, in addition to existing state and/or federal incentives, to help alleviate the high cost of building retrofits. Similar EV-related incentives, providing local financial incentives such as rebates for building electrification, were widely supported.

- *"Incentivizing retrofits for existing homes"*
- *"Incentivize electrification (or partial CHPWH) of buildings"*
- *"SANDAG to prioritize cities w/ building electrification ordinances in funding opportunities (EVITP)"*
- *"incentives for solar on parking + roofs + speed permitting"*

Retrofit Municipal Buildings and Schools

Retrofitting existing buildings to be more energy efficient was among the most frequently mentioned topics at the workshop. Given the scope of the PCAP and potential challenges with home retrofit, people were especially focused on retrofitting publicly owned buildings like municipal facilities and schools.

- *"Regional Strategy/guidance on building electrification + retrofit accelerator"*
- *"Implement energy efficiency for municipal buildings"*
- *"Fund municipal retrofits"*
- *"Old gas infrastructure decommission + electrify it (work w/ SDGE on this)"*
- *"Solar + battery storage on the desalination plant"*

Revise Standards for New Buildings and Renovations

In addition to retrofits for municipal buildings and schools, several attendees also talked about revised standards for newly constructed and renovated buildings. These standards, known as reach codes, would be implemented by city governments to require builders to abide by more stringent energy standards.

- *"Require all new housing to be passive solar design and construction (in places that make sense)"*
- *"Energy audits at all points of sale. Building standards for residential, commercial, and industrial building"*
- *"EFF Plan for every building"*
- *"Building electrification, performance standards - new and old"*
- *"Uniform BPS across the county"*

<u>Conclusion and Next Steps</u>

Overall, the workshop findings indicate that key priorities for the PCAP (at a high level) are to:

1. Provide funding or incentives for transportation and building electrification.
2. Expand existing transportation or building electrification programs, whenever possible, rather than duplicating efforts or creating new projects.
3. Continue to prioritize community-focused efforts that support equity, such as designated funding, outreach and engagement, technical assistance, and workforce development.

In terms of next steps, staff will incorporate these findings as the PCAP is developed by narrowing down these themes into more specific measures, policies, and projects that reflect EPA requirements, regional needs, and local priorities.

Attachment A: Organizations Invited to 12/6/23 Climate Table Workshop*

**Bolded* = organizations that had at least one representative attend the workshop*

Barona Band of Mission Indians
Bayside Community Center
BikeSD
C4GS-ZEDlife
California Air Resources Board
California Nurses for Environmental Health & Justice
Campo Band of Mission Indians
Casa Familiar
Chula Vista Community Collaborative
Citizens' Climate Lobby - San Diego
City Heights Community Development Corporation
City of Carlsbad
City of Encinitas
City of La Mesa
City of San Diego
Clean Earth 4 Kids
Climate Action Campaign
ClimatePlan
County of San Diego
El Cajon Collaborative
Environmental Health Coalition
Escondido Education Compact
EV Association of San Diego
Ewiiaapaayp Band of the Kumeyaay Nation
Fallbrook Climate Action Team
GRID Alternatives
Hammond Climate Solutions Foundation
I Am Green
Iipay Nation of Santa Ysabel
In Good Company
Inaja-Cosmit Band of Indians
International Brotherhood of Electrical Workers (IBEW) 569
Jamul Indian Village of California
La Jolla Band of Luiseño Indians

La Posta Band of Mission Indians
MAAC Project
Manzanita Band of the Kumeyaay Nation
Mesa Grande Band of Mission Indians
Mid-City Community Advocacy Network
North County Climate Change Alliance
Office of Chairwoman Nora Vargas, County Supervisor and SANDAG Board of Directors Chair
Olivewood Gardens and Learning Center
Operation Samahan
Pala Band of Mission Indians
Partnership for the Advancement of New Americans
Pauma Band of Luiseño Indians
Redwood Energy
RideSD
Rincon Band of Luiseño Indians
San Diego 350
San Diego Building Electrification Coalition
San Diego Community Power
San Diego County Air Pollution Control District
San Diego County Bicycle Coalition
San Diego Foundation
San Diego Green Building Council
San Diego Regional Climate Collaborative
San Diego Regional Policy & Innovation Center
San Diego State University Center for Community Energy and Environmental Justice
San Diego Urban Sustainability Coalition
San Pasqual Band of the Diegueño Indians
Sierra Club - San Diego Chapter
South Bay Community Services Corporation
Southwest Wetlands Interpretive Association
Surfrider Foundation - San Diego Chapter
Sycuan Band of the Kumeyaay Nation
The Living Coast
U.S. Environmental Protection Agency
University of San Diego Energy Policy Initiatives Center
Urban Collaborative Project
Viejas Band of the Kumeyaay Nation
Vista Community Clinic

Second Climate Table Workshop Summary Report

Overview and Purpose

The second workshop, on January 25th, 2024, focused on the EPA Climate Pollution Reduction Grant Priority Climate Action Plan (PCAP) and implementation grant funding application. This workshop enabled SANDAG to share updates on the types of greenhouse gas (GHG) reduction measures to be included in the PCAP and collect project ideas for future implementation.

Participants

Over 90 organizations were invited to the workshop; ultimately, representatives from 40 of those organizations attended, many of whom were repeat attendees from the first workshop in December (see Attachment B for a list of organizations invited and those that attended). Also, the second workshop was held at in a significantly larger venue—the San Diego Central Library—allowing organizations to bring any number of members without limitations.

Process

Like December's meeting, January's workshop consisted of two segments: presentations and breakout sessions. The workshop began with introductions and opening remarks from SANDAG staff:

- Antoinette Meier, Senior Director of Regional Planning
- Susan Freedman, Climate Planning Manager
- Anna Bettis, Senior Regional Planner

The presentation portion included a brief refresher about the CRPG program, as well as updates on the process of developing the San Diego regional PCAP. Subsequently, staff provided a detailed overview of the implementation grant funding made available by the EPA, including requirements, deadlines, and other considerations for project competitiveness. SANDAG provided time for a Q&A before moving on to the breakout session.

After the presentations and Q&A session, attendees were invited to join one of five breakout group stations to participate in discussions about measures and project ideas within these topics: Vehicle Miles Traveled (VMT) Reduction, Building Electrification, Transportation Electrification, Energy Efficiency, and Energy Supply. The workshop allotted time for attendees to move throughout the space and participate in each station. Each group included a moderator and notetaker. The goals of the breakout group stations were to:

2. Provide a space to hear community priorities to reduce GHG emissions.
5. Communicate opportunities *and* constraints of the implementation grant funding to workshop participants.
6. Encourage attendees to write their ideas and provide input on preformatted comment cards, either via physical paper copies or using their phone with a QR code.
7. Gather input and ideas for competitive, implementation-ready projects and programs.

At the end of the breakout sessions, attendees were able to report points of discussion from the workshop and ask any additional questions they may have for the SANDAG team. The workshop concluded with closing remarks and next steps to SANDAG to process and review attendees' feedback and moving forward with the PCAP and implementation grant application.

After the workshop, SANDAG staff reviewed all submitted comment cards; each topic already below summarizes the comments and lists them in order of how frequently they were mentioned. The following paragraph briefly describes the next steps for using the input in PCAP and/or implementation grant application development.

What We Heard

VMT REDUCTION

- Expand and/or improve bike infrastructure, including more bike lanes, safety improvements, and making transit more bike-friendly (e.g., enabling buses to store/carry more bikes).
- Plan and implement more micromobility/micro-transit projects, including Flexible Fleets, neighborhood electric vehicles, etc. to facilitate connections to transit and support seniors/low-income/disadvantaged communities.
- Invest in and expand the Youth Opportunity Pass, along with other transit incentives; for example, consider transit passes or discounts through workplaces for employees.
- Expand and improve bus and light rail transit, including the frequency, location and number of routes, and the conditions of the transit stations or stops themselves (e.g., adding bathrooms).
- Expand vanpool and other shared mobility programs/services.
- Make improvements to pedestrian infrastructure through Complete Streets and improved streetscape design, such as incorporating more shade.
- Explore transit priority signaling.
- Deploy EV charging stations for e-bikes, medium- and heavy-duty vehicles, etc.

BUILDING ELECTRIFICATION

- Fund incentive programs, rebates, and/or subsidies for electrification/retrofit of all types of buildings (e.g., municipal, commercial, residential).
- Set aside funding for building electrification studies and/or audits to understand where the greatest greenhouse gas reductions can be achieved.
- Develop programs for residents to try out electric appliances, such as electric cooktops. Consider funding heat pumps for residential buildings.
- Develop resources guides and best practices, and conduct outreach/engagement to property owners to share information about building electrification throughout the region.
- Promote workforce development through electrician training and/or certification requirements, such as C-10 certification.
- Develop reach codes and/or building electrification ordinances.
- Consider incentives for landlords to support electrification of rental properties.

TRANSPORTATION ELECTRIFICATION

- Fund more publicly accessible EV charging stations, especially in low-income and disadvantaged communities, rural areas, and at transit stations/workplaces. This could be achieved in part through municipal-led programs to install, operate, and maintain charging stations at publicly owned sites.
- Provide more incentives for residents to purchase zero-emission vehicles.
- Coordinate regionally on EV charging station deployment. This includes various measures, such as:
    - Uptime standards for public charging stations
    - More funding for charger operations and maintenance, perhaps through a regional grant program
- Subsidize municipal fleet electrification.
- Invest in electrification of medium- and heavy-duty vehicles, such as buses and large trucks.
- Develop an EV ambassador program or other mechanism to conduct EV-focused outreach, engagement, and education.
- Explore bidirectional charging.
- Require Electric Vehicle Infrastructure Training Program (EVITP) certification for electricians working on EV infrastructure projects.
- Develop an energy pricing strategy or incentive program for energy costs related to EV charging.
- Develop a zero-emission train (Sprinter) pilot.
- Create a battery replacement program for EV drivers in low-income communities.

ENERGY EFFICIENCY:

- Conduct outreach and education to residents about energy efficiency benefits and opportunities.
- Develop guidelines for weatherization and energy efficiency upgrades.
- Develop a regional policy requiring energy use audits in each local jurisdiction to inform a baseline/standard for future upgrades. Consider targeting retrofits for buildings that do not meet energy efficiency standards.
- Create a program for all types of property owners (commercial, residential, municipal, etc.) to receive subsidies or incentives for energy efficiency upgrades.
- Leverage benchmarking data to inform distribution of energy efficiency subsidies and incentives.

ENERGY SUPPLY:

- Fund more solar and battery storage programs. This includes:
    - Create incentives for residential solar and battery storage projects. Fund direct installation of solar in low-income communities.
    - Subsidize municipal solar installation and battery storage programs.
    - Expand CCA solar and battery storage programs.
    - Infill solar in urban growth areas.
    - Install solar on municipal lighting fixtures.

- Invest in more microgrids, especially in low-income and/or disadvantaged communities and around multi-unit dwellings.
- Develop an energy ambassador program or other energy-focus outreach and education effort.
- Create an energy provider information network that is easy-to-use and includes information from all energy suppliers in the region.
- Deploy agrivoltaics in rural communities.

Conclusion and Next Steps

In general, the feedback and input collected at the second Climate Table workshop in January was consistent with the priorities heard at the first workshop in December. While specific project ideas were put forth to SANDAG through the comment cards, there was still an overall emphasis on transportation and building electrification, equity, outreach and education, and expanding access to existing infrastructure and/or programs.

Next steps include finalizing project descriptions and implementers, as well as quantifying the greenhouse gas emission reductions from the proposed projects for inclusion in the PCAP. Further analysis of these projects will occur when preparing the application for EPA implementation grant funds.

Attachment B: Organizations Invited to 01/25/2024 Climate Table Workshop*

** Organizations with at least one representative in attendance are **bolded.***

Barona Band of Mission Indians
Bayside Community Center
BikeSD
C4GS-ZEDlife, LLC
California Department of Transportation (Caltrans)
California Nurses for Environmental Health & Justice
Campo Band of Mission Indians
Casa Familiar
Chula Vista Community Collaborative
Citizens Climate Lobby - San Diego
City Heights Community Development Corporation (City Heights CDC)
City of Carlsbad
City of Chula Vista
City of Coronado
City of Del Mar
City of El Cajon
City of Encinitas
City of Escondido
City of Imperial Beach
City of La Mesa
City of Lemon Grove
City of National City
City of Oceanside
City of Poway
City of San Diego
City of San Marcos
City of Santee
City of Solana Beach
City of Vista
CleanEarth4Kids
Climate Action Campaign
ClimatePlan
County of San Diego
El Cajon Collaborative
Environmental Health Coalition
Escondido Education COMPACT
EV Association of San Diego
Ewiiaapaayp Band of the Kumeyaay Nation
Fallbrook Climate Action Team
GRID Alternatives
Hammond Climate Solutions Foundation
I Am Green

Iipay Nation of Santa Ysabel
In Good Company
Inaja-Cosmit Reservation
International Brotherhood of Electrical Workers (IBEW) Local 569
Jamul Indian Village of California
La Jolla Band of Luiseño Indians
La Posta Band of Mission Indians
Los Coyotes Band of Cahuilla/Cupeño Indians
MAAC Project
Manzanita Band of the Kumeyaay Nation
Mesa Grande Band of Mission Indians
Metropolitan Transit System
Mid-City Community Advocacy Network
North County Climate Change Alliance
North County Transit District
Olivewood Gardens and Learning Center
OPSAM Health
Padre Dam Municipal Water District
Pala Band of Mission Indians
Partnership for the Advancement of New Americans
Pauma Band of Luiseño Indians
Port of San Diego
Redwood Energy
RideSD
Rincon Band of Luiseño Indians
San Diego 350
San Diego Building Electrification Coalition
San Diego Community Power
San Diego County Air Pollution Control District
San Diego County Bicycle Coalition
San Diego County Regional Airport Authority
San Diego County Water Authority
San Diego Foundation
San Diego Green Building Council
San Diego Regional Climate Collaborative
San Diego Regional Policy & Innovation Center
San Diego Urban Sustainability Coalition
San Pasqual Band of Diegueño Indians
SBCS Corporation
SDSU Center for Community Energy and Environmental Justice
Sierra Club
Southwest Wetlands Interpretive Association
SURFRIDER Foundation San Diego
Sycuan Band of the Kumeyaay Nation

The Living Coast
The Urban Collaborative Project
USD Energy Policy Initiatives Center (EPIC)
Viejas Band of Kumeyaay Nation
Vista Community Clinic

Outreach and Engagement Conducted for PCAP			
Date	**Event Name/Audience**	**Presenter(s)**	**Topic/Purpose**
7/19/2023	Interagency Meeting	Climate team	Kickoff meeting with PCAP Stakeholder Group including local governments, public agencies, and other stakeholders
8/8/2023	Interagency Meeting	Climate team	Provide updates on PCAP and facilitate discussion
9/5/2023	EPA & SDSU Advancing Environmental Justice Community Convening	Susan Freedman, Climate Planning Manager	Project introduction and overview
9/28/2023	Social Equity Working Group	Susan Freedman, Climate Planning Manager	Project introduction and overview
10/10/2023	Interagency Meeting	Climate team	Provide updates on PCAP and facilitate discussion
10/24-26/2023	EPA Regional 9 Tribal Conference	Climate team	Tabled at conference, offered high-level project info to conference attendees
11/9/2023	Mobility Working Group	Susan Freedman, Climate Planning Manager	Project introduction and overview
11/14/2023	Interagency Meeting	Climate team	Provide updates on PCAP and facilitate discussion
12/6/2023	Regional Climate Table Workshop	Climate team	Kickoff meeting for Regional Climate Readiness Table, discussed transportation and building sector priorities
12/12/2023	Interagency Meeting	Climate team	Provide updates on PCAP and facilitate discussion
12/14/2023	CBO Outreach Team	Samaya Elder, Regional Planner II	Share CBO Scope of Work for outreach and engagement prior to contracting
~~1/5/2024~~	~~Regional Planning Committee~~	~~Susan Freedman, Climate Planning Manager~~	Meeting was cancelled due to lack of quorum

1/9/2024	Interagency Meeting	Climate team	PCAP updates, Phase II overview and application development plans (project information request)
1/25/2024	Regional Climate Table Workshop	Climate team	PCAP updates, Phase II overview and application development plans (project information request)
2/13/2024	Interagency Meeting	Climate team	PCAP updates and immediate next steps for completing the report
2/22/2024	Social Equity Working Group	Samaya Elder, Regional Planner II	PCAP updates, Phase II overview and application updates
2/28/2024	Tribal Transportation Working Group	Susan Freedman, Climate Planning Manager	PCAP overview, discuss development process and final content

Appendix B: 2016 Greenhouse Gas Emissions Inventory for the San Diego Region

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Introduction

The San Diego Association of Governments (SANDAG) contracted the Energy Policy Initiatives Center (EPIC) at the University of San Diego (USD) to estimate the 2016 greenhouse gas (GHG) emissions for the San Diego region. GHG emissions estimates were included in San Diego Forward: The 2021 Regional Plan (2021 Regional Plan) and its associated Environmental Impact Report (EIR). This appendix summarizes the methodologies and data used to conduct this analysis.

To the extent possible, EPIC followed the same methods used in developing the 2012 GHG emissions inventory for San Diego Forward: The 2015 Regional Plan.[1] The 2016 GHG inventory includes 15 categories of emissions calculated based on the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions and California Air Resources Board (CARB) California statewide GHG inventory methodology.

Overview of the Appendix

This appendix includes the following sections:

- **Background** provides common background sources and assumptions used for the inventory.
- **Summary of Results** provides the results of the 2016 GHG inventory.
- **Method to Calculate Emissions Inventory by Category** includes subsections that cover the methods used to develop the inventory.

Background

Greenhouse Gases

The primary GHGs included in this document are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O); others are included where data is available. Each GHG has a different capacity to trap heat in the atmosphere, known as its global warming potential (GWP), which is normalized relative to CO_2 and expressed in carbon dioxide equivalents (CO_2e). The 100-year GWPs reported by the Intergovernmental Panel on Climate Change (IPCC) are used by CARB to estimate GHG emissions inventories statewide.[2] The GWPs in this document, provided in Table B.1, are from the IPCC Fourth Assessment Report (AR4).[3]

[1] SANDAG: San Diego Forward: 2015 Regional Plan (2015).
[2] CARB: Current California GHG Emission Inventory Data. 2000–2018 GHG Inventory (2020 Edition).
[3] IPCC Fourth Assessment Report: Climate Change 2007: Direct Global Warming Potentials (2013).

Table B.1: Global Warming Potentials Used in the Regional Greenhouse Gas Inventory

Global Warming Potentials Used in the Regional Greenhouse Gas Inventory	
Greenhouse Gas	**Global Warming Potential**
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298
Difluoromethane (HFC-32)	675
1,1,1,2-Tetrafluoroethane (HFC-134a)	1,430
Pentafluoroethane (HFC-125)	3,500
1,1,1-Trifluoroethane (HFC-143a)	4,470
Carbon tetrafluoride (CF_4)	7,390
Octafluoropropane (C_3F_8)	8,830
1,1,1,3,3,3-Hexafluoropropane (HFC – 236fa)	9,810
Octafluorocyclobutane (C_4F_8)	10,300
Hexafluoroethane (C_2F_6)	12,200
Fluoroform (HFC-23)	14,800
Nitrogen trifluoride (NF_3)	17,200
Sulfur hexafluoride (SF_6)	22,800

Source: IPCC 2013.

Demographics

SANDAG estimates and forecasts population, housing, and employment for the San Diego region. The demographic estimates for 2016 are provided in Table B.2.[4]

Table B.2: Demographic Estimates in the San Diego Region

Demographic Estimates in the San Diego Region				
Year	**Population**	**Jobs**	**Manufacturing Jobs***	**Housing Units**
2016	3,287,280	1,646,419	109,234	1,182,983

* Manufacturing jobs are included in jobs.

2016 population and housing data are estimates.

Source: SANDAG 2020, 2021.

[4] 2016 population and housing are from the SANDAG Demographic & Socio-Economic Estimates (August 19, 2020, Version). SANDAG Data Surfer, accessed on December 10, 2020. Other estimates are based on SANDAG Series 14 Growth Forecast, provided by SANDAG staff to EPIC, March 29, 2021.

Rounding of Values in Tables and Figures

Rounding is used only for the final GHG values within the tables and figures throughout the document. Values are rounded to the nearest integer of a higher order of magnitude. Values are not rounded in the intermediary steps in the actual calculation. Because of rounding, some totals may not equal the exact values summed in any table or figure.

Summary of Results

Table B.3 provides a summary of the 2016 GHG inventory in the San Diego region.

Table B.3: Summary of 2016 Greenhouse Gas Inventory

Summary of 2016 Greenhouse Gas Inventory	
Greenhouse Gas Emissions (Million Metric Tons [MMT] CO_2e)	
Emissions Category	**2016**
Passenger Cars and Light-Duty Vehicles	10.4
Electricity	5.3
Natural Gas	3.1
Industrial	2.1
Heavy-Duty Trucks and Vehicles	1.8
Other Fuels	1.1
Off-Road Transportation	0.62
Solid Waste	0.59
Water	0.24
Aviation	0.21
Rail	0.11
Wastewater	0.07
Agriculture	0.05
Marine Vessels	0.05
Soil Management	0.05
Total	**26**

MMT – million metric tons.
SAFE Rule – Federal Safer Affordable Fuel-Efficiency Vehicles Rule, April 2020.
Source: EPIC, USD 2021.

The previous 2012 GHG inventory included the following land use and development influences on the regional inventory: (1) carbon sequestration from vegetation cover, (2) carbon emissions from vegetation displaced by development, and (3) carbon emissions from vegetation burning due to wildfires. This inventory excludes emissions and sequestration estimates from

vegetation and follows CARB's approach to track statewide GHG emissions from anthropogenic activities not including the GHG flux associated with carbon stocks in California's natural and working lands[5] and wildfire emissions. This is because wildfires are part of Earth's carbon cycle and it is difficult to determine how much of the wildfire emissions are from anthropogenic activities.[6, 7]

Method to Calculate Emissions Inventory by Category

On-Road Transportation – Passenger Car and Light-Duty Vehicles

The passenger car and light-duty vehicles emissions category is the largest contributor of GHG emissions in the San Diego region, accounting for about 40% of total GHG emissions in the 2016 inventory. Tailpipe GHG emissions from on-road transportation are the result of fuel combustion (i.e., gasoline, diesel, natural gas) from mobile vehicles on freeways, highways, and local roads. The vehicle classes included in this emissions category are passenger cars and light-duty vehicles. The GHG emissions from other on-road vehicles are accounted for in the subsection titled *On-Road Transportation – Heavy-Duty Trucks and Vehicles*.

Method Used to Estimate 2016 Emissions

EPIC used EMFAC2017, CARB's on-road mobile sources model, to estimate the on-road transportation emissions for passenger cars and light-duty vehicles.[8] SANDAG provided the input file to run EMFAC2017 under custom mode, as well as the output file containing all emissions results.[9] The input file, from SANDAG's activity-based model (ABM14.2.2), includes vehicle miles traveled (VMT) on an average weekday by EMFAC vehicle categories and fuel types. The output file, from an EMFAC2017 custom model run, provides CO_2 emissions in tons per weekday for each vehicle category and each fuel type. This passenger car and light-duty vehicles emissions category covers the GHG emissions from EMFAC2017 vehicle classes LDA, LDT1, LDT2, and MDV.[10]

To convert the emissions output from tons of CO_2 per weekday to metric tons of CO_2e per year, EPIC used the weekday-to-year conversion factor and CO_2-to-CO_2e (CO_2, CH_4, and N_2O) conversion factor for each EMFAC vehicle category, based on statewide GHG inventory assumptions and EMFAC2017 default run results, respectively.[11] The weekday-to-annual conversion factors for LDA, LDT1, LDT2 and MDV are all 347 weekdays per year;

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8 CARB: Mobile Source Emissions Inventory. EMFAC2017.
8 CARB: Mobile Source Emissions Inventory. EMFAC2017.
8 CARB: Mobile Source Emissions Inventory. EMFAC2017.
8 CARB: Mobile Source Emissions Inventory. EMFAC2017.
9 Files provided by SANDAG staff, October 6, 2021.
10 LDA: passenger cars; LDT1: light-duty trucks with gross vehicle weight rating (GVWR) less than 6,000 lbs and equivalent test weight (ETW) no larger than 3,750 lbs; LDT2: light-duty trucks with GVWR less than 6,000 lbs and ETW between 3,750 and 5,750 lbs; and MDV: medium-duty trucks with GVWR between 6,000 and 8,500 lbs.
11 This approach is recommended by CARB EMFAC staff. Personal communication, January 27, 2020.

the CO_2 to CO_2e conversion factors range from 1.01 for gasoline LDT2 to 1.05 for diesel LDA.[12] The key inputs and results are shown in Table B.4.

Table B.4: Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Passenger Cars and Light-Duty Vehicles

Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Passenger Car and Light-Duty Vehicles	
VMT (miles per weekday)*	78,987,431
CO_2 Emissions (tons per weekday)**	32,605
Conversion Factor (tons CO_2 per weekday to MT CO_2e per year)	319
GHG Emissions (MT CO_2e)	10,404,317
GHG Emissions (MMT CO_2e)	**10.4**

* SANDAG ABM14.2.2 VMT.

** EMFAC2017 model run with custom VMT inputs from ABM14.2.2.

Passenger car and light-duty vehicles are EMFAC2017 vehicle classes LDA, LDT1, LDT2, and MDV.

Source: CARB 2016, 2017; SANDAG 2021; EPIC, USD 2021.

On-Road Transportation – Heavy-Duty Trucks and Vehicles

The on-road transportation heavy-duty trucks and vehicles category accounts for 7% of total GHG emissions in the 2016 inventory. Vehicle classes included in this category are taken from EMFAC2017.[13]

Method Used to Estimate 2016 Emissions

EPIC used the same method to estimate emissions from this category and the on-road transportation passenger cars and light-duty vehicles category, with an EMFAC2017 model run of VMT from SANDAG ABM14.2.2 and tons of CO_2 per weekday to MT CO_2e per year conversion. The key inputs and results are shown in Table B.5.

[12] The weekday-to-year conversion factors are based on CARB's California's 2004–2014 Greenhouse Gas Emission Inventory Technical Support Document, 2016 Edition, accessed March 23, 2020. The CO_2-to-CO_2e conversion factors are based on EMFAC2017 default 2016 emissions run for San Diego region by vehicle category and fuel type, January 14, 2020, model run.

[13] Vehicle classes are all except LDA, LDT1, LDT2, and MDV as shown in EMFAC2017 Technical Documentation, Table 6.1-1.

Table B.5: Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Heavy-Duty Trucks and Vehicles

Key Inputs and 2016 Greenhouse Gas Emissions from On-Road Transportation – Heavy-Duty Trucks and Vehicles	
VMT (miles per weekday)*	4,834,783
CO_2 Emissions (tons per weekday)**	5,866
Conversion Factor (tons CO_2 per weekday to MT CO_2e per year)	300
GHG Emissions (MT CO_2e)	1,761,445
GHG Emissions (MMT CO_2e)	**1.8**

* SANDAG ABM14.2.2 VMT.

** EMFAC2017 model run with custom VMT inputs from SANDAG.

Heavy-duty trucks and vehicles are EMFAC2017 vehicle categories except LDA, LDT1, LDT2, and MDV. Conversion factors are different for each vehicle class.

Source: CARB 2016, 2017; SANDAG 2021; EPIC, USD 2021.

Off-Road Transportation

The off-road transportation category includes the following subcategories by equipment type: construction and mining equipment, cargo handling equipment, industrial equipment, airport ground support, pleasure craft, recreational equipment, lawn and garden equipment, agricultural equipment, transport refrigeration units, military tactical support equipment, and other portable equipment. The GHG emissions from off-road equipment fuel combustion account for 2% of total emissions in the 2016 inventory.

Method Used to Estimate 2016 Emissions

CARB released the OFFROAD ORION model in 2017 and the SORE model in 2020.[14] The ORION 2017 model generates off-road equipment emission data by county, vehicle category, vehicle type, horsepower (HP), and fuel type. SORE 2020 is a standalone Microsoft Access model that generates emission data for off-road vehicles with engines less than or equal to 25 HP. EPIC used ORION 2017 to generate 2016 regional off-road emissions for HP greater than or equal to 25. For the vehicles with HP equal to 25, data may overlap with SORE 2020 results. EPIC used SORE 2020 results for the overlapping vehicles because SORE 2020 is the latest and most recently updated model. Pleasure crafts and recreational vehicles are subcategories in ORION 2017; however, no San Diego regional data were available. EPIC used CARB's pleasure craft model, PC2014, and recreational vehicle model, RV 2018, to generate the emission data for the respective subcategories.[15] Like SORE 2020, both these models are standalone Microsoft Access models.

Table B.6 shows the different databases used to generate the emissions for the different vehicle subcategories.

[14] CARB: ORION 2017 and SORE 2020 Small Off Road Engine model.

[15] CARB: PC2014 Pleasure Craft model and RV 2018 Recreational Vehicle model.

Table B.6: Databases Used to Estimate Off-Road Emissions

Databases Used to Estimate Off-Road Emissions	
Databases/Models	**Vehicle Subcategories**
ORION 2017, SORE 2020	Agriculture
ORION 2017, SORE 2020	Airport Ground Support
ORION 2017, SORE 2020	Cargo Handling Equipment
ORION 2017, SORE 2020	Construction and Mining
ORION 2017, SORE 2020	Industrial
SORE 2020	Lawn
ORION 2017, SORE 2020	Light Commercial
ORION 2017	Military Tactical Support
PC2014	Pleasure Crafts
ORION 2017	Portable Equipment
RV 2018	Recreational Vehicles
ORION 2017, SORE 2020	Transportation Refrigeration Unit

Source: CARB: ORION 2017, SORE 2020, PC2014 Pleasure Craft model, RV 2018 Recreational Vehicle model; EPIC, USD 2020.

The key inputs and 2016 GHG emissions are shown in Table B.7.

Table B.7: Key Inputs and 2016 Greenhouse Gas Emissions from Off-Road Transportation

Key Inputs and 2016 Greenhouse Gas Emissions from Off-Road Transportation	
Subcategories	**GHG Emissions (MMT CO_2e)**
Agriculture	0.010
Airport Ground Support	0.017
Cargo Handling Equipment	0.002
Construction and Mining	0.204
Industrial	0.097
Lawn	0.052
Light Commercial	0.071
Military Tactical Support	0.022
Pleasure Crafts	0.066
Portable Equipment	0.068
Recreational Vehicles	0.003
Transportation Refrigeration Unit	0.008
Total	**0.62**

Source: CARB: ORION 2017, SORE 2020, PC2014 Pleasure Craft model, RV 2018 Recreational Vehicle model; EPIC, USD 2020.

Rail

The rail category includes GHG emissions from both passenger and freight rail resulting from the combustion of fuels in internal combustion engines. Emissions from rail contribute to 0.4% of total emissions in the 2016 inventory.

Method Used to Estimate 2016 Emissions

Detailed activity or fuel consumption data for rail were not available for the San Diego region. EPIC scaled the emissions from the CARB statewide inventory to the San Diego region, based on the ratio of 2016 County Business Pattern establishments for support activities for rail transportation to that of the state.[16]

Because the rail category in CARB's statewide inventory is not separated into freight and passenger rail subcategories, EPIC used the number of support establishments for rail in the San Diego region to capture both freight and passenger rail activities. However, it may not represent the exact ratio of all rail in the region compared to the state. The most

[16] CARB: CARB Greenhouse Gas Emission Inventory – Query Tool, accessed on October 25, 2020. U.S. Census Bureau: 2016 County Business Patterns, accessed on October 25, 2020. The NAICS Code for rail transportation support activities is 4882.

recent 2018 County Business Pattern data do not show any data on support establishments for rail transportation for the San Diego region; therefore, the method used in this appendix may be limited. Table B.8 shows the key inputs and 2016 GHG emissions from rail.

Table B.8: Key Inputs and 2016 Greenhouse Gas Emissions from Rail

Key Inputs and 2016 Greenhouse Gas Emissions from Rail	
Support Activities for Rail Transportation in California	78
Support Activities for Rail Transportation in San Diego Region	4
Total Rail Emissions in California (MMT CO_2e)	2.17
Total Rail Emissions in San Diego (MMT CO_2e)	**0.11**

Support Activities for Rail Transportation: NAICS 4882. Industries under NAICS 4882 provide services that support rail transportation.

Source: EPIC, USD 2020.

Electricity

GHG emissions from electricity use in the San Diego region account for 20% of total emissions in the 2016 inventory.

Method Used to Estimate 2016 Emissions

To estimate GHG emissions from grid-supply electricity use, EPIC adjusted the 2016 electricity sales with transmission and distribution losses and multiplied the adjusted sales by the electricity emission factor, expressed in pounds of CO_2e per megawatt-hour (lbs CO_2e/MWh).

The local utility, San Diego Gas & Electric (SDG&E), provided the 2016 San Diego regional electricity sales by bundled and Direct Access (DA) supply for each customer class. The San Diego regional electricity sales account for electricity sales to all local jurisdictions, including military bases and tribal reservations.[17] The transmission and distribution loss factor, 0.082, is the loss estimate for the entire SDG&E service territory (larger than the San Diego region) and accounts for the difference between electricity generated for load and electricity sales.[18]

SDG&E and electric service providers (ESPs) for DA customers have different power mixes in their electricity supplies. The SDG&E 2016 bundled emission factor, 527 lbs CO_2e/MWh, was calculated using Federal Energy Regulatory Commission Form 1 data, the California Energy Commission (CEC) Power Source Disclosure Program data on SDG&E-owned and purchased power, and EPA's Emissions and Generating Resource Integrated Database (eGRID) on specific power plant emissions. EPIC's technical working paper, "Estimating Annual Average Greenhouse Gas Emission Factors for the Electricity Sector: A Method for Inventories," describes the detailed method to calculate the SDG&E bundled electricity

[17] Electricity sales data provided by SDG&E to EPIC, August 16, 2018.

[18] Loss factor is from CEC Energy Demand 2019 Forecast. For each forecast cycle, utilities provide the estimates, which remain relatively stable. Personal communication with CEC staff. March 23, 2020.

emission factor.[19] The DA emission factor, 836 lbs CO_2e/MWh, is a default taken from the California Public Utilities Commission Decision 14-12-037.[20]

Two adjustments are made to the emissions estimate based on grid-supply electricity:

- Emissions associated with electricity use at water treatment plants in the San Diego region were allocated to the water category and removed from the electricity category. The method used to identify electricity use at water treatment plants is discussed in the *Water* section of this appendix B.
- Emissions associated with natural gas used for on-site self-serve electric generation, mostly attributed to co-generation plants, were removed from the natural gas category and allocated to the electricity category. EPIC used the CEC Quarterly Fuel and Energy Report (QFER) Power Plant Owner Reporting database, U.S. Energy Information Administration (EIA) Form 923 data, and the 2016 SDG&E Power Source Disclosure Program to identify the self-serve electric generation plants.

With the adjustments, the key inputs and results are shown in Table B.9.

Table B.9: Key Inputs and 2016 Greenhouse Gas Emissions from Electricity

Key Inputs and 2016 Greenhouse Gas Emissions from Electricity	
Electricity Sales – Bundled (MWh)	14,482,332
Electricity Sales – Direct Access (MWh)	3,360,561
Transmission and Distribution Loss Factor	1.082
SDG&E Electricity Emission Factor (lbs CO_2e/MWh)	527
Direct Access Electricity Emission Factor (lbs CO_2e/MWh)	836
GHG Emissions (MT CO_2e)	5,121,950
GHG Emissions Associated with Electricity for Water Treatment – Excluded (MT CO_2e)	–58,925
GHG Emissions Associated with Natural Gas Used at On-Site Self-Serve Electric Generation – Added (MT CO_2e)	204,014
GHG Emissions (MT CO_2e)	5,267,039
GHG Emissions (MMT CO_2e)	**5.3**

Source: CEC 2020; SDG&E 2018; EPIC, USD 2020.

[19] EPIC: Estimating annual average greenhouse gas emission factors for the electric sector: a method for inventories (2016), accessed May 7, 2020.

[20] D.14-12-037, December 18, 2014, in Rulemaking 11-03-012 (filed March 24, 2011). The recommended emission factor is 0.379 MT CO_2e/MWh (836 lbs CO_2e/MWh).

Natural Gas

The combustion of natural gas for building end use accounts for 12% of total emissions in the 2016 inventory. This category calculates emissions from building end use natural gas for purposes other than electric generation, not for utility-level electric generation (UEG) and not for on-site self-serve electric generation, as they are accounted for under the electricity category. However, emissions associated with natural gas use for heat output from any of the co-generation plants are captured in this category.

Method Used to Estimate 2016 Emissions

To estimate GHG emissions from metered natural gas end use, EPIC multiplied the metered natural gas sales by a constant natural gas emission factor.

SDG&E provided the 2016 San Diego regional natural gas sales by customer class. The San Diego regional natural gas sales are sales to all local jurisdictions, including military bases and tribal reservations. The natural gas use for UEG purposes, either at co-generation or electric generation plants, is excluded.[21] However, certain co-generation plants may have dual purposes that generate electricity use for both on-site use and sales to the utility. EPIC used the natural gas emission factor, 0.00545 MT CO_2e per therm, based on CARB's statewide inventory data.[22]

Three adjustments are made to the emissions estimate based on natural gas sales:

- Emissions associated with natural gas used at on-site self-serve electric generation, mostly co-generation plants, were removed from this category and allocated to the electricity category. EPIC used the CEC QFER Power Plant Owner Reporting database, EIA Form 923, and the 2016 SDG&E Power Source Disclosure Program to identify the self-serve electric generation plants.
- Emissions associated with natural gas used for utility electric sales at dual-purpose (both on-site use and utility sales) co-generation plants were removed from this category because they are already accounted for in the electricity emission factor calculation. The method to identify the plants is the same as above.
- Emissions associated with heat output from utility-level co-generation plants were estimated separately and added to this category. This natural gas use is not captured in the SDG&E natural gas sales. EPIC assumed that excess heat output was sold by the plants for other use (e.g., to another industrial customer nearby). The method to identify the plants is the same as above.

With these adjustments, the key inputs and results are shown in Table B.10.

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21 Natural gas sales data provided by SDG&E, August 16, 2018.

22 CARB: Documentation of California's Greenhouse Gas Inventory (11th Edition), accessed March 23, 2020. The natural gas emission factor is also used in CARB Mandatory GHG Reporting and is the same under each customer class (e.g., residential, commercial).

Table B.10: Key Inputs and 2016 Greenhouse Gas Emissions from Natural Gas

Key Inputs and 2016 Greenhouse Gas Emissions from Natural Gas	
Natural Gas Sales (therms)	585,460,937
Natural Gas Emission Factor (MT CO_2e/therm)	0.00545
GHG Emissions (MT CO_2e)	3,192,578
GHG Emissions Associated with Heat Output from Utility-Level Co-Generation Plants – Included (MT CO_2e) (1)	118,239
GHG Emissions from Natural Gas used to Generate Electricity for Sales to Utility – Excluded (MT CO_2e)* (2)	−3,593
GHG Emissions from Natural Gas Used at On-Site Self-Serve Electric Generation – Excluded (MT CO_2e) (3)	−204,014
Total Adjustment (MT CO_2e) (1+2+3)	−89,369
GHG Emissions (MT CO_2e)	3,103,209
GHG Emissions (MMT CO_2e)	**3.1**

* Does not include power plants generating electricity for utility sales only.

Source: CARB 2019; SDG&E 2018; EPIC, USD 2020.

Industrial

Emissions from GHGs with high GWPs used in industrial processes and the processing of materials to manufacture items (e.g., mineral aggregate products, chemicals, metals, refrigerants, electronics, and other consumer goods) account for 8% of total emissions in the 2016 inventory. GHGs with high GWPs are used in air conditioning units and refrigeration, as well as in the manufacturing of electronics, fire protection equipment, insulation, and aerosols. This category focuses on industrial processes that directly release CO_2 and other GHGs with high GWPs (i.e., SF_6, C_2F_6, C_3F_8, CF_4, C_4F_8, HFC-23, NF_3, HFC-125, HFC-134a, HFC-143a, HFC-236fa, HFC-32) by processes other than fuel consumption.

Method Used to Estimate 2016 Emissions

Similar to the method used in the other fuels category, EPIC scaled down the industrial emissions in the CARB statewide GHG inventory to the San Diego region based on the San Diego region to state ratio relevant to each economic sector.[31]

The following are the IPCC category numbers, subcategory numbers, headings, codes, and fuel types used within each type of activity in the statewide inventory. Only those categories, subcategories, activities, and fuel types causing emissions in the San Diego region are shown:

- 2D1: Industrial Lubricant Use
  - Not Specified Industrial > Fuel Consumption – Lubricants > CO_2
  - Not Specified Transportation > Fuel Consumption – Lubricants > CO_2
- 2D3: Industrial Solvent Use
  - Solvents & Chemicals: Evaporative Losses: Fugitives > Fugitive Emissions > CO_2

- 2E: Electronic Industry
  - Manufacturing: Electric & Electronic Equip.: Semiconductors & Related Products > Semiconductor Manufacture > C_2F_6
  - Manufacturing: Electric & Electronic Equip.: Semiconductors & Related Products > Semiconductor Manufacture > C_3F_8
  - Manufacturing: Electric & Electronic Equip.: Semiconductors & Related Products > Semiconductor Manufacture > C_4F_8
  - Manufacturing: Electric & Electronic Equip.: Semiconductors & Related Products > Semiconductor Manufacture > CF_4
  - Manufacturing: Electric & Electronic Equip.: Semiconductors & Related Products > Semiconductor Manufacture > HFC-23
  - Manufacturing: Electric & Electronic Equip.: Semiconductors & Related Products > Semiconductor Manufacture > NF_3
  - Manufacturing: Electric & Electronic Equip.: Semiconductors & Related Products > Semiconductor Manufacture > SF_6
- 2F: Product Uses as – Not Specified Commercial
  - Use of Substitutes for Ozone-Depleting Substances > CF_4
  - Use of Substitutes for Ozone-Depleting Substances > HFC-125
  - Use of Substitutes for Ozone-Depleting Substances > HFC-134a
  - Use of Substitutes for Ozone-Depleting Substances > HFC-143a
  - Use of Substitutes for Ozone-Depleting Substances > HFC-236fa
  - Use of Substitutes for Ozone-Depleting Substances > HFC-32
  - Use of Substitutes for Ozone-Depleting Substances > Other Ozone-Depleting Substances Substitutes
- 2G1b: Other Industrial Product – Electrical
  - Imported Electricity: Transmission and Distribution > Electricity Transmitted > SF_6
  - In State Generation: Transmission and Distribution > Electricity Transmitted > SF_6
- 2G4: Other Industrial Product – CO_2, Limestone
  - Not Specified Industrial > CO_2 Consumption > CO_2
  - Not Specified Industrial > Limestone and Dolomite Consumption > CO_2
  - Not Specified Industrial > Soda Ash Consumption > CO_2

EPIC used different ratios to scale down the activities above to the San Diego region. Table B.11 shows the ratios used and their values in 2016.

Table B.11: Key Inputs and 2016 Greenhouse Gas Emissions from Industrial

Key Inputs and 2016 Greenhouse Gas Emissions from Industrial				
Economic Sector/Industry	**Basis for Ratio Value**	**California (MMT CO_2e)**	**Ratio Value**	**San Diego Region (MMT CO_2e)**
Industrial Lubricant and Limestone Use	San Diego manufacturing sector employees/ California manufacturing sector employees	1.93	9%	0.17
Industrial Lubricant Use – Not Specified Transportation (Lubricant, ODS)	San Diego VMT/California statewide VMT	5.55	9%	0.51
Industrial Solvent Use – Solvents and Chemicals	San Diego manufacturing sector employees/ California manufacturing sector employees	0.79	9%	0.07
Electronic Industry – Semiconductor Manufacture	San Diego semiconductor manufacturing sector employees/California semiconductor manufacturing sector employees	0.16	7%	0.01
Not Specified Residential (ODS)	San Diego total residential units/California total residential units	3.17	9%	0.27
Not Specified Commercial (ODS)	San Diego total employees/California total employees	11.9	9%	1.01
Imported Electricity – Transmission and Distribution	San Diego purchased electricity/California purchased electricity	0.03	11%	0.004
In State Generation – Transmission and Distribution	San Diego in-county electricity generated/ California in-state electricity generated	0.07	3%	0.002
Total GHG Emissions (MMT CO_2e)		**24**	**N/A**	**2.1**

ODS – Emissions from use of substitutes for Ozone-Depleting Substances.
Source: 2016 County Business Patterns; SANDAG ABM14.2.2 VMT; EMFAC2017 statewide on-road emission inventory; SANDAG demographic data; EPIC, USD 2021.

Emissions from the following categories were included in CARB's statewide inventory but not in the 2016 regional inventory because Economic Census data indicated no economic activity in the San Diego region.[32] The categories are:

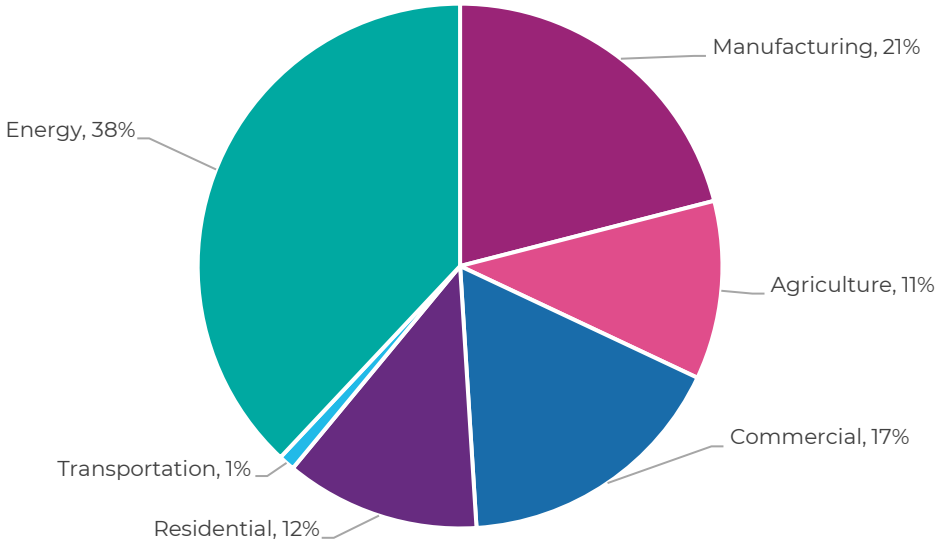
- 2A1: Manufacturing: Stone, Clay, Glass, and Cement: Cement > Clinker Production > CO_2
- 2A2: Manufacturing: Stone, Clay, Glass, and Cement: Lime > Lime Production > CO_2
- 2B2: Manufacturing: Chemical and Allied Products: Nitric Acid > Nitric Acid Production > N_2O
- 2H3: Petroleum Refining: Transformation > Fuel Consumption > CO_2

Other Fuels

The Other Fuels category accounts for 4% of total emissions in the 2016 inventory. These fuels include distillate (other than in power production), kerosene, gasoline (other than in transportation), liquefied petroleum gas (LPG), residual fuel oil (other than in power production), and wood (wet).

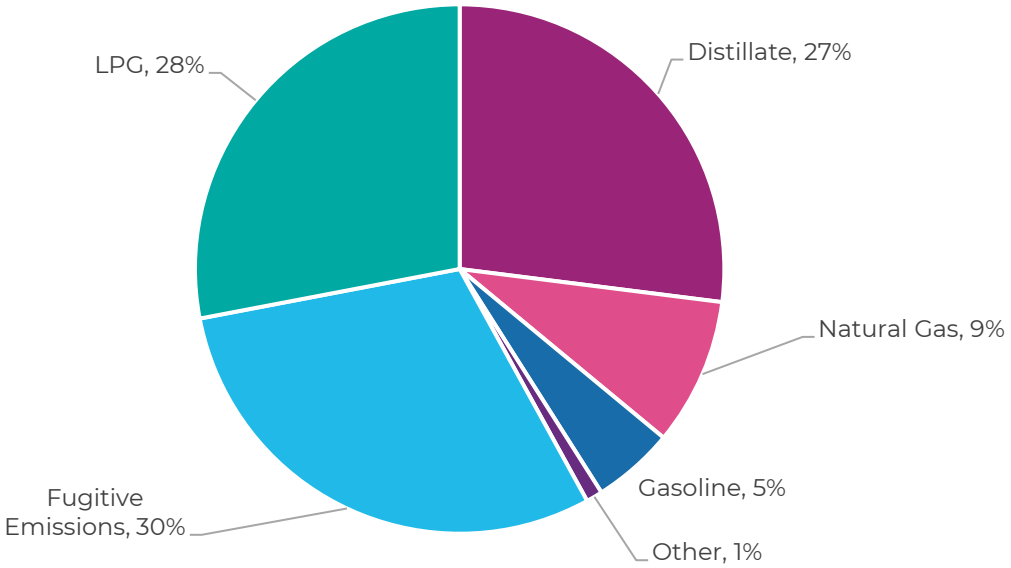
Emissions from this category are divided into the following economic sectors, according to the CARB statewide GHG inventory: agriculture, commercial, residential, transport, energy, and manufacturing. The relative distribution of emissions by economic sector is provided in Figure A.1 and by fuel type in Figure A.2.

Figure B.1: Relative Distribution of 2016 Greenhouse Gas Emissions from Other Fuels by Economic Sectors



Source: EPIC, USD 2020.

Figure B.2: Relative Distribution of 2016 Greenhouse Gas Emissions from Other Fuels by Fuel Type



Source: EPIC, USD 2020.

Method Used to Estimate 2016 Emissions

The GHG emissions from the CARB statewide inventory were the basis of the regional estimates.[23] EPIC scaled down the statewide emissions by economic sector to the San Diego region based on whether a particular category had any economic activity in the San Diego region using relevant economic, population, employment, or transportation data. Therefore, not all of CARB's statewide emissions from these economic sectors are included in the 2016 regional inventory.

CARB uses the IPCC category and subcategory names and codes, as specified in the IPCC 2006 Guidelines for GHG Inventories, to be consistent with the EPA national inventory. Below are only those IPCC categories, subcategories, activities, and fuel types with GHG emissions in the San Diego region, based on economic activity data in the San Diego region.

CARB agriculture sector: EPIC scaled down the emissions from the following categories to San Diego region using the 2016 ratio of the revenue generated by agricultural activities in the San Diego region to the statewide agricultural revenue.[24]

- 1A4c: Agriculture/Forestry/Fishing/Fish Farms > Agriculture Energy Use
  - Distillate > CH_4, CO_2, N_2O

[23] CARB Greenhouse Gas Emission Inventory – Query Tool for years 2000 to 2017 (12th edition), accessed on May 25, 2020.
[24] California Department of Food & Agriculture: California Agricultural Statistics Review, 2016–2017. accessed May 28, 2020.

- Kerosene > CH_4, CO_2, N_2O
- Gasoline > CH_4, CO_2, N_2O
- Ethanol > CH_4, CO_2, N_2O

CARB commercial sector: EPIC scaled down the emissions from the following categories to the San Diego region using the 2016 ratio of the number of employees in the San Diego region's manufacturing sector to the statewide manufacturing sector.[25]

- 1A4a: Commercial/Institutional > Not Specified Commercial
  - Distillate > CH_4, CO_2, N_2O
  - Kerosene > CH_4, CO_2, N_2O
  - Gasoline > CH_4, CO_2, N_2O
  - LPG > CH_4, CO_2, N_2O
  - Residual Fuel Oil > CH_4, CO_2, N_2O
  - Wood (wet) > CH_4, N_2O

CARB residential sector: EPIC scaled down the emissions from the following categories to the San Diego region using the 2016 ratio of the San Diego regional population to the statewide population.[26]

- 1A4b: Residential > Household Use
  - Distillate > CH_4, CO_2, N_2O
  - Kerosene > CH_4, CO_2, N_2O
  - LPG > CH_4, CO_2, N_2O
  - Wood (wet) > CH_4, N_2O

CARB transportation sector: This category included the emissions from LPG fuel combustion. EPIC scaled down the emissions from the following categories to the San Diego region using the 2016 ratio of San Diego regional VMT to statewide VMT.[27]

- 1A3: Transport > Not Specified Transportation
  - LPG > CH_4, CO_2, N_2O
  - Residual Fuel Oil > CH_4, CO_2, N_2O

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25 2016 County Business Patterns, accessed on May 30, 2020. The 2012 North American Industry Classification System (NAICS) Code for manufacturing Sector is 31-33.

26 San Diego demographic data are shown in Table A.2. Statewide population projections are from California Department of Finance, accessed on May 30, 2020.

27 San Diego regional 2016 VMT are provided in Table A.4 and Table A.5. California statewide VMT is from EMFAC2017, accessed on June 1, 2020.

CARB energy sector: This category included the emissions from the transmission and distribution of electricity (e.g., fugitive and fuel combustion emissions from natural gas pipelines used for electric generation, non-natural gas pipelines and natural gas storage). EPIC scaled down the emissions from the following categories to the San Diego region using the 2016 ratio of total establishments for transmission and distribution activities in the San Diego region to the statewide establishments for the same activities.[28]

- 1B2: Oil and Natural Gas
  - Not Specified Industrial > Fugitives > Fugitive Emissions > CH_4
  - Pipelines > Natural Gas > Fugitives > Fugitive Emissions > CH_4, CO_2
- 1A1: Energy Industries > Pipelines
  - Natural Gas Pipelines > Natural Gas > CH_4, CO_2, N_2O
  - Non-Natural Gas Pipelines > Natural Gas > CH_4, CO_2, N_2O

CARB manufacturing sector: EPIC scaled down the emissions from the following categories to the San Diego region using the 2016 ratio of the number of employees in the San Diego region's manufacturing sector and the statewide manufacturing sector.[29]

- 1A2f: Manufacturing Industries and Construction > Non-Metallic Minerals > Stone, Clay, Glass, and Cement > Cement
  - Distillate > CH_4, CO_2, N_2O
  - LPG > CH_4, CO_2, N_2O
  - MSW > CH_4, CO_2, N_2O
  - Petroleum Coke > CH_4, CO_2, N_2O
  - Residual Fuel Oil > CH_4, CO_2, N_2O
  - Tires > CH_4, CO_2, N_2O
- 1A2k: Manufacturing Industries and Construction > Construction
  - Gasoline > CH_4, CO_2, N_2O
- 1A2m: Manufacturing Industries and Construction > Non-Specified Industry
  - Distillate > CH_4, CO_2, N_2O
  - Gasoline > CH_4, CO_2, N_2O
  - Kerosene > CH_4, CO_2, N_2O
  - LPG > CH_4, CO_2, N_2O

[28] 2016 County Business Patterns, accessed on May 30, 2020. The 2012 NAICS Code for Electric Power Generation, Transmission and Distribution is 2211.

[29] 2016 County Business Patterns, accessed on May 30, 2020. The 2012 NAICS code for manufacturing sector is 31-33.

    - Petroleum Coke > CH_4, CO_2, N_2O
    - Residual Fuel Oil > CH_4, CO_2, N_2O
- 1B2: Oil and Natural Gas > Manufacturing
    - Chemicals and Allied Products > Fugitives > Fugitive Emissions > CH_4
    - Construction > Fugitives > Fugitive Emissions > CH_4
    - Electric and Electronic Equipment > Fugitives > Fugitive Emissions > CH_4
    - Food Products > Fugitives > Fugitive Emissions > CH_4
    - Fugitives > Fugitive Emissions > CH_4
    - Plastic and Rubber > Fugitives > Fugitive Emissions > CH_4
    - Primary Metals > Fugitives > Fugitive Emissions > CH_4
    - Pulp and Paper > Fugitives > Fugitive Emissions > CH_4
    - Storage Tanks > Fugitives > Fugitive Emissions > CH_4

Several categories were included in CARB's statewide inventory, but not in this 2016 regional inventory, because 2016 business patterns in data for the San Diego region indicated no economic activities under these categories. The categories are:

- 1A1b: Petroleum Refining
    - Associated Gas > CH_4, CO_2, N_2O
    - Catalyst Coke> CH_4, CO_2, N_2O
    - Distillate> CH_4, CO_2, N_2O
    - LPG > CH_4, CO_2, N_2O
    - Petroleum Coke > CH_4, CO_2, N_2O
    - Refinery Gas > CH_4, CO_2, N_2O
    - Residual Fuel Oil > CH_4, CO_2, N_2O
- 1A1c: Manufacture of Solid Fuels and Other Energy Industries
    - Associated Gas > CH_4, CO_2, N_2O
    - Crude Oil > CH_4, CO_2, N_2O
    - Distillate > CH_4, CO_2, N_2O
    - Residual Fuel Oil > CH_4, CO_2, N_2O
- 1B2: Oil and Natural Gas > Manufacturing: Stone, Clay, Glass, and Cement: Fugitives > Fugitive Emissions > CH_4
- 1B2a: Oil > Petroleum Refining: Process Losses: Fugitives > Fugitive Emissions > CH_4

- 1B3: Other Emissions from Energy Production > In State Generation: Merchant Owned > Geothermal Power – Geothermal > CO_2
- 1B3: Other Emissions from Energy Production > In State Generation: Utility Owned > Geothermal Power > CO_2

The key inputs and results are shown in Table B.12.

Table B.12: Key Inputs and 2016 Greenhouse Gas Emissions from Other Fuels

Key Inputs and 2016 Greenhouse Gas Emissions from Other Fuels	
Economic Sectors Associated with Other Fuels*	**2016 Emissions (MMT CO_2e)**
Agriculture	0.12
Commercial	0.20
Residential	0.13
Transportation	0.01
Energy	0.44
Manufacturing	0.24
Total GHG Emissions	**1.1**

* Economic sectors used in CARB statewide GHG inventory.

Source: California Agricultural Statistics Review 2016–2017; 2016 County Business Patterns; SANDAG ABM14.2.2 VMT; EMFAC2017 statewide on-road emission inventory; EPIC, USD 2020.

Solid Waste

Emissions from solid waste are a result of biodegradable, carbon-bearing waste decomposing in largely anaerobic environments and producing landfill gas. The degradation process can take 5 to 50 years. Emissions from solid waste contribute to 2% of total emissions in the 2016 inventory.

Method Used to Estimate 2016 Emissions

EPIC estimated the emissions from solid waste using method SW.4 from the ICLEI U.S. Community Protocol.[30] The emissions are based on the disposed waste in a given year, the characterization of the waste stream, and emissions factor of each type of waste. Because a waste characterization study for the entire region was not available, EPIC used the waste characterization studies from the cities of Chula Vista, Oceanside, and San Diego to estimate the waste composition in the region.[31] The solid waste emission factors, MT CO_2e per short ton of waste by type, are from the EPA Waste Reduction Model (WARM).[32] Table B.13 shows the waste composition derived and the corresponding emission factors.

[30] ICLEI: U.S. Community Protocol Appendix E, accessed in May 2020.

[31] The City of Chula Vista and the City of Oceanside's waste characterization studies were provided by the jurisdictions. Personal communication. City of San Diego Waste Characterization Study.

[32] U.S. EPA Waste Reduction Model (WARM) Version 15.

Table B.13: Estimated San Diego Region Solid Waste Composition

Estimated San Diego Region Solid Waste Composition		
Type of Waste	**Percentage of Total Composition***	**Landfill Methane Without Recovery (MT CO_2e/Short Ton)**
Paper	17%	2.12
Plastic	9.9%	0
Glass	1.9%	0
Metal	3.5%	0
Organics	40.4%	1.03
Electronics	0.8%	0
Inerts and Other	21.2%	0.07
Household Hazardous Waste	0.2%	0
Special Waste	2.9%	0
Mixed Residue	2.1%	0

* The composition was derived from the waste composition of the City of Chula Vista, City of Oceanside, and City of San Diego.

Source: EPIC, USD 2020.

The 2016 emissions from solid waste are provided in Table B.14.

Table B.5: Key Inputs and 2016 Greenhouse Gas Emissions from Solid Waste

Key Inputs and 2016 Greenhouse Gas Emissions from Solid Waste	
Total Waste Disposal (short tons)	3,317,216
Mixed Waste Emission Factor (MT CO_2e/short ton)*	0.79
Landfill Gas Capture Rate	0.75
Oxidation Rate	0.10
Total GHG Emissions (MMT CO_2e)	**0.59**

* Weighted average from Table X.26.

Source: EPIC, USD 2020.

Water

The GHG emissions from energy associated with upstream supply and conveyance, and treatment of water account for 1% of total emissions in the 2016 inventory. This category does not include emissions associated with electricity used for water distribution and water end use (e.g., water heating at homes). The emissions from energy used for water distribution and water end use are captured in the electricity and natural gas categories, discussed in previous sections.

Method Used to Estimate 2016 Emissions

The San Diego County Water Authority (SDCWA) is the water wholesaler for the San Diego region. SDCWA imports raw and treated water on behalf of its 24 member agencies. The raw water sources, from the State Water Project and Colorado River, vary year by year depending on water availability; therefore, the energy needed to supply and convey water differs as well. The latest available upstream energy intensity, in kWh per acre-foot of water, is from the average of fiscal years 2013 and 2014 in the SDCWA 2015 Urban Water Management Plan. EPIC calculated the GHG emissions from upstream water supply by multiplying the water supplies with their respective energy intensities and the California average electricity GHG emission factor in 2016.[33] The upstream emissions are shown in Table B.15.[34]

Table B.15: 2016 Upstream Emissions from Water Supply

2016 Upstream Emissions from Water Supply		
Water Source	**Imported Treated Water**	**Imported Raw Water**
Water Demand (acre-feet)	138,312	282,726
Energy Intensity (kWh/acre-foot)*	1,862	1,817
California Average Electricity Emission Factor (lbs CO_2e/MWh)**	530	530
Upstream GHG Emissions (MT CO_2e)		185,411

* Includes water conveyance from the State Water Project and Colorado River to Metropolitan Water District and SDCWA system. The difference between energy intensity for treated and raw water is the water treatment energy intensity.

** eGRID 2016 CAMX subregion emission factor.

Source: EPIC, USD 2020.

SDCWA has its own water treatment plant (WTP), Twin Oaks WTP, and many SDCWA member agencies have their own WTPs as well. Member agencies that do not have WTPs may purchase treated water from other member agencies or from SDCWA. For example, the City of San Diego and the City of Del Mar are member agencies of the SDCWA, but the City of San Diego provides water treatment service for the City of Del Mar. Local water treatment energy intensity depends on water sources, treatment level, capacity, and efficiency of the WTP. For example, brackish groundwater requires advanced treatment, such as reverse osmosis, to remove the salinity in the water, so its treatment has a higher energy intensity than surface water treatment with conventional methods. Table B.16 below shows the WTPs in the San Diego region, the water treated, and the associated

[33] SDCWA 2016: Urban Water Management Plan 2015, Metropolitan Water District of Southern California, Urban Water Management Plan 2015. The Western Electricity Coordinating Council CAMX (eGRID Subregion) emission rate from eGRID was used as representative of the average California electricity emission rate for upstream electricity. U.S. EPA. eGRID 2016 Edition, released February 15, 2018, accessed June 29, 2018.

[34] 2016 water source and demand for each SDCWA member agency were provided by SDCWA staff to EPIC, October 23, 2018.

electricity use for water treatment in 2016.[35] EPIC calculated the GHG emissions from water treatment by multiplying the electricity used for water treatment with SDG&E 2016 electricity GHG emission factor.

Table B.16: 2016 Emissions from Local Water Treatment

2016 Emissions from Local Water Treatment				
Water Treatment Plant	**Plant Operator**	**Water Treated (Acre-Feet)**	**Water Treatment Energy Intensity (kWh/Acre-Foot)**	**Water Treatment Electricity Use (kWh)**
R.M. Levy WTP	Helix WD	42,767	58	2,493,844
R.E. Badger Filtration Plant	Santa Fe ID	12,685	44	558,346
Combined Miramar, Otay, and Alvarado WTP*	City of San Diego	163,823	56	9,151,144
Escondido-Vista WTP	Escondido + Vista ID	30,678	47	1,441,875
David C. McCollum WTP	Olivenhain MWD	21,301	142	3,018,745
Richard A. Reynolds Ground Water Desalination Facility	Sweetwater Authority	1,855	1,174	2,178,583
Robert A. Perdue WTP	Sweetwater	13,347	141	1,879,760
Lester J. Berglund WTP	City of Poway	10,329	208	2,150,666
Robert A. Weese WFP	City of Oceanside	11,878	29	348,546
Mission Basin Groundwater	City of Oceanside	2,997	1,257	3,766,499
Twin Oaks Valley WTP	SDCWA	79,538	33	2,661,602
Carlsbad Desalination Plant**	SDCWA	45,107	4,397	198,335,919
Total Water Treatment Electricity Use (kWh)				227,985,529
SDG&E Electricity Emission Factor (lbs CO_2e/MWh)				527
Transmission and Distribution Loss Factor				1.082
Local Treatment GHG Emissions (MT CO_2e)				58,925

ID: irrigation district; WD: water district; WFP: water filtration plant; WTP: water treatment plant.

* The electricity use and energy intensity include both water treatment and conveyance from nearby reservoirs for City of San Diego WTPs and both water extraction and treatment for Sweetwater Authority's brackish water desalination plant. The data associated with water treatment cannot be separated out.

** The water treated at the plant includes SDCWA wholesale water and local supply for individual SDCWA member agencies that have separate contracts with the plant. The energy intensity is the high efficiency estimate from the Plant's Environmental Impact Report (2008).

[35] Data were collected by EPIC from 2018 to 2020 for the development of SANDAG's 2016 and 2018 "ReCAP Snapshots" (greenhouse gas inventory and Climate Action Plan monitoring reports prepared for local jurisdictions).

Source: EPIC, USD 2020.

Combining the upstream and local emissions, the total 2016 emissions from water are shown in Table B.17.

Table B.17: 2016 Greenhouse Gas Emissions from Water Supply, Treatment, and Distribution

2016 Greenhouse Gas Emissions from Water Supply, Treatment, and Distribution	
Upstream GHG Emissions (MT CO_2e)	185,411
Local Treatment GHG Emissions (MT CO_2e)	58,925
Total (Upstream + Local) GHG Emissions (MT CO_2e)	244,337
Total (Upstream + Local) GHG Emissions (MMT CO_2e)	**0.24**

Source: EPIC, USD 2020.

Wastewater

The GHG emissions from domestic wastewater treatment account for 0.3% of total emissions in the 2016 inventory. This category presents emissions from community-generated wastewater treated at centralized wastewater treatment plants and on-site septic systems. Emissions associated with the energy used to collect and treat wastewater are not included in this category but are included in the electricity and natural gas category.

Method Used to Estimate 2016 Emissions

In 2019, SANDAG, in collaboration with local jurisdictions, prepared the 2016 Regional Climate Action Planning Framework (ReCAP) Snapshots to assist local jurisdictions with monitoring community-wide GHG emissions and Climate Action Plan (CAP) implementation.[36] EPIC calculated the 2016 community-wide GHG emissions inventories for 16 (out of 19) jurisdictions in the San Diego region and used the wastewater emissions from these 16 GHG inventories directly in this category.

The City of Coronado postponed preparation of a ReCAP Snapshot due to the ongoing CAP development; however, 2016 wastewater flow was collected during the data-collection process. The GHG emissions shown in Table A.18 for Coronado include wastewater flow from military bases in Coronado to the Point Loma Wastewater Treatment Plant (WWTP). Depending on the boundary determined in the future Coronado CAP, the wastewater emissions estimated here may differ from those calculated under the CAP.

The City of San Diego and the unincorporated County of San Diego (the County) report community-wide GHG emissions separately under their own CAP monitoring processes. The 2016 wastewater emissions from the City of San Diego are taken directly from its

[36] SANDAG: Climate Action. November 2019 ReCAP Snapshots (with 2016 GHG Emissions Inventories).

2019 CAP Annual Report.[37] For the County, EPIC estimated the 2016 wastewater emissions using its 2014 (CAP baseline year) wastewater emissions and population increase.[38] The key inputs and 2016 wastewater emissions are show in Table B.18.

Table B.18: Key Inputs and 2016 Greenhouse Gas Emissions from Wastewater

Key Inputs and 2016 Greenhouse Gas Emissions from Wastewater	
Local Jurisdiction	**2016 Wastewater Emissions (MT CO_2e)**
Carlsbad	2,972
Chula Vista	2,577
Coronado	260
Del Mar	87
El Cajon	1,161
Encinitas	1,916
Escondido	4,986
Imperial Beach	353
La Mesa	734
Lemon Grove	260
National City	656
Oceanside	5,751
Poway	1,140
San Diego*	21,257
San Marcos	2,915
Santee	584
Solana Beach	619
Vista	3,207
Unincorporated County of San Diego**	21,583
Total	73,014
Total (MMT CO_2e)	**0.07**

* 2016 emissions reported in the City of San Diego CAP 2019 Annual Report.

** Estimated based on 2014 wastewater emissions reported in the County of San Diego CAP Appendix A (21,183 MT CO_2e), 2014 population (498,159), and 2016 population (507,555).

All wastewater emissions are from SANDAG November 2019 ReCAP Snapshots (with 2016 GHG Emissions), except City of San Diego and County of San Diego.

Source: SANDAG 2019, EPIC, USD 2020

[37] City of San Diego CAP: 2019 Annual Report Appendix (2020), accessed November 2, 2020.

[38] County of San Diego CAP Appendix A: 2014 Greenhouse Gas Emissions Inventory and Projections (2017), accessed May 20, 2020.

Civil Aviation

The GHG emissions from commercial aviation operations account for 1% of total emissions in the 2016 inventory. The San Diego International Airport (SAN) and McClellan-Palomar Airport (CRQ) are the only airports in the San Diego region in 2016 with scheduled commercial flights services, while other airports operate on a private and on-demand basis.[39] Because 99% of commercial passengers in the San Diego region are covered by SAN and CRQ, this category does not include the GHG emissions associated with aviation operations at other municipal airports in the San Diego region.[40] GHG emissions in this category are from combustion of jet fuel and aviation gasoline used by commercial aircrafts.

Method Used to Estimate 2016 Emissions

EPIC used the aircraft emissions reported in the SAN 2016 GHG Emissions Inventory (SAN GHG Inventory)—developed by the San Diego County Regional Airport Authority—and CRQ 2016 Emissions Inventory—developed for the CRQ Master Plan Program Environmental Impact Report (PEIR). The aircraft emissions in the SAN GHG Inventory are calculated based on the Airport GHG Emissions Management Guidance Manual and include emissions from aircraft start up, take off, and up to mixing height (3,000 feet).[41] The aircraft emissions in CRQ 2016 Emissions Inventory include emissions from fuel combustion and emissions from auxiliary power units.[42]

The 2016 aircraft emissions were 213,353 (0.2 MMT CO_2e), with 95% from SAN aircraft emissions and 5% from CRQ aircraft emissions.

Agriculture

GHG emissions from livestock (from enteric fermentation and manure management) are included in this category. Enteric fermentation is a microbial fermentation process that occurs in the stomach of ruminant animals, producing CH4 that is released through flatulence and eructation. Manure management is the process by which manure is stabilized or stored. CH4 and N2O emissions result from livestock manure, and the amount of gas produced depends on the manure management system involved. The agriculture category contributes to 0.2% of total emissions in the 2016 inventory.

Method Used to Estimate 2016 Emissions

EPIC followed the ICLEI U.S. Community Protocol for Emissions from Domestic Animal Production within a Community (A.1 and A.2) to calculate the emissions from agriculture.[43] Method A.1 addresses enteric fermentation from livestock production. CH4 emissions due

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[39] Airports with scheduled commercial flights follow Federal Aviation Administration (FAA)'s FAR Part 139 rules. On-demand basis refers to aviation operators allowed under FAA rules to accept paying passengers (FAR Part 135 operators).

[40] FAA: Passenger Boarding (Enplanement) and All-Cargo Data for U.S. Airports, CY 2016. Airports included are SAN, CRQ, Miramar MCAS, North Island NAS, Montgomery-Gibbs, Brown Field, and Gillespie Field.

[41] San Diego County Regional Airport Authority: 2016 Greenhouse Gas Emissions Inventory (October 16, 2018), provided by Airport Authority staff to EPIC, August 7, 2018.

[42] CRQ Master Plan Update PEIR: Appendix H – Climate Change Technical Report (2018).

[43] ICLEI: U.S. Community Protocol for Emissions from Domestic Animal Production within a Community, accessed August 3, 2020.

to enteric fermentation are derived from the livestock population and emission factors for each animal type. Method A.2 addresses emissions from manure management. Emissions from manure management are derived from data on animal populations, animal characteristics, and manure management practices. Method A.2 is broken up into three subcategories, including CH4 emissions from manure management (A.2.1), direct N2O emissions from manure management (A.2.3), and indirect N2O emissions from manure management (A.2.4).

All the emission factors and other factors used for the calculations were taken from the ICLEI protocol. Table B.19 shows the factors used to calculate the agriculture emissions.

Table B.19: Factors Used to Calculate Greenhouse Gas Emissions from Agriculture

Factors Used to Calculate Greenhouse Gas Emissions from Agriculture							
	Dairy Cattle	**Other Cattle, Including Calves**	**Beef Cattle**	**Sheep**	**Goats**	**Swine**	**Horses**
Methane Emissions from Enteric Fermentation (A.1)							
Enteric Fermentation Emission Factor (kg CH_4/head/year)	147	54	100	8	5	1.5	18
Methane Emissions from Manure (without anaerobic digester) (A.2.1)							
Percentage Dry Lot	0	0.11	1	0.5	0.5	0	0.5
Percentage Pasture	0	0	0	0.5	0.5	0.2	0.5
Percentage Liquid Slurry	0.2	0.09	0.01	0	0	0.07	0
Percentage Daily Spread	0.1	0.01	0	0	0	0	0
Percentage Solid Storage	0.09	0	0	0	0	0	0
Percentage Anaerobic Lagoon	0.6	0.21	0	0	0	0.43	0
Percentage Dip Pit	0	0.58	0	0	0	0.27	0
Volatile Solid (VS) (kg/animal/year)	2,025	1,252	1,259	0	0	0	0
Average VS (kg/day/1,000 kg animal mass)	0	0	0	8.3	9.5	5.4	6.1
Typical Animal Mass	0	0	0	25	64	39	450

Factors Used to Calculate Greenhouse Gas Emissions from Agriculture							
	Dairy Cattle	**Other Cattle, Including Calves**	**Beef Cattle**	**Sheep**	**Goats**	**Swine**	**Horses**
Max CH_4 Producing Capacity per Pound of Manure (m^3 kg VS)	0.24	0.17	0.33	0.36	0.17	0.48	0.33
Methane Conversion Factor Pasture	0.015	0	0	0.015	0.015	0.015	0.015
Methane Conversion Factor Dry Lot	0	0.015	0.015	0.015	0.015	0	0.015
Methane Conversion Factor Liquid Slurry	0.34	0.35	0.43	0	0	0.33	0
Methane Conversion Factor Daily Spread	0.005	0.005	0	0	0	0	0
Methane Conversion Factor Solid Storage	0.04	0	0	0	0	0.04	0
Methane Conversion Factor Anaerobic Lagoon	0.73	0.75	0	0	0	0.73	0
Methane Conversion Factor Dip Pit	0	0.35	0	0	0	0.33	0
Direct Nitrous Oxide Emissions from Manure (A.2.3)							
Daily Rate of Kjeldahl Nitrogen Excreted (kg N/animal/year)	156	54.7	52.3	0.45	0.45	0.54	0.25
Direct N_2O Emission Factor Dry Lot	0	0.03	0.02	0.03	0.03	0	0.03
Direct N_2O Emission Factor Pasture	0	0	0	0	0	0	0

Factors Used to Calculate Greenhouse Gas Emissions from Agriculture							
	Dairy Cattle	**Other Cattle, Including Calves**	**Beef Cattle**	**Sheep**	**Goats**	**Swine**	**Horses**
Direct N_2O Emission Factor Daily Spread	0	0	0	0	0	0	0
Direct N_2O Emission Factor Solid Storage	0.005	0	0	0	0	0.005	0
Direct N_2O Emission Factor Liquid/Slurry	0.005	0.08	0.005	0	0	0.08	0
Direct N_2O Emission Factor Dip Pit	0	0.002	0	0	0	0.002	0
Direct N_2O Emission Factor Anaerobic Lagoon	0	0	0	0	0	0	0
Indirect Nitrous Oxide Emissions from Manure (A.2.4)							
Frac Gas, Pasture*	0	0	0	0	0	0	0
Frac Gas, Liquid/Slurry	26	26	26	0	0	26	0
Frac Gas, Daily Spread	10	10	0	0	0	0	0
Frac Gas, Dry Lot	0	23	23	23	23	0	23
Frac Gas, Solid Storage	27	0	0	0	0	45	0
Frac Gas, Anerobic Lagoon	43	43	0	0	0	58	0
Frac Gas, Dip Pit	0	24	0	0	0	34	0
Frac Runoff/Leach, Pasture**	0	0	0	0	0	0	0
Frac Runoff/Leach, Daily Spread	0	0	0	0	0	0	0
Frac Runoff/Leach, Solid Spread	0	0	0	0	0	0	0
Frac Runoff/Leach, Liquid/Slurry	0.8	0.8	0	0	0	0.8	0
Frac Runoff/Leach, Anaerobic Lagoon	0.8	0.8	0	0	0	0.8	0

Factors Used to Calculate Greenhouse Gas Emissions from Agriculture							
	Dairy Cattle	**Other Cattle, Including Calves**	**Beef Cattle**	**Sheep**	**Goats**	**Swine**	**Horses**
Frac Runoff/Leach, Dry Lot	0	3.9	3.9	3.9	3.9	0	0
Frac Runoff/Leach, Dip Pit	0	0	0	0	0	0	0

* Frac Gas – Nitrogen lost through volatilization.

** Frac Runoff/Leach – Nitrogen lost through runoff and leaching.

Source: ICLEI 2013; EPIC, USD 2020.

Marine Vessels

The GHG emissions from marine vessels in the San Diego region are largely attributed to the Port of San Diego, which serves as a transshipment facility for San Diego, Orange, Riverside, San Bernardino, and Imperial Counties, as well as northern Baja California and Arizona. The GHG emissions from marine vessels account for 0.2% of total emissions in the 2016 inventory.

The emissions are from the following two subcategories:

- **Ocean-Going Vessels (OGV):** These include auto carriers, bulk carriers, passenger cruise vessels, general cargo vessels, refrigerated vessels (reefers), roll-on roll-off vessels, and tankers for bulk liquids.
- **Commercial Harbor Craft (CHC):** These include tugboats, towboats, pilot boats, work boats, ferries, and sports and commercial fishing vessels.

The emissions from OGV or CHC beyond the Port of San Diego's landside and waterside boundary (24 nautical miles from the coastline) are not included in the 2016 inventory.

Method Used to Estimate 2016 Emissions

EPIC used the OGV and CHC emissions reported in the Port of San Diego 2016 Maritime Air Emissions Inventory.[44] The 2016 emissions are shown in Table B.20.

[44] Port of San Diego 2016 Maritime Air Emissions Inventory (2018), accessed May 8, 2020. Other emissions from the 2016 Port of San Diego inventory, e.g., cargo handling equipment, locomotives, and on-road vehicles, are included in "Other categories" of this regional inventory.

Table B.60: 2016 Greenhouse Gas Emissions from Marine Vessels

2016 Greenhouse Gas Emissions from Marine Vessels	
Vessel Type	**2016 Emissions**
OGV (MT CO_2e)	22,500
CHC (MT CO_2e)	25,500
Total GHG Emissions (MT CO_2e)	48,000
Total GHG Emissions (MMT CO_2e)	**0.05**

Source: Port of San Diego, 2018.

Soil Management

Emissions from synthetic fertilizer use and crop residue or soil management contribute to 0.2% of total emissions in the 2016 inventory. The emissions are broken into two subcategories: farm emissions and non-farm emissions. The farm emissions account for the emissions due to agricultural soil management activities, such as synthetic fertilizers used for cultivation purposes to enhance the soil's nutrients and emissions due to crop residue. The non-farm emissions account for synthetic fertilizers used for residential or commercial purposes.

Farm emissions due to agricultural synthetic fertilizer use include direct N_2O emissions, indirect N_2O emissions, and CO_2 emissions from urea and lime application. The non-farm emissions only include direct N_2O and indirect N_2O emissions. The N_2O emissions from crop residues are due to the nitrogen content in the residue.

Method Used to Estimate 2016 Emissions

EPIC followed the IPCC method to calculate the direct and indirect N_2O and CO_2 emissions from managed soils.[45] The IPCC method calculates emissions from manure management, fertilizer application, and agricultural activities. Because the emissions from manure management are accounted for in the agriculture category, this section does not include these emissions.

To calculate the direct and indirect N_2O emissions from fertilizer applications for both farm and non-farm activities, EPIC multiplied the tonnage used by the nitrogen content of each synthetic fertilizer.[46] The nitrogen content of each fertilizer is based on the specific chemical content.[47] If the specific chemical content of a fertilizer is not given,

[45] IPCC: N_2O Emissions from Managed Soils and CO_2 Emissions from Urea and Lime Application, accessed on August 2, 2020.

[46] California Department of Food & Agriculture: 2016 Fertilizing Materials Tonnage Report, accessed on August 3, 2020.

[47] International Fertilizer Association: Fertilizer Converter, accessed on August 3, 2020. This database provides information on the nitrogen content percentage by weight of a given fertilizer.

code 97 fertilizer with a 25-15-17 Nitrogen-Phosphorous-Potassium (NPK) composition is used.

The farm use soil management has N_2O emissions from crop residue and from crop burning activities. Because the San Diego region does not have agricultural burning activities in 2016, EPIC only considered the emissions due to crop residue. Among the crops that have nitrogen content in their residue, only oats/hay are grown in the San Diego region. EPIC calculated the emissions from crop residue using the total nitrogen content in the crop residue based on the acres of crop cultivated.[48] The CO_2 emissions from urea application and from liming are based on the total quantities of urea and lime applied and their respective emission factors.[46] Table B.21 shows the key inputs and results for the soil management emissions.

Table B.21: Key Inputs and 2016 Greenhouse Gas Emissions from Soil Management

Key Inputs and 2016 Greenhouse Gas Emissions from Soil Management	
Total Nitrogen in Farm Use Synthetic Fertilizers (tons)	3,013
Total Nitrogen in Non-Farm Use Synthetic Fertilizers (tons)	5,247
N_2O Emitted per Unit of Nitrogen (kg N_2O-N/kg N)	0.01
N_2O Emitted per Unit of Nitrogen Volatilized (kg N-N_2O/kg NH_3- N + NO_x-N volatilized)	0.01
N_2O Emitted per Unit of Nitrogen Leached/Runoff (kg N_2O-N/kg N leaching/runoff)	0.0075
Total Area of Oats Harvested (acres)	2,100
Total Nitrogen in Crop (Oats/Hay) Residue (kg N)	7,990
Amount on Lime Applied (tons)	216
Carbon Content of Lime (ton C/ton of lime)	0.125
Amount of Urea Applied (tons)	559
Carbon Content of Urea (ton C/ton of urea)	0.2
Direct N_2O Emissions from Farm Activities – Synthetic Fertilizers and Crop Residue (MMT of CO_2e)	0.013
Direct N_2O Emissions from Non-Farm Activities – Synthetic Fertilizer (MMT of CO_2e)	0.022
Indirect N_2O Emissions from Farm Activities – Synthetic Fertilizers and Crop Residue (MMT of CO_2e)	0.004
Indirect N_2O Emissions from Non-Farm Activities – Synthetic Fertilizer (MMT of CO_2e)	0.007
CO_2 Emissions from Farm Urea Applications (MMT CO_2e)	4×10^{-4}

[48] California Department of Agriculture Weights & Measures: 2016 County of San Diego Crop Statistics and Annual Report, accessed on August 4, 2020.

Key Inputs and 2016 Greenhouse Gas Emissions from Soil Management

CO_2 Emissions from Farm Lime Applications (MMT CO_2e)	1×10^{-4}
Total Farm Emissions (MMT CO_2e)	0.02
Total Non-Farm Emissions (MMT CO_2e)	0.03
Total GHG Emissions from Soil Management Sector (MMT CO_2e)	**0.05**

Source: County of San Diego 2016; International Fertilizer Association IPCC 2006; EPIC, USD 2020.

Appendix C: GHG Reduction Technical Report

San Diego Regional Priority Climate Action Plan (PCAP)

GHG Reduction Technical Report

February 2024

Prepared for

San Diego Association of Governments

SANDAG

Prepared by

Energy Policy Initiatives Center

EPIC
ENERGY POLICY INITIATIVES CENTER
UNIVERSITY OF SAN DIEGO SCHOOL OF LAW

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The Energy Policy Initiatives Center is a research center of the USD School of Law that studies energy policy issues affecting California and the San Diego region. Energy Policy Initiatives Center's mission is to increase awareness and understanding of energy- and climate-related policy issues by conducting research and analysis to inform decision makers and educating law students.

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1 INTRODUCTION

This report summarized the methods, models/tools, activity level assumptions, and data sources used to estimate GHG reductions for measures, programs, and projects included in the San Diego-Chula Vista-Carlsbad Metropolitan Statistical Area (San Diego Region) Priority Climate Action Plan (PCAP). For each program or projects, the following information is Included.[1]

- GHG Reduction Estimate Method
- Models/Tools Used
- Measure Implementation Assumptions
- GHG Reduction Estimate Assumptions
- Reference Case Scenario
- Measure Specific Activity Data

Section 2 summarizes common assumptions and methods that affect more than one PCAP measure or program. Sections 3 through 6 summarize the methods used to estimate GHG emission reductions. Not all programs included in the PCAP have quantified GHG reduction estimates. This document only includes those with estimated GHG reductions.

1.1 Summary of Results

Table 1 summarizes the estimated cumulative GHG reductions for 2025-203 and 2025-2050 for PCAP measures.

Table 1 Cumulative GHG Reductions by PCAP Measure

PCAP Measures	2025-2030 Cumulative GHG Reduction	2025-2050 Cumlative GHG Reduction
T-1 Increase Adoption of Zero Emission Vehicles	307,000	841,000
T-2 Increase Zero Emission Vehicle Charging Infrastructure	12,000	30,000
T-3 Expand Active Transportation Opportutnities	34,000	182,000
T-4 Increase Use of Public Transit	82,300	251,300
T-5 Improve Transportation System Efficiency	2,000	10,000
B-2 Electrify Buildings	44,000	171,000
CE-1 Increase Solar and Energy Storage	67,000	215,000
W. 1 Improve Water and Wastewater System Efficiency	15,000	77,000
Total	**563,300**	**1,777,300**

Table 2 summarizes the GHG reductions for PCAP measures and associated programs and projects.

[1] Based on guidance in the Phase II Notice of Funding Opportunity (NOFO) EPA-R-OAR-CPRGI-23-07.

Table 2 GHG Reduction Estimates for PCAP Measures, Programs, and Projects

PCAP Measure/Action*	2025-2030 Cumulative GHG Reduction (MT CO2e)	2025-2050 Cumulative GHG Reduction (MT CO2e)
T-1 Increase Adoption of Zero Emission Vehicles	**307,000**	**841,000**
T-1.1 Zero Emission Light-Duty Vehicle Incentive Program	238,000	615,000
T-1.2 Zero Emission Medium and Heavy-Duty Vehicle Incentive Program	29,000	76,000
T-1.4 Zero Emission Vehicles in Municipal Fleets	29,000	75,000
T-1.5 Zero Emission Rail	11,000	75,000
T-2 Increase Zero Emission Vehicle Charging Infrastructure	**12,000**	**30,000**
T-2.1 Public Light-Duty Zero-Emission Vehicle Charging Infrastructure Program	8,000	20,000
T-2.2 Zero-Emission Medium and Heavy-Duty Vehicle Charging Infrastructure Program	4,000	10,000
T-3 Expand Active Transportation Opportutnities	**34,000**	**182,000**
T-3.1 Active Transportation Program	34,000	182,000
T-4 Increase Use of Public Transit	**82,300**	**251,300**
T-4.1 Transit Incentive Programs	11,000	11,000
T-4.2 Bus Rapid Transit Projects	71,000	240,000
T-4.3 Flexible Fleets Program	300	300
T-5 Improve Transportation System Efficiency	**2,000**	**10,000**
T-5.1 Freight Signal Prioritization Project	2,000	10,000
B-2 Electrify Buildings	**44,000**	**171,000**
B-2.1 Municipal Building Electrification Program	13,000	49,000
B-2.2 Residential Building Electrification Program	31,000	122,000
CE-1 Increase Solar and Energy Storage	**67,000**	**215,000**
CE-1.2 Solar and Storage on Residential Buildings	67,000	215,000
W. 1 Improve Water and Wastewater System Efficiency	**15,000**	**77,000**
W-1.1 Wastewater and Energy Recovery Project	15,000	77,000
Total	**563,300**	**1,777,300**

*This table includes only measures, programs, and projects with estimated GHG reductions.

2 COMMON ASSUMPTIONS

This section provides a summary of methods used for more than one PCAP measure, including electric emissions rates, vehicle emission rates, and consideration of useful life. Further discussion of specific methods used to estimate GHG impacts is provided in the sections below.

2.1 Electric Emission Rates

For measures related to electricity, a key input in the analysis is the GHG emission rate of electric supply. For most of the electricity-related programs and projects s in the PCAP, we calculated GHG impacts annual average emission rates (AAER), which represent the total emissions divided by the total associated electricity. Table 3 shows the amount of electricity sales in 2021 and the annual GHG emissions intensity for retail electricity suppliers in the San Diego region.[2] The average weighted by retail sales is 472 lbs. CO_2e/MWh.

Table 3 GHG Emission Intensity for Retail Electricity Suppliers in the San Diego Region

Retail Suppliers	2021 Retail Sales (MWh)	2021 Annual Greenhouse Gas Emissions Intensity (lbs CO2e/MWh)
Clean Energy Alliance - Clean Impact Plus	419,723	238
Clean Energy Alliance - Clean Impact	5,723	472
Clean Energy Alliance - Green Impact	3,376	0
San Diego Community Power - PowerOn	1,918,834	378
San Diego Community Power - Power100	129,043	0
San Diego Gas & Electric Company	11,298,590	504
San Diego Gas & Electric Company - EcoChoice	43,107	0

This value is associated with a certain percentage of renewable supply. We assume that the ratio of GHG emissions intensity and percentage renewable remains constant as suppliers reach the statutory goal of 60% renewable electric supply by 2030 and 100% zero carbon by 2045. Table 4 shows data for the year 2021 (year of the most recent Power Source Disclosure data)[3], 2030 (interim year of renewable electricity content requirements), and 2045 (final year of requirements). For the analysis conducted for the PCAP, we interpolated between these values to get annual average emissions intensity rates.

Table 4 Forecast of Renewable/Zero Carbon Content and Annual Average Emission Rates

[2] Note that energy service providers that sell to customer under direct access are not listed here. Data is not available on the specific companies supplying customers or the amount supplied to customers in the San Diego region.
[3] California Energy Commission (CEC): Annual Power Content Labels for 2021. https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label/annual-power-1

Year	Renewable/ Zero Carbon Content	Annual Average Emissions Intensity (lbs CO2e/MWh)
2021	45%	472
2030	60%	340
2045	100%	-

2.1.1 Hourly Short-Run Marginal Emission Rates

There is one program related to solar and energy storage for which AAER were not sufficient to estimate GHG impacts. For this, we used hourly short-run marginal emission rates (SRMER) generated from the CPUC Avoided Cost Calculator[4] through 2050. Hourly SRMER assume only limited changes to the grid due to policy and other changes like additional electricity demand from electric vehicles and heat pumps for heating water and space heating and cooling. As a result, they are accurate in the short-term but can overestimate the level of emissions from the grid over time.

2.2 Vehicle Emission Rates

California Air Resources Board (CARB) EMFAC Model was used to derive vehicle miles driven per year, fuel/electricity use per vehicle, and emissions per vehicle mile (grams CO_2e/mile) of relevant vehicle classes to estimate GHG impacts for several PCAP programs and projects.[5] EMFAC is developed and used by CARB to assess emissions from on-road vehicles including cars, trucks, and buses in California, and to support CARB's regulatory and air quality planning efforts. US EPA approves EMFAC for use in State Implementation Plan and transportation conformity analyses. Table 5 provides an example of the emissions rates by vehicle class from the EMFAC model. Rates shown represent an average of all vehicle types across all vehicle model years within each vehicle class.

Table 5 Emission Rates by Vehicle Class in the San Diego Region (grams CO_2e/mile)[6]

Year	LDA	LDT	MDV	HDV	UBUS	SBUS
2030	266	329	397	1,353	884	1,045
2035	250	306	371	1,305	866	1,001
2040	243	293	357	1,274	842	971
2045	239	285	350	1,254	842	946
2050	239	282	347	1,239	842	924

[4] 2021 CPUC Avoided Cost Calculator. Available at https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/idsm.

[5] California Air Resources Board, EMFAC Model. The most recent version is EMFAC2021 v1.0.2. Available at https://ww2.arb.ca.gov/our-work/programs/msei/on-road-emfac

[6] LDA is passenger cars, LDT is light-duty trucks, MDV is medium-duty vehicles, HDV is heavy-duty vehicles, UBUS is urban buses, and SBUS is school bus. The emission rates are specific to San Diego Region's vehicle mix based EMFAC2021 v1.0.2.

2.3 Useful Life and Replacement

GHG reduction estimates assume implementation activity occurs between 2025 and 2029. Reductions are assumed to occur during the useful life of the activity and no replacement is considered. For example, if the useful life of an electric vehicle is 10 years, reductions would be estimated for the 10 years a vehicle is assumed to be operational. In this case, the first vehicle would be put into operation in 2025 (and remain operational through 2034) and the last vehicle, put in operation in 2029, would still be operational in 2038. In this way, this measure would have GHG reductions from 2025 through 2038, a total of 13 years. Further, we do not assume that the vehicle would be replaced and continue to reduce emissions beyond this point. So, in this example, no emissions reductions for 2039-2050 would be included in the estimates presented here.

There are measures with longer useful lives, including bike lanes and solar that would continue to reduce emissions through the 2050 timeframe. For example, a rooftop solar system installed in 2025, would continue to be operational through 2049. And those installed in 2026 and beyond would continue to operate and reduce emissions through the 2050 timeframe. Emissions for these projects would be included in the cumulative GHG reduction estimate for 2025-2050.

3 TRANSPORTATION

The transportation section of the PCAP includes five measures.

- T.1. Increase Adoption of Zero-Emission Vehicles
- T.2. Increase Zero-Emission Vehicle Charging Infrastructure
- T.3 Expand Active Transportation Opportunities
- T.4. Increase Use of Public Transit
- T.5 Improve Transportation System Efficiency

3.1 T-1 Increase Adoption of Zero-Emission Vehicles

Measure T-1 comprises four programs and projects:

- T.1.1 Zero Emission Light-Duty Vehicle Incentive Program
- T-1.2 Zero Emission Medium and Heavy-Duty Vehicle Incentive Program
- T-1.4 Zero Emission Vehicles in Municipal Fleets
- T-1.5 Zero Emission Rail

The following sections summarize the methods used to estimate GHG reductions for these programs or projects.

3.1.1 Zero-Emission Light-Duty Vehicle Incentive Program

GHG reductions from the Zero-Emission Light-Duty Vehicle Incentive Program are estimated using the net impact of a reduction in fossil fuel usage and an increase in electricity use to charge electric vehicles. Emissions impacts are calculated using electricity emissions rates and carbon content of fossil fuels. Table 6 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 6 Methodology Summary for Light-Duty Zero Emission Vehicles

Models/Tools Used	We used one model to generate inputs for a custom calculation using standard methods for GHG quantification.[7] The California Air Resources Board EMFAC2021 v1.0.2 Model was used to derive emissions per vehicle (grams CO_2e/mile) of relevant vehicle classes.[8]
Measure Implementation Assumptions	The estimates presented here assume that vehicle purchases would occur equally over a five-year implementation period from 2025 to 2029.
GHG Reduction Estimate Assumptions	Key assumptions include: electric vehicles have a 10-year useful life;[9] and to estimate emissions from electricity use, a weighted average electric emission rate using reported emissions from all retail suppliers in the San Diego region,[10] which includes calculated values for years with reported data and an

[7] GHG quantification is based on methods summarized in the Regional Climate Action Planning Framework. Technical Appendices. See San Diego Association of Governments. Regional Climate Action Planning Framework -- TECHNICAL APPENDIX II Methods to Calculate GHG Emissions Impacts of CAP Measures, VERSION 1.1. NOVEMBER 2020. Available at https://www.sandag.org/-/media/SANDAG/Documents/ZIP/projects-and-programs/recap-and-technical-appendices.zip

[8] California Air Resources Board, EMFAC2021 v1.0.2 Model. Available at https://ww2.arb.ca.gov/our-work/programs/msei/on-road-emfac

[9] Smith, K., Earleywine, M., Wood, E., Neubauer, J., & Pesaran, A. (2012). Comparison of Plug-In Hybrid Electric Vehicle Battery Life Across Geographies and Drive Cycles. National Renewable Energy Laboratory.

[10] California Energy Commission. Power Source Disclosure Program Power Content Label. Available at https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label.

	interpolation between statutory targets of 60% renewable electricity by 2030 and 100% carbon-free electricity in 2045.
Reference Case Scenario	The reference case is a typical light-duty passenger vehicle using fossil fuels. Emissions for a reference vehicle are derived using the CARB EMFAC model.
Measure Specific Activity Data	Assumed levels of vehicle purchases were derived from project data for San Diego County from the California Clean Vehicle Rebate Program.[11] During program years 2021-2023 an average of 5,000 incentives were provided each year. We assume this same level of participation would occur between 2025 and 2029.
2025-2030 Cumulative GHG Emissions Reduced	238,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	615,000 MT CO_2e

3.1.2 Zero Emission Medium- and Heavy-Duty Vehicle Incentive Program

GHG reductions from the Zero Emission Medium and Heavy-Duty Vehicle Incentive Program are estimated using the net impact of a reduction in fossil fuel usage and an increase in electricity use to charge electric vehicles. Emissions impacts are calculated using electricity emissions rate and carbon content of fossil fuels. Table 7 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 7 Methodology Summary for Medium- and Heavy-Duty Zero Emission Vehicles

Models/Tools Used	Same as LDV above.
Measure Implementation Assumptions	Same as LDV above.
GHG Reduction Estimate Assumptions	Same as LDV above.
Reference Case Scenario	Same as LDV above.
Measure Specific Activity Data	Assumed levels of vehicle purchases were derived from project data for San Diego County from the California Hybrid and Zero-emission Truck and Bus Voucher Incentive Project (HVIP).[12] During program years 2021-2023 an average of 100 incentives were provided. We assume 100 incentives per year would occur between 2025 and 2029.
2025-2030 Cumulative GHG Emissions Reduced	29,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	75,000 MT CO_2e

3.1.3 Zero Emission Vehicles in Municipal Fleets

GHG reductions from the Zero Emission Vehicles in Municipal Fleets Program are estimated using the net impact of a reduction in fossil fuel usage and an increase in electricity use to charge electric vehicles.

[11] California Clean Vehicle Rebate Program website. Available at https://cleanvehiclerebate.org/en
[12] California Hybrid and Zero-emission Truck and Bus Voucher Incentive Project (HVIP). Available at https://californiahvip.org/

Emissions impacts are calculated using electricity emissions rate and carbon content of fossil fuels. Table 8 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 8 Methodology Summary for Zero Emission Vehicles in Municipal Fleets

Models/Tools Used	Same as LDV above.
Measure Implementation Assumptions	Same as LDV above.
GHG Reduction Estimate Assumptions	Same as LDV above.
Reference Case Scenario	Same as LDV above.
Measure Specific Activity Data	Assumed levels of vehicle purchases were derived from project data provided by local jurisdictions and other public agencies in the San Diego region. The total number of vehicles provided is 2,062 LDV and 50 MDV. We assume a total of 2,500 vehicle purchases between 2025 and 2029 and assumed these would match the vehicle types and numbers reported.
2025-2030 Cumulative GHG Emissions Reduced	29,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	75,000 MT CO_2e

3.1.4 Zero-Emission Rail

GHG emissions reduction from electrifying North County Transit District's (NCTD) light rail SPRINTER line is estimated based on (1) the ultra-low-sulfur diesel (ULSD) avoided by switching to zero-emission multiple units (ZEMU), and (2) the ULSD emission factor. Table 9 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 9 Methodology Summary for Zero Emission Rail

Models/Tools Used	Data from the Argonne National Laboratory Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) 2022 was used to derive emission factors for ULSD.[13] These served as inputs to a custom calculation using the general method described above and NCTD's actual fuel use data.
Measure Implementation Assumptions	It is assumed that one ZEMU would be operational in 2027 and another ZEMU would be in 2028 (two total).
GHG Reduction Estimate Assumptions	Key assumptions include: ULSD savings were the diesel fuel used per year per vehicle replaced by a zero emissions vehicle; the fuel savings value (in gallons per year) was then multiplied by the following factors to get a value for GHG savings (in MT of CO_2e/year): 78,966 g/MMBtu and 0.129 MMBtu/gallon ULSD both from the GREET1 2022 Model;[14] 156,214 gallons of ULSD saved per year per ZEMU based on analysis of NCTD actual fuel use data; and GHG

[13] https://www.energy.gov/eere/greet
[14] Argonne National Laboratory. The Greenhouse gases, Regulated Emissions, and Energy use in Technologies Model. Available at https://greet.anl.gov/

	reductions will occur from 2027 (when the first ZEMU enters into operation) through 2050.
Reference Case Scenario	The reference scenario is the business-as-usual diesel use from traditional vehicles; no ZEMU in operation.
Measure Specific Activity Data	300,000 gallons of ULSD avoided per year from 2 ZEMUs. NCTD determined that this is the level of activity for this project that is feasible during the 2025-2029 implementation period.
2025-2030 Cumulative GHG Emissions Reduced	11,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	75,000 MT CO_2e

3.2 T-2 Increase Zero Emission Vehicle Charging and Fueling Infrastructure

Measure T-2 comprises two programs:

- T-2.1 Public Light-Duty Zero-Emission Vehicle Charging Infrastructure Program
- T-2.2 Zero-Emission Medium and Heavy-Duty Vehicle Charging Infrastructure Program

The following sections summarize the methods used to estimate GHG reductions for these programs.

3.2.1 Public Light-Duty Zero-Emission Vehicle Charging Infrastructure Program

The overall approach to estimate GHG reduction associated with the installation of public light-duty electric vehicle chargers is to determine the VMT shift from gasoline to electricity per plug-in hybrid vehicle (PHEV) because of increased EV charging stations. Calculations followed the standard methods from the 2019 Final Sustainable Communities Strategy (SCS) Program and Evaluation Guidelines[15] and the Handbook for Analyzing GHG Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.[16] Table 10 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 10 Methodology Summary for Public Light-Duty Zero-Emission Vehicle Chargers

Models/Tools Used	Several models were used to generate outputs for a customer calculating using standard calculation methods. California Air Resources Board EMFAC2021 v1.0.2 Model was used to derive the projected precent of PHEV miles in electric mode, VMTs per year, and the fuel and electricity consumption per PHEV.[17] NREL/CEC EVI Pro lite was used to evaluate the number of chargers and chargers per vehicle in the San Diego region.[18]

[15] California Air Resources Board (CARB). (2019, November). Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendices. Retrieved from https://ww2.arb.ca.gov/resources/documents/scs-evaluation-resources.
[16] California Air Pollution Control Officers Association. (n.d.). Handbook for Analyzing GHG Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Retrieved from https://www.caleemod.com/documents/handbook/ch_1/handbook_front.pdf.
[17] California Air Resources Board, EMFAC2021 v1.0.2 Model. Available at https://ww2.arb.ca.gov/our-work/programs/msei/on-road-emfac
[18] National Renewable Energy Laboratory and California Energy Commission. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Available at https://afdc.energy.gov/evi-pro-lite

Measure Implementation Assumptions	The estimates presented here assume that the installation of EV charging stations would occur equally over a five-year implementation period from 2025 to 2029.
GHG Reduction Estimate Assumptions	Key assumptions include: 80% of PHEV miles in electric mode with the measure[19]; annual GHG reductions are based on the equivalent of 2 vehicles per year per charger;[20] analysis is based on emissions from light-duty PHEVs; 10-year useful life of an electric vehicle;[21] and emissions from electricity were estimated using a weighted average electric emission rate using reported emissions from all retail suppliers in the San Diego region,[22] which includes calculated values for years with reported data and an interpolation between statutory targets of 60% renewable electricity by 2030 and 100% carbon-free electricity in 2045.
Reference Case Scenario	The reference case scenario is the projected emission of PHEVs before the measure of increased EV chargers (about 50% eVMT). Emissions for the reference vehicle were derived using data from the CARB EMFAC 2021 v1.0.2 model.
Measure Specific Activity Data	We assumed installation of 1,000 chargers during the implementation period 2025 to 2029.
2025-2030 Cumulative GHG Emissions Reduced	8,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	20,000 MT CO_2e

3.2.2 Medium and Heavy-Duty Electric Vehicle Charging Infrastructure Program

The overall approach to estimate GHG reduction associated with the installation of medium- and heavy-duty electric vehicle chargers is to determine the VMT shift from gasoline to electricity per plug-in hybrid vehicle (PHEV) because of increased EV charging stations. Calculations followed the standard methods from the 2019 Final Sustainable Communities Strategy (SCS) Program and Evaluation Guidelines[23] and the Handbook for Analyzing GHG Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.[24] Table 11 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 11 Methodology Summary for Medium- and Heavy-Duty Electric Vehicle Chargers

Models/Tools Used	Same as LDV above.

[19] Smith, K., Earleywine, M., Wood, E., Neubauer, J., & Pesaran, A. (2012). Comparison of Plug-In Hybrid Electric Vehicle Battery Life Across Geographies and Drive Cycles. National Renewable Energy Laboratory.
[20] National Renewable Energy Laboratory and California Energy Commission. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Available at https://afdc.energy.gov/evi-pro-lite
[21] Smith, K., Earleywine, M., Wood, E., Neubauer, J., & Pesaran, A. (2012). Comparison of Plug-In Hybrid Electric Vehicle Battery Life Across Geographies and Drive Cycles. National Renewable Energy Laboratory.
[22] California Energy Commission. Power Source Disclosure Program Power Content Label. Available at https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label.
[23] California Air Resources Board (CARB). (2019, November). Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendices. Retrieved from https://ww2.arb.ca.gov/resources/documents/scs-evaluation-resources.
[24] California Air Pollution Control Officers Association. (n.d.). Handbook for Analyzing GHG Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Retrieved from https://www.caleemod.com/documents/handbook/ch_1/handbook_front.pdf.

Measure Implementation Assumptions	Same as LDV above.
GHG Reduction Estimate Assumptions	Key assumptions include: 80% of PHEV miles in electric mode with the measure;[25] annual GHG reductions are based on the equivalent of 2 vehicles per year per charger;[26] analysis is based on emissions from medium-duty PHEVs, other medium- and heady-duty vehicles can be considered in future analysis; 10-year useful life of an electric vehicle;[27] and emissions from electricity were estimated using a weighted average electric emission rate using reported emissions from all retail suppliers in the San Diego region,[28] which includes calculated values for years with reported data and an interpolation between statutory targets of 60% renewable electricity by 2030 and 100% carbon-free electricity in 2045.
Reference Case Scenario	Same as LDV above.
Measure Specific Activity Data	We assumed installation of 500 chargers during the implementation period 2025 to 2029.
2025-2030 Cumulative GHG Emissions Reduced	4,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	8,000 MT CO_2e

3.3 T-3 Expand Active Transportation Opportunities

Measure T-3 comprises one program: T-3.1 Active Transportation Program. The following sections summarize the methods used to estimate GHG reductions for this program.

3.3.1 Active Transportation Program

GHG emissions reductions from active transportation program are estimated based on annual VMT reduction from changes in transportation mode share due to additional bike lanes and annual average vehicle emission rate. Table 12 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 12 Methodology Summary for Active Transportation Program

Models/Tools Used	Several models were used to generate inputs for a custom calculation using method described above, including CARB California Climate Investments Benefits Calculator Tools and Quantification Methodology, Active Transportation (December 15, 2022)[29] and SANDAG Transportation Forecast

[25] Smith, K., Earleywine, M., Wood, E., Neubauer, J., & Pesaran, A. (2012). Comparison of Plug-In Hybrid Electric Vehicle Battery Life Across Geographies and Drive Cycles. National Renewable Energy Laboratory.
[26] National Renewable Energy Laboratory and California Energy Commission. Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Available at https://afdc.energy.gov/evi-pro-lite
[27] Smith, K., Earleywine, M., Wood, E., Neubauer, J., & Pesaran, A. (2012). Comparison of Plug-In Hybrid Electric Vehicle Battery Life Across Geographies and Drive Cycles. National Renewable Energy Laboratory.
[28] California Energy Commission. Power Source Disclosure Program Power Content Label. Available at https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label.
[29] CARB California Climate Investments Benefits Calculator Tools and Quantification Methodology, Active Transportation. Available at https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/sgc_ahsc_userguide_121522.pdf

	Information (ABM2+/2021 RP, Year 2025)[30] to determine VMT impact; and CARB EMFAC2021 v1.0.2[31] to determine vehicle emissions rates.
Measure Implementation Assumptions	Local jurisdictions and other public agencies have identified the new bicycle facilities that are ready for implementation in the 2025 to 2029 implementation period and are assumed to be constructed and operational by 2027.
GHG Reduction Estimate Assumptions	Key assumptions include: Annual VMT reduction: (1) new facility type (i.e., Class I bike path, Class II bike lane, and Class IV separated bikeway); (2) location of the facility (North San Diego County Coastal, San Diego South Bay, San Diego Urban Core); (3) first year facility will be open to user; (4) mileage of facility; (5) average daily traffic on road parallel to facility; (6) number of key destinations within 0.25 mile of facility; and (7) number of key destination within 0.5 mile of facility). Annual average vehicle emission rate is estimated based on (1) VMT distribution of light-duty vehicle by vehicle category and (2) emission rate of each light-duty vehicle category. GHG reductions will occur from 2027 (when the bicycle facilities are constructed and operational) through 2050 based on useful life. As the vehicle fleet gets cleaner (due to higher vehicle fuel efficiency and high penetration of ZEVs), the GHG reduction from miles avoided decreases.
Reference Case Scenario	No new bicycle facilities; trips are made by an average light-duty vehicle.
Measure Specific Activity Data	As noted above, local jurisdictions and public agencies have identified 77 miles of new bicycle facilities throughout the San Diego region.
2025-2030 Cumulative GHG Emissions Reduced	34,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	182,000 MT CO_2e

3.4 T-4 Increase Use of Public Transit

Measure T-4 comprises three programs:

- T-4.1 Transit Incentive Programs
- T-4.2 Bus Rapid Transit Projects
- T-4.3 Flexible Fleets Program

The following sections summarize the methods used to estimate GHG reductions for these programs.

3.4.1 Transit Incentive Programs

Transit incentives includes two programs to promote use of public transit: Youth Opportunity Pass (YOP)[32] and Try Transit.[33]

[30] CARB EMFAC Model. Available https://experience.arcgis.com/experience/81b2daca1827470ca8beeb4708139f79/page/Main/
[31] https://arb.ca.gov/emfac/emissions-inventory/dd07a6ca4ed10aa7ada49fc3daf62ef502a3afc7
[32] SANDAG Youth Opportunity Pass Program. Available at https://www.sandag.org/projects-and-programs/regional-initiatives/transit-equity-pilot/youth-opportunity-pass
[33] SANDAG Try Transit. Available at https://www.sandag.org/projects-and-programs/regional-initiatives/sustainable-transportation-services/transit-services

3.4.1.1 Youth Opportunity Pass

GHG emissions reduction from extending the YOP pilot program is estimated based on annual VMT reduction from transit trips replacing passenger vehicle trips and the annual average vehicle emission rate. Table 13 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 13 Methodology Summary for Youth Opportunity Pass

Models/Tools Used	Two models were used to generate inputs for the custom calculation using the general method described above: SANDAG Activity Based Model (ABM2+) to determine the VMT impact of the transit use and CARB EMFAC2021 v1.0.2[34] for vehicle emission rates.
Measure Implementation Assumptions	This existing program is assumed to be extended and funded from 2025 through 2029 at the same level of funding (adjusted with an inflation escalator) as in previous years.
GHG Reduction Estimate Assumptions	Key assumptions include: GHG reductions will occur from 2025 (when program is extended) through 2029; no GHG reduction after 2029 (i.e., no program impact after 2029); as the vehicle fleet gets cleaner (due to higher vehicle fuel efficiency and higher penetration of ZEVs), the GHG reductions from miles avoided will decrease; annual VMT reduction is estimated based on current FY2023 pilot program annual VMT reduction with an adjustment factor of 1/3 to account for new trips that would not have been made with a vehicle without the program;[35] FY2023 annual VMT reduction is based on (1) the difference between FY2023 and FY2019 boardings (with and without the program) and (2) estimated average trip distance for K-12 school trip purposes; annual average vehicle emission rate is estimated based on (1) VMT distribution of light-duty vehicle by vehicle category and (2) emission rate of each light-duty vehicle category.
Reference Case Scenario	No YOP program; trips are made by an average light duty vehicle.
Measure Specific Activity Data	Participation and VMT impact assumptions are based on actual program data: 2 million additional annual trips including Metropolitan Transit System (MTS) and NCTD buses and light rail trips, and 7 million vehicle miles avoided
2025-2030 Cumulative GHG Emissions Reduced	11,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	11,000 MT CO_2e

3.4.1.2 Try Transit

GHG emissions reductions from restarting Try Transit pilot program are estimated based on annual VMT reduction due to change in transportation mode share and annual average vehicle emission rate. Table 14 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

[34] https://arb.ca.gov/emfac/emissions-inventory/dd07a6ca4ed10aa7ada49fc3daf62ef502a3afc7

[35] The adjustment factor from SANDAG's Youth Opportunity Pass Pilot Program is used as a proxy. SANDAG: Youth Opportunity Pass Pilot Program: Comprehensive Program Report (December 2023). https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/regional-initiatives/transit-equity-pilot/youth-opportunity-pass/yop-comprehensive-program-report.pdf

Table 14 Methodology Summary for Try Transit

Models/Tools Used	One model was used to generate inputs for the custom calculation using method described above: CARB EMFAC2021 v1.0.2[36] for vehicle emission rates.
Measure Implementation Assumptions	This existing pilot program is assumed to be restarted and funded from 2025 through 2029 at the same level of funding as the previous program.
GHG Reduction Estimate Assumptions	Key assumptions include: GHG reductions will occur from 2025 (when program restarts) through 2030; 36% of program impacts will carryover for one year based on program evaluation data;[37] no GHG reductions occur after 2030 (i.e., no program impact after one year); as the vehicle fleet gets cleaner (due to higher vehicle fuel efficiency and high penetration of ZEVs), GHG reductions from miles avoided will decrease; annual VMT reduction is estimated based on (1) current pilot program (FY 2022 Q3 – FY 2023 Q4) annual VMT reduction,[38] (2) an adjustment factor of 1/3 to account for new trips that would not have been made with a vehicle without the program (similar to the YOP program)[39], and (3) a one year carryover factor to account for pilot participants continuing using transit after the pilot;[40] annual average vehicle emission rate is estimated based on (1) VMT distribution of light-duty vehicle by vehicle category and (2) emission rate of each light-duty vehicle category.
Reference Case Scenario	No Try Transit pilot program; trips are made by an average light duty vehicle.
Measure Specific Activity Data	Participation and VMT impact assumptions are based on actual program data: 338 participants per year on average, 222 Pronto Card (transit card) activated per year, and 90,000 vehicle miles avoided (not including adjustment factor).[41]
2025-2030 Cumulative GHG Emissions Reduced	120 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	120 MT CO_2e

3.4.2 Bus Rapid Transit Projects

GHG emissions reductions from implementing three new bus rapid transit (BRT) routes are estimated based on (1) emissions reduction from passenger vehicle miles avoided due to changes in mode share, and (2)

[36] California Air Resources Board, EMFAC Model. Available https://experience.arcgis.com/experience/81b2daca1827470ca8beeb4708139f79/page/Main/
[37] SANDAG. Try Transit Program: Summary Report Quarter 3 Fiscal Year 2022 – Quarter 4 Fiscal Year 2023.
[38] SANDAG: Try Transit Program: Summary Report, Quarter 3 Fiscal Year 2022 - Quarter 4 Fiscal Year 2023.
[39] The adjustment factor from SANDAG's Youth Opportunity Pass Pilot Program is used as a proxy. SANDAG: Youth Opportunity Pass Pilot Program: Comprehensive Program Report (December 2023). https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/regional-initiatives/transit-equity-pilot/youth-opportunity-pass/yop-comprehensive-program-report.pdf
[40] SANDAG: Try Transit Program: Summary Report, Quarter 3 Fiscal Year 2022 - Quarter 4 Fiscal Year 2023.
[41] *Ibid*.

emissions added due to new transit buses. Table 15 summarizes key aspects of the methodology used to estimate the GHG reductions from these projects.

Table 15 Methodology Summary for Bus Rapid Transit Projects

Models/Tools Used	Three models were used to generate inputs for a custom calculation using the general method described above: CARB Benefits Calculator Tool for the Transit and Intercity Rail Capital Program (October 18, 2019)[42] to estimate GHG impacts; SANDAG Activity Based Model (ABM2+) to estimate VMT impacts;[43] and CARB EMFAC2021 v1.0.2 for vehicle emission rates.[44]
Measure Implementation Assumptions	The new BRT routes analyzed here have already been identified by SANDAG and are assumed to be operational by 2027.
GHG Reduction Estimate Assumptions	Key assumptions include: GHG reductions will occur from 2027 (when BRT services are operational) and continue through 2041, based on the useful life of a transit bus; as the vehicle fleet gets cleaner (i.e., due to higher vehicle fuel efficiency and higher penetration of ZEVs), the GHG reduction from miles avoided will decrease; annual VMT avoided from passenger vehicle miles and added due to new transit buses is estimated based on (1) year 1 (2027) and year final (2041) annual ridership of the three routes and (2) length of average trip of the three routes; annual average passenger vehicle emission rates are estimated based on (1) VMT distribution of light-duty vehicle by vehicle category and (2) emission rate of each light-duty vehicle category; and annual transit bus emission rates are based on a model year 2027 transit bus during the useful life of the bus (15 years or 2027-2041).
Reference Case Scenario	No new BRT routes; trips are made by an average light duty vehicle.
Measure Specific Activity Data	SANDAG provided the following activity data based on output from their ABM: 7.9 million annual ridership (three routes), 9.2 million per year final annual ridership (three routes), and 2.7 million service miles (three routes).
2025-2030 Cumulative GHG Emissions Reduced	71,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	240,000 MT CO_2e

3.4.3 Flexible Fleets Program

GHG emissions reduction from extending four existing pilot flexible fleet routes or adding new similar routes similar is estimated based on annual passenger VMT reduction and annual average vehicle emission rate. Table 16 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 16 Methodology Summary for Flexible Fleets Program

Models/Tools Used	Two models were used to generate inputs for this custom calculation using the general method described above: CARB California Climate Investments

[42] https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/calsta_tircp_finalqm_cycle4.pdf
[43] https://www.sandag.org/data-and-research/transportation-modeling
[44] https://arb.ca.gov/emfac/emissions-inventory/dd07a6ca4ed10aa7ada49fc3daf62ef502a3afc7

	Benefits Calculator Tools and Quantification Methodology, Shared Mobility – Innovative Transit (December 15, 2022)[45] to estimate GHG impacts and CARB EMFAC2021 v1.0.2 for vehicle emission rates.[46]
Measure Implementation Assumptions	The existing pilot programs will be extended or a new similar programs will be funded from 2025 through 2029, at the same level of funding as the previous program.
GHG Reduction Estimate Assumptions	Key assumptions include: GHG reductions will occur from 2025 (i.e., when program is extended) through 2029; no GHG reduction after 2029 (i.e., no program impact after 2029); annual passenger VMT reductions are estimated based on (1) current pilot programs' average monthly trips, ridership, and VMT; annual average vehicle emission rates are estimated based on (1) VMT distribution of light-duty vehicle by vehicle category and (2) emission rate of each light-duty vehicle category; and, as vehicles fleet gets cleaner (i.e., due to higher vehicle fuel efficiency and high penetration of ZEVs), the GHG reduction from miles avoided will decrease.
Reference Case Scenario	No on-demand shared mobility services; trips are made by the average light duty vehicle.
Measure Specific Activity Data	Ridership and VMT impact data is based on existing program data provided by SANDAG and other similar programs operational in the San Diego region: 11,000 average monthly ridership (four routes), 210,000 passenger miles avoided (four routes).
2025-2030 Cumulative GHG Emissions Reduced	300 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	300 MT CO_2e

3.5 T-5 Improve Transportation System Efficiency

Measure T-5 comprises one program: T-5.1 Freight Signal Prioritization Project. The following sections summarize the methods used to estimate GHG reductions for this program.

3.5.1 Freight Signal Prioritization Project

GHG emissions reduction from implementing the Harbor Drive Freight Signal Prioritization (FSP) is estimated based on (1) annual moving and idling emissions from heavy-duty trucks serving the Port of San Diego's marine cargo terminals,[47] and (2) average moving and idling emissions reduction from the FSP field testing.[48] Table 17 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

[45] https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/sgc_ahsc_userguide_121522.pdf
[46] https://arb.ca.gov/emfac/emissions-inventory/dd07a6ca4ed10aa7ada49fc3daf62ef502a3afc7
[47] Port of San Diego Maritime Clean Air Strategy (October 2021)
https://pantheonstorage.blob.core.windows.net/environment/20211214-Final-MCAS.pdf
[48] https://www.ite.org/ITEORG/assets/File/Awards/2022/TSMO_MORE_STC%20Traffic_stripped.pdf

Table 17 Methodology Summary Freight Signal Prioritization Project

Models/Tools Used	One model is used to generate inputs for a custom calculation using the general method described above: CARB EMFAC2021 v1.0.2 for vehicle emission rates.[49] In addition, results from field tests are used to estimate emissions impacts.
Measure Implementation Assumptions	The projects are assumed to be operational by 2027.
GHG Reduction Estimate Assumptions	Key assumptions include: GHG reductions will occur from 2027 through 2045, assuming all trucks will be zero emission trucks on and after 2045 due to California's Advanced Clean Trucks requirement; the SANDAG Advancing Border (US – Mexico border) Connectivity Project is under design, so the emissions reduction from the Harbor Drive FSP is used as a conservative proxy.
Reference Case Scenario	No FSP projects; heavy-duty truck trips are made without signal prioritization.
Measure Specific Activity Data	Assumed activity levels for this measure is based on the following data on the Harbor Drive FSP provided by SANDAG: average travel time decreased by 9.5%; average stops decreased by 21.7%; and average speed increased by 13.9%
2025-2030 Cumulative GHG Emissions Reduced	2,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	10,000 MT CO_2e

[49] https://arb.ca.gov/emfac/emissions-inventory/dd07a6ca4ed10aa7ada49fc3daf62ef502a3afc7

4 BUILDING ENERGY USE

The building energy section of the PCAP includes one measure: B.2 Electrify Buildings.

4.1 B-2 Electrify Buildings

Measure B-2 comprises two programs:

- B-2.1 Municipal Building Electrification Program
- B-2.2 Residential Building Electrification Program

The following sections summarize the methods used to estimate GHG reductions for these programs.

4.1.1 Municipal Building Electrification Program

GHG reductions from Municipal Building Electrification projects is estimated using the energy impacts of switching from natural gas water heaters, natural gas space heating, traditional electric space cooling technology to heat pump technologies. GHG estimates are estimated using changes in energy use, electricity emissions rates, and carbon content of natural gas. Table 18 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 18 Methodology Summary for Municipal Building Electrification

Models/Tools Used	No models or tools were used. Custom calculations using standard methods for GHG quantification were used.[50]
Measure Implementation Assumptions	The estimates presented here assume that the total number of heat pump equipment installations and associated energy reductions would occur equally over a five-year implementation period from 2025 to 2029. Equipment to be replaced with heat pump technologies includes traditional water heaters, boilers, space heating and cooling equipment.
GHG Reduction Estimate Assumptions	Key general assumptions include: a 15-year useful life for heat pump technologies based on information from the California electronic Technical Reference Manual (eTRM);[51] three quarters of the local jurisdictions receive service from a 100% renewable/carbon free service option; the other quarter receive service at the weighted average electric emission rate using reported emissions from all retail suppliers in the San Diego region,[52] which includes calculated values for years with reported data and an interpolation to statutory targets of 60% renewable electricity by 2030 and 100% carbon-free electricity in 2045; as a consequence of this only 25% of the electricity increase is assumed to cause an emissions increase; carbon content of methane is 0.0054 MT CO_2e/therm;[53] regional GHG reduction potential is based in part on detailed analysis the City of San Diego's energy services performance contract (ESPC) provider to assess decarbonization

[50] GHG quantification is based on methods summarized in the Regional Climate Action Planning Framework. Technical Appendices. See San Diego Association of Governments. Regional Climate Action Planning Framework -- TECHNICAL APPENDIX II Methods to Calculate GHG Emissions Impacts of CAP Measures, VERSION 1.1. NOVEMBER 2020. Available at https://www.sandag.org/-/media/SANDAG/Documents/ZIP/projects-and-programs/recap-and-technical-appendices.zip

[51] The California electronic Technical Reference Manual (eTRM)is available online at https://www.caltf.org/etrm-overview

[52] California Energy Commission. Power Source Disclosure Program Power Content Label. Available at https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label.

[53] The Climate Registry 2021 Default Emission Factors and Emissions Factors for Greenhouse Gas Inventories, U.S EPA April 2022.

	opportunities at a select group of City of San Diego buildings, representing 55 buildings, totaling approximately 497,650 square feet; baseline annual natural gas use was taken from monthly utility bill data for 46 of the 55 candidate sites; domestic water heating is assumed to be approximately 60% of the total annual gas load; swimming pools are assumed to have an estimated annual average natural gas use of 35,000 therms per year; to determine savings from electrification, an average gas heating efficiency of 78% was assumed for space and domestic water heating, as well as pool heating; an average annual coefficient of performance (COP) for new heat pumps was assumed to be 4.0; and, a conversion factor of 5.7 kWh/therm was used to estimate future electricity use post-electrification.
Reference Case Scenario	The reference scenario is the business-as-usual use of traditional technologies for water heaters, boilers, space heating and cooling equipment. As described above, the baseline consumption was derived using energy billing data.
Measure Specific Activity Data	The level of activity assumed for GHG reduction estimates are based on detailed analysis completed by the City of San Diego to implement their building electrification plan (assumptions described above). These projects are a mix of heat pump water heaters (HPWH), heat pump HVAC (HPHVAC), and pool heaters. This mix is assumed to be representative of project needs of other jurisdictions in the region based on additional data collected from local jurisdictions. The City of San Diego represents about 43% of the region's population. Results for the City of San Diego's analysis were extrapolated to the regional population.
2025-2030 Cumulative GHG Emissions Reduced	13,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	49,000 MT CO_2e

4.1.2 Residential Building Electrification Program

GHG reductions from Residential Building Electrification projects is estimated using the energy impacts of switching from natural gas water heaters, natural gas space heating, and traditional electric space cooling technology to heat pump technologies. GHG estimates are estimated using changes in energy use and electricity emissions rate and carbon content of natural gas. Table 19 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 19 Methodology Summary for Residential Building Electrification

Models/Tools Used	No models or tools are used. Custom calculations using standard methods for GHG quantification were used.[54]

[54] GHG quantification is based on methods summarized in the Regional Climate Action Planning Framework. Technical Appendices. See San Diego Association of Governments. Regional Climate Action Planning Framework -- TECHNICAL APPENDIX II Methods to Calculate GHG Emissions Impacts of CAP Measures, VERSION 1.1. NOVEMBER 2020. Available at https://www.sandag.org/-/media/SANDAG/Documents/ZIP/projects-and-programs/recap-and-technical-appendices.zip

Measure Implementation Assumptions	The estimates presented here assume that heat pump equipment installations and associated energy reductions would occur equally over a five-year implementation period from 2025 to 2029.
GHG Reduction Estimate Assumptions	Key assumptions include: a 15-year useful life for heat pump technology based on information from the California electronic Technical Reference Manual (eTRM);[55] an annual electricity increase of 1,507 kWh and a natural gas reduction of 195 therms for HPWHs and 1,303 kWh and 220 therms for HPHVAC; all baseline water and space heating technologies were assumed to be fueled by natural gas;[56] emissions impacts of electricity were estimated using a weighted average electric emission rate using reported emissions from all retail suppliers in the San Diego region,[57] which includes calculated values for years with reported data and an interpolation to statutory targets of 60% renewable electricity by 2030 and 100% carbon-free electricity in 2045; carbon content of methane is 0.0054 MT CO_2e/therm.[58]
Reference Case Scenario	Reference case is business as usual, assuming energy consumption associated with existing equipment. For heat pump water heaters (HPWH) the baseline technology is natural gas and for heat pump HVAC (HPHVAC) the base line is natural gas for heating and electricity for cooling.
Measure Specific Activity Data	The level of activity is based on actual project Tech Clean California data for incentives provided in the San Diego region.[59] It is assumed that 150 HPWHs and 1,500 HPHVACs will be installed annually, for a total of 750 and 7,500, respectively, over the five-year implementation period of 2025-2029.
2025-2030 Cumulative GHG Emissions Reduced	31,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	122,000 MT CO_2e

[55] The California electronic Technical Reference Manual (eTRM)is available online at https://www.caltf.org/etrm-overview
[56] Based on project data from the Tech Clean California program. Data available at https://techcleanca.com/public-data/download-data/
[57] California Energy Commission. Power Source Disclosure Program Power Content Label. Available at https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label.
[58] The Climate Registry 2021 Default Emission Factors and Emissions Factors for Greenhouse Gas Inventories, U.S EPA April 2022.
[59] Based on project data from the Tech Clean California program. Data available at https://techcleanca.com/public-data/download-data/

5 INCREASE SUPPLY OF CLEAN ENERGY

The clean energy supply section of the PCAP includes one measure: CE.1 Increase Solar and Energy Storage.

5.1 CE-1 Increase Solar and Energy Storage

Measure CE-1 comprises one program: CE-1.1 Solar and Storage on Residential Buildings. The following sections summarize information on the methods used to estimate GHG reductions for this program.

5.1.1 Solar and Energy Storage on Residential Buildings

GHG reductions from solar and energy projects are estimated by (1) determining the amount of solar and battery energy used to serve building load, the amount solar and battery energy exported to the grid, and the amount energy imported from the grid, and (2) determining the emissions impacts using electric emissions rates. To account for different project configurations, we calculated emissions impacts two ways to create a range. For the solar only scenario, we used an annual average emission rate (AAER) to represent the low end of estimate. For the solar plus energy storage, we used hourly short run marginal emission rates (SRMER). Values reported here represent the midpoint of this range, this reflects a potential mix of 50% solar only and 50% solar plus storage projects. Table 20 summarizes key aspects of the methodology used to estimate the GHG reductions from this program.

Table 20 Methodology Summary for Residential Solar and Energy Storage

Models/Tools Used	Several tools were used to generate inputs for a custom calculation using generally accepted methods. Building energy load shapes were derived using the California Energy Commission's (CEC) California Building Energy Code Compliance (CBECC) model.[60] Hourly short-run marginal emission rates (SRMER) are from the CPUC Avoided Cost Calculator.[61] PV production estimates are from the CBECC model and validated using the National Renewable Energy Laboratory (NREL) PVWatts calculator.[62]
Measure Implementation Assumptions	The estimates presented here assume that solar and energy storage equipment installations and associated energy reductions would occur equally over a five-year implementation period from 2025 to 2029.
GHG Reduction Estimate Assumptions	Key assumptions include: PV performance declines by 1.4% per year[63] and batteries by 0.01% per cycle;[64] hourly building energy load shapes and hourly data on PV generation and battery behavior are used to determine import, export, and self-consumption of PV and battery energy; because GHG emissions impacts of energy storage are based on the differences in emission rates when charging and discharging, hourly analysis is used to estimate the emissions impact of adding energy storage to a PV project; GHG reduction estimates for the solar plus storage scenario are calculated using hourly short-run marginal emission rates (SRMER) from the CPUC Avoided Cost

[60] California Energy Commission. 2022 Energy Code Compliance Software. Available at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency-1.
[61] 2021 CPUC Avoided Cost Calculator. Available at https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/idsm.
[62] National Renewable Energy Laboratory PV Watts Calculator. Available at https://pvwatts.nrel.gov/
[63] PV degradation rate: NEM 2_Lookback_Study 2021, p. 63.
[64] Degradation rate provided by Unigrid battery company.

	Calculator - this represents the high end of the range;[65] a 25-year useful life for PV and 13-year-life for battery storage;[66] and, for the low end of the range, we use a weighted annual average electric emission rate using reported emissions from all retail suppliers in the San Diego region,[67] which includes calculated values for years with reported data and an interpolation to statutory targets of 60% renewable electricity by 2030 and 100% carbon-free electricity in 2045.
Reference Case Scenario	The reference scenario is business-as-usual energy consumption from the grid with no solar and energy storage. In the solar-only scenario, AAER is used to determine reference emissions (low end of range). For the solar-plus-energy storage scenario, SRMER is used (high end of range).
Measure Specific Activity Data	We assumed 1,000 projects per year with an average PV system size of 8 kW and average storage size of 10 kWh.
2025-2030 Cumulative GHG Emissions Reduced	67,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	215,000 MT CO_2e

[65] 2021 CPUC Avoided Cost Calculator. Available at https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/idsm.
[66] Verdant. (2021, January). Net-Energy Metering 2.0 Lookback Study. Retrieved from https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/net-energy-metering-nem/nemrevisit/nem-2_lookback_study.pdf.
[67] California Energy Commission. Power Source Disclosure Program Power Content Label. Available at https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label.

6 DECARBONIZE THE WATER SUPPLY

The Water section of the PCAP includes one measure: W-1 Improve Energy Efficiency of Water System.

6.1 W-1 Improve Water and Wastewater System Efficiency

Measure W-1 comprises one project: W-1.1 Wastewater and Energy Recovery Project. The following sections summarize information on the methods used to estimate GHG reductions for this project.

6.1.1 Wastewater and Energy Recovery Project

GHG emissions reduction from the East County Advanced Water Purification (AWP) project is estimated based on (1) the emissions associated with treating water locally to reduce imported water, and (2) the emissions reduction from using electricity and heat generated an on-site combined heat and power (CHP) plant instead of grid purchase. The CHP uses biogas generated at AWP's anaerobic digester.

Emissions associated with treating water locally is estimated based on (1) energy used to supply, treat, and distribute imported water to Southern California; (2) energy used to treat water beyond tertiary level to achieve potable water quality and to convey treated water to surface water reservoir; and (3) San Diego regional electricity emission factor in Table 4.

Emissions reduction associated with CHP plant is estimated based on (1) emissions avoided from diverting organic waste from the landfill, (2) emissions avoided from running the boiler, (3) emissions avoided from grid electricity purchase, and (4) emissions added due to CHP plant operation using biogas. Table 21 summarizes key aspects of the methodology used to estimate the GHG reductions from this project.

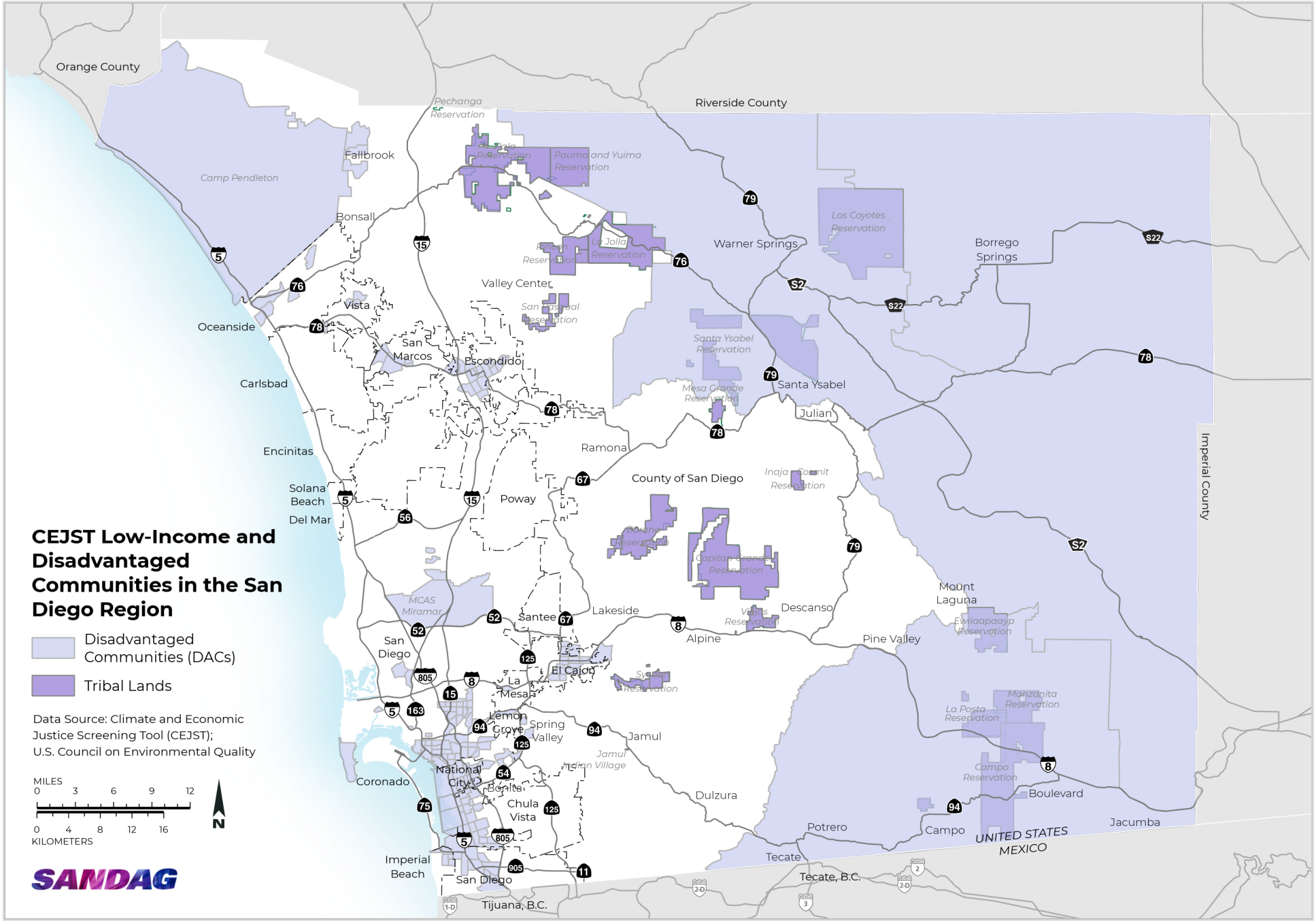
Table 21 Methodology Summary for Wastewater and Energy Recovery Project

Models/Tools Used	Custom calculation using facility and plant engineering and design specifications provided by facility staff.
Measure Implementation Assumptions	The advanced water treatment and CHP plant are both assumed to be constructed and operational by 2027.
GHG Reduction Estimate Assumptions	Key assumptions include: GHG reductions will occur from 2027 (when the facilities are constructed and operational) through 2050; and as the grid electricity get cleaner (due to California's Renewable Portfolio Standards), the GHG reduction from grid electricity avoided will decrease.
Reference Case Scenario (GHG Emissions/ Activity Level)	San Diego East County continues to receive imported water; and organic waste (food waste) continues to be disposed at landfills.
Measure Specific Activity Data	To estimate energy and GHG impacts of this project, we assume that 11.5 million gallons of potable water are produced per day (12,880 acre feet per year) and 75 wet short tons of food waste diverted from landfill to digester per day.
2025-2030 Cumulative GHG Emissions Reduced	15,000 MT CO_2e
2025-2050 Cumulative GHG Emissions Reduced	77,000 MT CO_2e

Appendix D: List and Map of Low-Income and Disadvantaged Census Tract in the San Diego Region

List of LIDAC Census Tract IDs							
6073001600	6073003301	6073005100	6073011602	6073013802	6073018700	6073020500	6073010103
6073002100	6073003303	6073005700	6073011700	6073013907	6073018903	6073020601	6073010107
6073002201	6073003304	6073006600	6073011801	6073014400	6073018904	6073020707	6073010300
6073002202	6073003305	6073008800	6073011802	6073014806	6073018906	6073020903	6073010501
6073002301	6073003403	6073009400	6073012002	6073015701	6073019501	6073021000	6073012003
6073002302	6073003404	6073009901	6073012101	6073015703	6073019502	6073021100	6073012303
6073002401	6073003501	6073010004	6073012102	6073015704	6073019805	6073021900	6073012402
6073002402	6073003502	6073010005	6073012200	6073015801	6073020018	6073022000	6073012800
6073002501	6073003601	6073010009	6073012302	6073015802	6073020028	6073002705	6073013102
6073002502	6073003602	6073010010	6073012401	6073015901	6073020029	6073002803	6073013104
6073002601	6073003603	6073010012	6073012501	6073016301	6073020108	6073003108	6073013306
6073002602	6073003800	6073010013	6073012502	6073016302	6073020202	6073003112	6073013307
6073002707	6073003901	6073010106	6073012600	6073016402	6073020206	6073003115	6073013308
6073002708	6073003902	6073010110	6073012700	6073016502	6073020207	6073003201	6073015301
6073002709	6073004000	6073010111	6073013000	6073016504	6073020209	6073003209	6073015902
6073002710	6073004501	6073010112	6073013103	6073018200	6073020210	6073003214	6073016503
6073002712	6073004700	6073010401	6073013203	6073018509	6073020211	6073008352	6073020309
6073003004	6073004800	6073010402	6073013204	6073018512	6073020213	6073008357	6073019206
6073003101	6073004900	6073010502	6073013205	6073018603	6073020214	6073008360	6073020602
6073003111	6073005000	6073011601	6073013206	6073018610	6073020308	6073008600	

Source: Climate and Economic Justice Screening Tool, U.S. Council on Environmental Quality


CEJST Low-Income and Disadvantaged Communities in the San Diego Region
Disadvantaged Communities (DACs)
Tribal Lands
Data Source: Climate and Economic Justice Screening Tool (CEJST); U.S. Council on Environmental Quality
MILES
0 3 6 9 12
0 4 8 12 16
KILOMETERS
N
SANDAG
Orange County
Riverside County
Imperial County
Camp Pendleton
Fallbrook
Bonsall
Vista
Oceanside
San Marcos
Escondido
Carlsbad
Encinitas
Solana Beach
Del Mar
Valley Center
Pechanga Reservation
Pauma and Yuima Reservation
La Jolla Reservation
San Pasqual Reservation
Santa Ysabel Reservation
Mesa Grande Reservation
Los Coyotes Reservation
Warner Springs
Borrego Springs
Santa Ysabel
Julian
Ramona
Poway
County of San Diego
Inaja Cosmit Reservation
Capitan Grande Reservation
Barona Reservation
Viejas Reservation
Mount Laguna
Descanso
Alpine
Pine Valley
Ewiiaapaayp Reservation
Manzanita Reservation
La Posta Reservation
Campo Reservation
Boulevard
Jacumba
Campo
Potrero
Dulzura
Jamul
Jamul Indian Village
Sycuan Reservation
Lakeside
Santee
El Cajon
La Mesa
Lemon Grove
Spring Valley
Chula Vista
National City
Coronado
Imperial Beach
San Diego
Tijuana, B.C.
Tecate
Tecate, B.C.
MCAS Miramar
UNITED STATES
MEXICO