

Contra Costa County

Greenhouse Gas Emissions Inventory

For the Unincorporated Community and County Government Operations

Inventory Year: 2023



Photo Credit: Adam Scarbrough

Prepared by Contra Costa County Department of
Conservation and Development

October 2025

Table of Contents

Acknowledgments.....	2
Executive Summary	3
Introduction.....	6
Purpose of Inventory	6
Emissions Reduction Targets	6
Community-Wide Inventory.....	7
General Methodology	7
Categories of Emissions Activities.....	7
Sectors Included for Informational Purposes.....	8
Community-Wide Inventory Summary	10
Emissions by Sector	14
Per-person GHG Emissions	33
County Operations Inventory	35
General Methodology	35
Categories of Emissions Activities.....	35
County Operations Inventory Summary.....	36
Emissions by Sector	39
Appendix	46
Protocols	46
Community-Wide Inventory Data Collection Methods.....	47
County Operations Inventory Data Collection Methods	52
References	54

ACKNOWLEDGMENTS

This report was prepared by Blake McPherson, Sustainability Fellow / Student Intern. This report was edited and reviewed by the Sustainability Team at the Dept. of Conservation and Development.

Special recognition and gratitude are expressed to the following individuals for their help with the data collection and project evaluation processes to make this report possible:

Contra Costa County

Jody London, Sustainability Coordinator
Samantha Harris, Transportation Planner
Brendan Havenar-Daughton, Public Works Energy Manager
Joe Yee, Public Works Deputy Director
Jamar Stamps, Principal Transportation Planner
Robert Sarmiento, Transportation Planner
David Brockbank, Conservation Programs Manager
Kristine Solseng, Principal Geographic Information Systems Planner
AiLi Pigott, Geographic Information Systems Intern
Chris Howard, Principal Geographic Information Systems Planner
Greg Spurlock, Deputy Agricultural Commissioner
Ricky Williams, Fleet Maintenance Manager
John Kopchik, Conservation and Development Director
Jason Crapo, Conservation and Development Deputy Director
Emily Groth, Sustainability Planner
Nicole Shimizu, Sustainability Planner
Demian Hardman-Saldana, Principal Sustainability Planner
Adam Scarbrough, Sustainability Planner

Other Agencies and Organizations

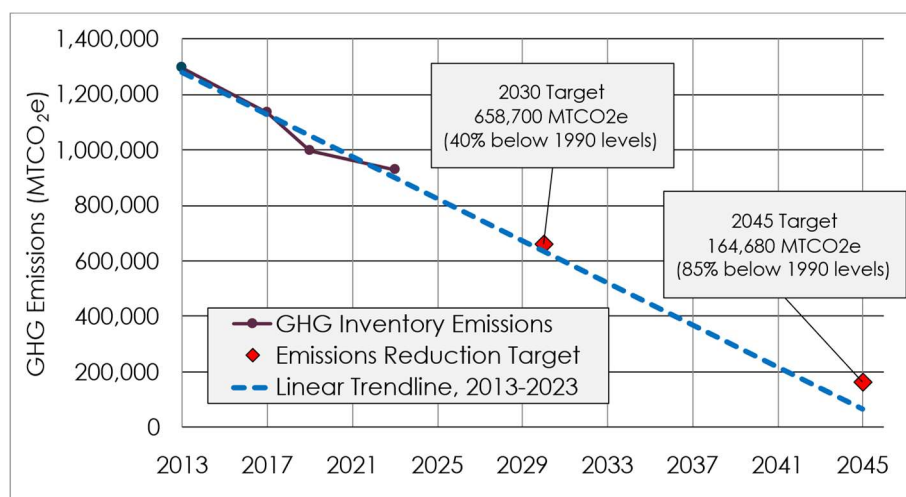
Eli Krispi, PlaceWorks
Kirsten Riker, Advanced Mobility Group / 511 Contra Costa
Kristin Bowman, East Bay Municipal Utility District
Stephanie Stewart, Pacific Gas & Electric
Martin Bond, MCE
Laura Wehrly, MCE
Sebastian Conn, MCE

EXECUTIVE SUMMARY

In accordance with the Contra Costa County's 2024 Climate Action and Adaptation Plan (CAAP) guidance to conduct greenhouse gas (GHG) emissions inventories at least every five years, two GHG emissions inventories have been completed for Contra Costa County for the calendar year of 2023: a community-wide GHG emissions inventory for unincorporated areas and a County operations GHG emissions inventory.

The 2023 community-wide GHG inventory results indicate that the County has continued to make progress in reducing GHG emissions compared to previous inventory years. **Figure 1** illustrates the linear trend of community-wide GHG emissions from 2013 to 2023 compared to emissions reduction targets specified in the 2024 CAAP.

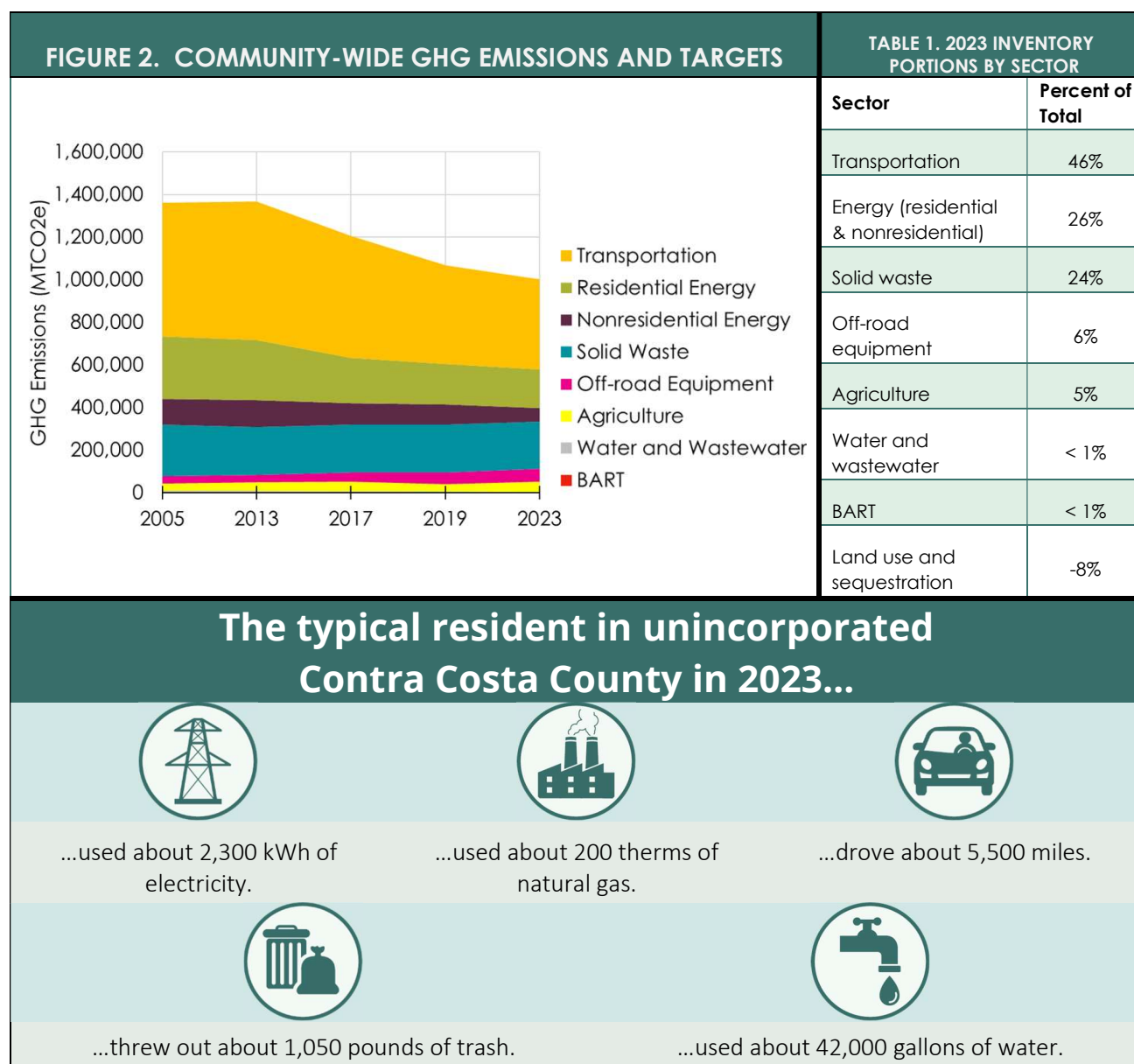
FIGURE 1. COMMUNITY-WIDE GHG EMISSIONS AND TARGETS, 2013-2045



Overall community-wide GHG emissions in the unincorporated county decreased from 1,291,580 metric tons of carbon dioxide equivalence (MTCO₂e) in the baseline year of 2005 to 928,060 MTCO₂e in 2023, a 28 percent decrease. The two largest sectors of GHG emissions in 2023, transportation (46 percent) and energy (26 percent), decreased in emissions compared to 2019's inventory, but will require reducing fossil fuel use to achieve additional emissions reductions in the future. Remarkably, GHG emissions per kilowatt-hour (kWh) of electricity consumed in Contra Costa County decreased by 96 percent from 2019 to 2023 due to electricity providers shifting toward almost entirely renewable sources, like wind and solar. However, this means any further reductions in the energy sector must come from reducing natural gas usage in buildings. The third largest sector of 2023 community-wide emissions was solid waste (24 percent). Emissions from solid waste were primarily emitted from existing waste-in-place that is decomposing at landfills in the county. The smallest sectors of emissions in the 2023 inventory include off-

Between 2019 and 2023, GHG emissions from electricity production and usage decreased by 96 percent.

road equipment (6 percent), agriculture (5 percent), water and wastewater (less than 1 percent) and Bay Area Rapid Transit (less than 1 percent). The land use and sequestration sector removed enough carbon dioxide (CO₂) from the atmosphere to equate to an 8 percent reduction in total emissions in the county. **Figure 2** illustrates the relative proportions of sector emissions in GHG inventories from 2005 to 2023. **Table 1** depicts the sector proportions of total GHG emissions in the 2023 community-wide inventory, with the two largest sectors of on-road transportation and energy presenting the greatest opportunities for future GHG emissions reductions in the unincorporated county.



In addition to the community-wide GHG emissions inventories, County operations GHG emissions inventories are conducted to ensure the County is modeling its commitment to climate action and equity. County operations GHG emissions inventories were completed for calendar years of 2006, 2017, and 2023. In 2006, County operations emissions totaled 54,090 MTCO₂e for the sectors reported in this inventory. In 2023, County operations

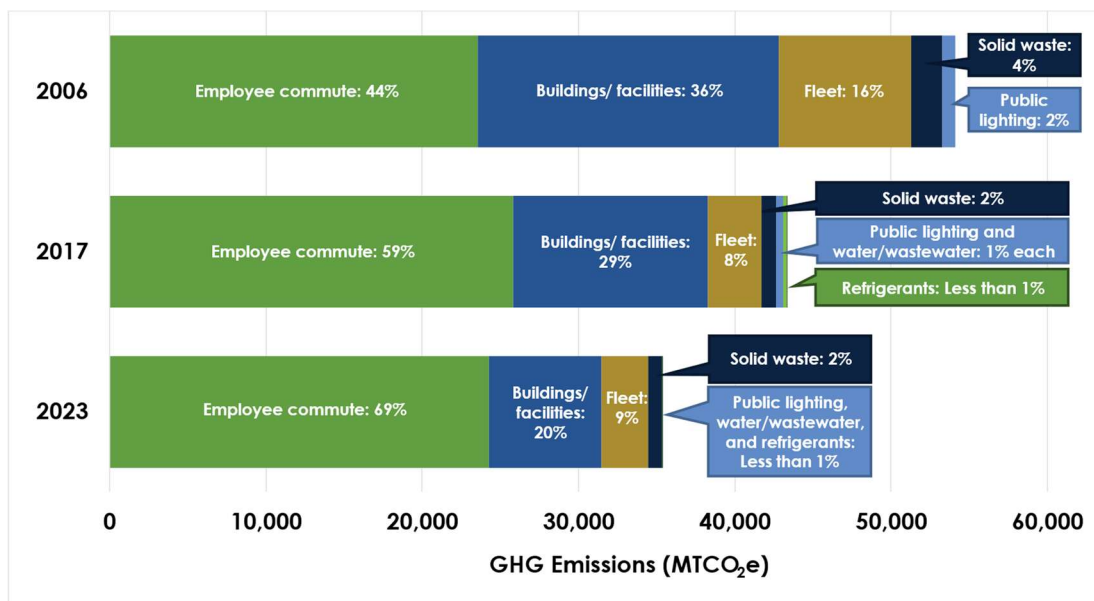
emissions decreased to 35,410 MTCO₂e, a 35 percent decrease in emissions, despite a 33 percent increase in the number of County employees from 2006 to 2023.

The largest sector of County operations GHG emissions in 2023 was employee commute, making up 69 percent of total emissions. Employee commute emissions have remained near-constant from 2006 to 2023 at around 25,000 MTCO₂e and present the greatest opportunity for the County to reduce its carbon footprint in municipal operations. Employee commute survey results collected for the 2023 emissions inventory indicate that employees driving electric vehicles, carpooling, and working from home helped reduce commute-related emissions by 24 percent. The average commute-related emissions per-employee decreased by 22 percent from 2006 to 2023.

In 2023, County employees driving **electric vehicles, carpooling, and working from home** prevented enough GHG emissions to equal taking **1,630 gas-powered cars off the road** for one year.

Significant emissions reductions occurred within the buildings and facilities sector for County operations in 2023, attributed to cleaner electricity being provided by MCE. In the buildings sector, natural gas usage made up over 99 percent of building-related emissions in 2023, so future emissions reductions will necessitate phasing out natural gas usage. Fuel burned by fleet vehicles accounted for 9 percent of County operations GHG emissions in 2023. The smallest sectors of 2023 County operations emissions collectively made up less than 3 percent of total GHG emissions, which include solid waste, public lighting, water and wastewater, and refrigerants. **Figure 3** shows the relative proportions of GHG emissions in each sector for County operations across the three inventory years.

FIGURE 3. COUNTY OPERATIONS ANNUAL GHG EMISSIONS BY SECTOR, 2006 TO 2023



INTRODUCTION

Purpose of Inventory

In 2024, Contra Costa County's Board of Supervisors adopted the Contra Costa County 2045 General Plan along with the Climate Action and Adaptation Plan (CAAP) 2024 Update. The 2024 CAAP is intended to serve as a companion to the Contra Costa County 2045 General Plan and to mitigate greenhouse gas (GHG) emissions in the unincorporated county that result from implementation of the General Plan. The main priority of the 2024 CAAP is to achieve GHG emissions reductions and to consider equity and social justice issues in the implementation of the plan, and directing that health, socioeconomic, and racial equity considerations be included in policymaking and climate solutions at all levels.

To track the County's progress in achieving GHG emissions reductions, the County develops two types of GHG inventories at least once every 5 years: (1) community-wide inventories and (2) County operations inventories.

- A community-wide GHG inventory identifies GHG emissions that result from activities of residents of unincorporated areas in Contra Costa County (unincorporated county), employees, visitors, and other community members. Examples include GHG emissions from residents driving cars, homes using water, and businesses using electricity. The community-wide GHG inventory presented for the unincorporated county is a production-based inventory, which means that it assesses the GHG emissions produced by activities occurring in the community.
- A County operations GHG inventory summarizes emissions that are a direct result of Contra Costa County's government operations. Examples include GHG emissions from electricity and water used in County buildings or the fuel used for County fleet vehicles.

EMISSIONS REDUCTION TARGETS

The 2024 CAAP set GHG emissions reduction targets for community-wide emissions in the unincorporated county, measured in metric tons of carbon dioxide equivalence (MTCO_{2e}). The County has committed to reducing community-wide GHG emissions to 40% below 1990 levels by 2030 and reducing emissions to 85% below 1990 levels and achieve carbon neutrality by 2045, shown in **Table 2**.

TABLE 2. CONTRA COSTA COUNTY COMMUNITY-WIDE EMISSIONS GOALS

	2030	2045
Reduction Target	40% below 1990 levels	85% below 1990 levels
Emissions Goal	658,700 MTCO _{2e}	164,680 MTCO _{2e}

COMMUNITY-WIDE INVENTORY

General Methodology

CATEGORIES OF EMISSIONS ACTIVITIES

The community-wide GHG inventory assessed GHG emissions from the following 11 categories of activities, known as sectors.

- **Transportation** includes GHG emissions created by driving on-road vehicles in the unincorporated county, including passenger and freight vehicles.
- **Residential energy** includes GHG emissions attributed to the use of electricity, natural gas, and other home heating fuels in residential buildings.
- **Nonresidential energy** includes GHG emissions attributed to the use of electricity and natural gas in nonresidential buildings.
- **Solid waste** includes the GHG emissions released from trash collected in the unincorporated areas of Contra Costa County, as well as collective annual emissions from waste already in place at the Acme, Keller Canyon, and West Contra Costa landfills.
- **Agriculture** includes GHG emissions from various agricultural activities in the unincorporated county, including agricultural equipment, crop cultivation and harvesting, fertilizer application, and livestock operations.
- **Off-road equipment** includes GHG emissions from equipment that does not provide on-road transportation, such as tractors for construction, equipment used for landscape maintenance, commercial and industrial equipment, and outdoor recreational equipment.
- **Water and wastewater** includes indirect GHG emissions from the electricity used to transport water and wastewater to and from unincorporated county residents and businesses, as well as direct emissions resulting from wastewater treatment activities.



- **Bay Area Rapid Transit (BART)** includes GHG emissions associated with the operation of BART for residents in unincorporated areas of the county.
- **Land use and sequestration** accounts for GHG emissions absorbed and stored in trees and soils on locally controlled lands as part of healthy ecosystems and released into the atmosphere from development of previously undeveloped land.
- **Stationary sources** include emissions from fuel use at major industrial facilities, permitted by State and regional air quality authorities. These emissions are informational and are not counted as part of the community total.
- **Wildfire** includes emissions released from wildfires. These emissions are informational and are not counted as part of the community total due to the unpredictability of wildfires.
- **Direct access electricity** is electricity purchased directly from an Electric Service Provider (ESP) rather than an investor-owned utility company or Community Choice Energy provider such as MCE, generally to power large industrial, commercial, and institutional facilities.



SECTORS INCLUDED FOR INFORMATIONAL PURPOSES

Emissions from stationary sources, wildfire, and direct access electricity are reported for informational purposes but are not formally counted as part of the unincorporated county's GHG emissions.

Contra Costa County is home to large industrial facilities whose operations have generated significant GHG emissions and/or products that create GHGs, such as gasoline for internal combustion engines. Most of those facilities were constructed decades before land use permits from the County were required. If these facilities apply for new land use permits, the County can impose new operational requirements in some circumstances. An example of this is applications the County received in 2020 from two refineries to process renewable fuels.

There are several factors outside of the County's control that influence the operations and related emissions and energy use at these facilities. The County has therefore elected to

exclude the direct emissions and energy use at these facilities from consideration of the County's GHG emissions inventories for the following reasons:

- These facilities are regulated primarily through the Federal Energy Regulatory Commission and the California Energy Commission and are subject to air quality and emissions standards set forth by the United States Environmental Protection Agency, California Air Resources Board (CARB), and Bay Area Air District (BAAD).
- The energy used at some of these facilities fluctuates from year to year, depending on the demand for resources and the availability of other electricity-generating sources, such as hydropower or renewable resources. This makes it difficult to accurately forecast the energy use at these facilities.
- The County has limited jurisdictional authority to reduce GHG emissions from these sources because they are subject to cap-and-trade regulations set forth by CARB.
- The approach to excluding energy from sources that are outside of the County's jurisdictional control is consistent with the *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*¹.
- The resultant jurisdictional inventory more accurately reflects the energy use from nonresidential customers in unincorporated Contra Costa County and allows the County to focus on actions that are within its control.

Large industrial customers frequently purchase electricity directly from Energy Service Providers (ESPs) who generate electricity, a practice known as "direct access electricity." Different ESPs produce electricity from different power sources with different proportions of fossil and renewable energy. The California Public Utilities Commission (CPUC) regulates the sale of direct access electricity in California, and the identities of direct access customers and the specific ESPs from which they purchase electricity are not made available to the public. Given the County's limited ability to monitor and regulate the sale and use of direct access electricity, as well as historical inconsistencies in how direct access electricity use is reported, direct access emissions are reported for informational purposes only.

¹ ICLEI – Local Governments for Sustainability USA. "U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions." July 2019. <https://icleiusa.org/us-community-protocol/>

Community-Wide Inventory Summary

The community-wide GHG inventory assessed GHG emissions from the following 12 categories of activities, known as sectors, from the unincorporated county. The sectors accounted for in the community-wide inventory include:

- Transportation
- Residential energy
- Nonresidential energy
- Solid waste
- Agriculture
- Off-road equipment
- Water and wastewater
- Bay Area Rapid Transit (BART)
- Land use and sequestration
- Stationary sources (Informational)²
- Wildfire (Informational)
- Direct access electricity (Informational)

Total community-wide GHG emissions **decreased 28 percent** from 2005 to 2023.

Table 3 and **Figure 4** show the community-wide GHG emissions for the unincorporated county during the five inventory years of 2005, 2013, 2017, 2019, and 2023. The sectors that experienced the largest percent decrease in annual GHG emissions between 2005 and 2023 were water and wastewater (72 percent), BART (71 percent), residential energy (46 percent), nonresidential energy (39 percent), and transportation (31 percent). Collectively, emissions from energy use declined 41 percent over this time period. The decrease in energy-related emissions is primarily due to electricity providers in the county providing electricity from more renewable, clean energy sources like wind and solar instead of coal or gas. Natural gas usage and emissions slightly increased from 2005 to 2023. Emissions reductions occurred in the solid waste sector, with a 9 percent decrease. Three sectors saw increases in their emissions from 2005 to 2023: nonresidential energy, off-road equipment, and agriculture.

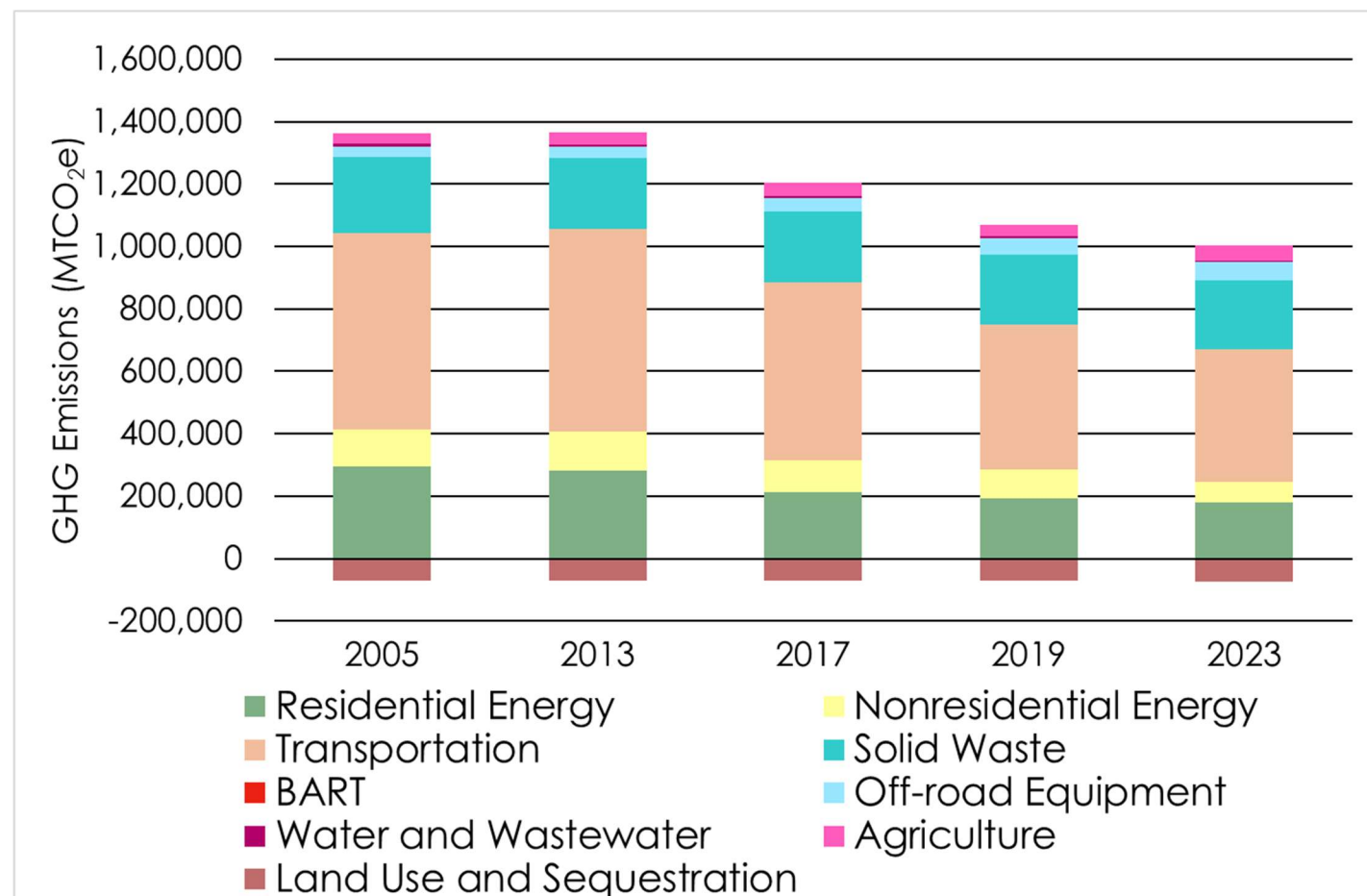
Between 2005 and 2023, offroad emissions increased by 76 percent, which may be due to modeling differences in the data obtained from CARB. The offroad data indicates increases in use of agricultural and other types of commercial and industrial equipment. Increases in emissions in the agriculture sector can be attributed to an increase in livestock population (primarily cattle) in the unincorporated county. Though increasing, off-road equipment and agriculture are relatively small sectors in overall unincorporated county emissions.

² Informational items do not contribute to the emissions total for the unincorporated areas of the county.

TABLE 3. ABSOLUTE ANNUAL GHG EMISSIONS, 2005 TO 2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Transportation (excluding BART)	628,200	651,130	571,650	464,040	425,060	-32%
Energy - Residential	294,930	280,870	212,420	191,780	180,590	-39%
Energy - Nonresidential	118,740	125,350	98,850 ¹	85,390	64,160	-46%
Solid waste	243,940	224,570	223,100	220,760	220,920	-9%
Off-road equipment	34,160	36,290	42,840	54,010	60,050	+76%
Agriculture	33,350	39,300	44,880	36,130	49,210	+48%
Water and wastewater	8,080	7,400	4,400	4,870	2,290	-72%
BART	1,040	1,320	1,440	190	300	-71%
Land use and sequestration	-74,520	-74,520	-74,520	-74,520	-74,520	0%
Total Annual MTCO₂e	1,291,580	1,295,370	1,128,720	986,310	928,060	-28%
<i>Informational Items</i>						
Stationary sources	13,983,030	11,956,000	11,232,290	10,867,670	8,569,854	-39%
Wildfire	14,270	66,080	0 ²	10,100	0 ²	N/A ³
Direct access electricity	0 ⁴	0 ⁴	0 ⁴	74,130	0 ⁴	N/A
Note: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows. ¹ Estimates of nonresidential electricity use in 2013 are used in 2017 to account for a lack of available data in 2017. ² No wildfires were recorded in the unincorporated county in 2017 or 2023. ³ Overall change between 2005 and 2023 for wildfire is not calculated because of the high degree of year-to-year variability. ⁴ PG&E did not provide direct access electricity use data in these years.						

FIGURE 4. ABSOLUTE ANNUAL GHG EMISSIONS BY SECTOR, 2005 TO 2023



The proportions of each GHG emissions sector compared to the total GHG emissions for each inventory year are presented in **Table 4**. The transportation sector has consistently been the largest source of GHG emissions in the unincorporated county, accounting for 46 percent of total community-wide GHG emissions in 2023 (excluding informational items). Residential and nonresidential energy combined are the second-largest source of emissions, comprising 26 percent of community-wide emissions in 2023. Of the energy-related emissions, approximately 70 percent came from residential buildings and 30 percent from nonresidential buildings. In both building types, almost all emissions in 2023 were associated with natural gas use. Solid waste was the third-largest source of emissions, accounting for 24 percent of the community-wide total in 2023. The smallest sectors of emissions in the 2023 inventory include off-road equipment (6 percent), agriculture (5 percent), water and wastewater (less than 1 percent) and BART (less than 1 percent). Detailed summaries of changes in GHG emissions by sector appear in the next section of this report.

TABLE 4. SECTOR PORTIONS OF GHG EMISSIONS FOR COMMUNITY-WIDE INVENTORY, 2005 TO 2023

SECTOR	2005	2013	2017	2019	2023
Transportation	49%	50%	51%	47%	46%
Energy - Residential	23%	22%	19%	19%	19%
Energy - Nonresidential	9%	10%	9%	9%	7%
Solid waste	19%	17%	20%	22%	24%
Off-road equipment	3%	3%	4%	5%	6%
Agriculture	3%	3%	4%	4%	5%
Water and wastewater	1%	1%	Less than 1%	Less than 1%	Less than 1%
BART	Less than 1%	Less than 1%	Less than 1%	Less than 1%	Less than 1%
Land use and sequestration	-5%	-5%	-6%	-7%	-8%
Total Annual MTCO_{2e}	100%	100%	100%	100%	100%
Note: Totals may not equal the sum of individual rows due to rounding.					

Between 2019 and 2023, the largest reduction in emissions occurred in the transportation and energy sectors. Two possible factors influencing the GHG emissions reduction in the transportation sector include the increased number of workers with the ability to work from home following the onset of the COVID-19 pandemic in 2020 and increased usage of electric vehicles (see **Figure 5**). One major factor reducing GHG emissions in the energy sector is the significant shift of electricity sourcing by electricity providers toward renewable sources like solar and wind. The electricity provided to unincorporate county residents in 2023 was generated with 97 percent less GHG emissions compared to 2019.

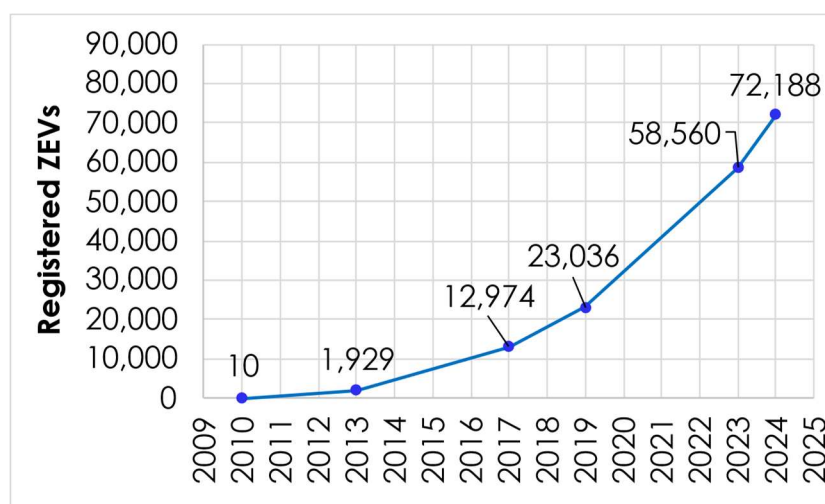
Emissions by Sector

Transportation

Transportation represented 46 percent of overall community-wide emissions in 2023. On-road transportation activity accounts for vehicle miles driven between two points in the unincorporated area, or between the unincorporated area or another community. It does not include miles for trips that begin and end in other communities but pass through the unincorporated area (e.g., from Sacramento to Oakland). Unincorporated Contra Costa County community members drove approximately 1.3 billion vehicle miles in 2005, decreasing 25 percent to approximately 955 million vehicle miles in 2023. The average daily vehicle miles traveled by unincorporated community residents decreased from 3,722,280 miles in 2005 to 2,775,180 miles in 2023, as shown in **Table 5**.

In addition to driving less miles, Contra Costa County residents have been choosing to drive zero-emissions vehicles (ZEVs), including all-electric vehicles (EVs), at an increasing rate, as shown in **Figure 5**. In 2023, Contra Costa residents registered 58,560 zero-emissions vehicles (ZEVs) in the county. ZEVs made up 7% of the light-duty vehicle population in 2023, shown in **Figure 6**. Data for both **Figure 5** and **Figure 6** was collected from the California Energy Commission³ for the entire population of Contra Costa County. As of September 2023, there were 1,734 public and shared EV chargers operating in Contra Costa County⁴.

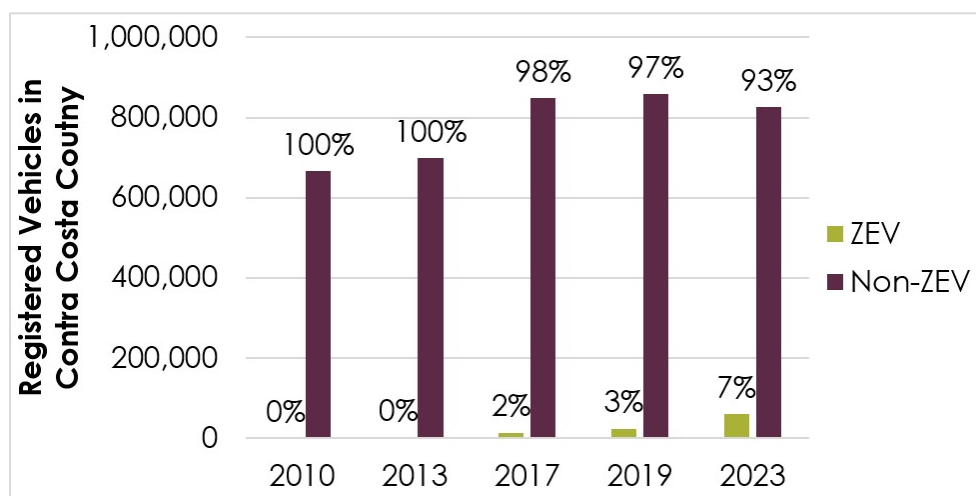
FIGURE 5. REGISTERED ZERO-EMISSIONS VEHICLES IN CONTRA COSTA COUNTY, 2010 TO 2024



³ California Energy Commission (2025). Light-Duty Vehicle Population in California. Data last updated May 16, 2025. Retrieved from <https://www.energy.ca.gov/zevstats>.

⁴ California Energy Commission (2025). Zero Emission Vehicle and Infrastructure Statistics. Data retrieved from report published in September 2023. Retrieved from <https://www.energy.ca.gov/zevstats>.

FIGURE 6. PERCENT OF TOTAL REGISTERED VEHICLES BY TYPE IN CONTRA COSTA COUNTY, 2010 TO 2023



The vehicle miles traveled (VMT) in 2005 resulted in GHG emissions of approximately 628,200 MTCO₂e, which decreased 32 percent to approximately 425,060 MTCO₂e in 2023. A decrease in VMT occurred between 2019 and 2023, which could be attributed to the increased ability to work from home for many workers following the COVID-19 pandemic, thus reducing the number of cars on the road each day. GHG emissions related to on-road transportation likely decreased due to this reduction in VMT, increasingly fuel-efficient vehicles, and wider adoption of electric vehicles. **Figure 7** illustrates the emissions and daily VMT across all GHG emissions inventory years.

FIGURE 7. TRANSPORTATION GHG EMISSIONS AND DAILY VMT, 2005 TO 2023

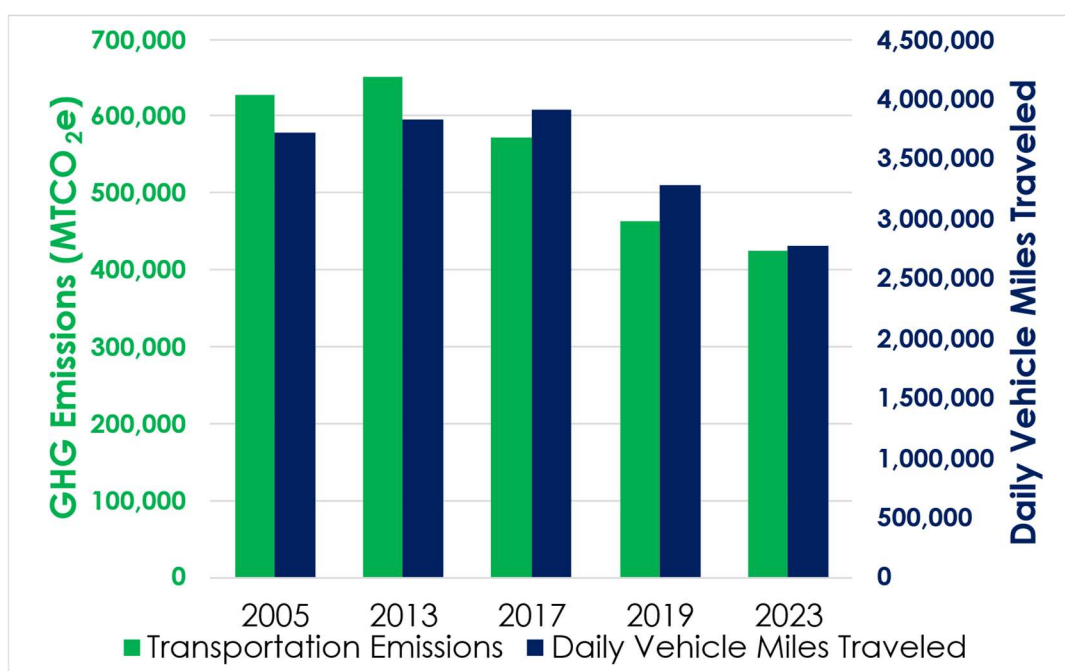


Table 5 provides a breakdown of the activity data and emissions for on-road transportation for the unincorporated area in each inventory year. For the most recent inventory for 2023, the portions of total VMT for each vehicle fuel type for on-road transportation are shown in **Table 6**.

TABLE 5. TRANSPORTATION ACTIVITY DATA AND GHG EMISSIONS, 2005 TO 2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005 – 2023
Activity Data (Daily VMT)						
On-road transportation	3,722,820	3,826,320	3,911,010	3,276,400	2,775,180	-25%
Emissions (MTCO₂e)						
Total Annual MTCO₂e	628,200	651,130	571,650	464,040	425,060	-32%
Portion of total emissions	49%	50%	51%	47%	46%	-3%
All numbers are rounded to the nearest 10. Percentages are rounded to the nearest single digit.						

TABLE 6. 2023 VEHICLE FUEL TYPE BY PERCENT OF TOTAL VMT

FUEL TYPE	PASSENGER	COMMERCIAL	ALL
Gasoline	92.4%	28.7%	86.5%
Diesel	0.7%	69.8%	7.2%
Natural gas	0.0%	1.4%	0.1%
Electric	5.1%	0.1%	4.6%
Plug-in hybrid	1.8%	0.0%	1.6%
All numbers are rounded to the nearest single decimal place.			

Residential Energy

Residential energy represented 19 percent of overall community-wide emissions in 2023. Contra Costa County's GHG emissions from residential energy totaled approximately 180,590 MTCO₂e in 2023, compared to 294,930 MTCO₂e in 2005, a decline of 39 percent. Residential electricity GHG emissions decreased due to a decrease in overall use and usage of cleaner sources for electricity. Residential electricity use decreased 18 percent from 2005 to 2023, from 488,236,740 kWh to 400,194,970 kWh. Over this period, as seen in **Table 7**, a unit of electricity supplied by Pacific Gas and Electricity Company (PG&E) emitted 97 percent less GHG in 2023 than in 2005. Electricity from MCE, which supplied electricity to community residents in 2017 to present, generated even fewer GHG emissions per unit of electricity than PG&E-supplied electricity, which has also contributed to the emissions decline in this sector. In 2023, natural gas use accounted for 91 percent of GHG emissions for residential energy, while electricity accounted for less than 1 percent of GHG emissions, as shown in **Figure 8**. Natural gas use and GHG emissions have remained fairly constant from 2005 to 2023 despite a growing population. Propane and wood use and GHG emissions also declined over this period, although GHG emissions from these fuels are only a small portion of those from the residential energy sector. **Table 7** provides a breakdown of the activity data and GHG emissions for residential energy for unincorporated areas.

FIGURE 8. RESIDENTIAL ENERGY PROPORTIONS OF GHG EMISSIONS BY SUBSECTOR, 2005-2023

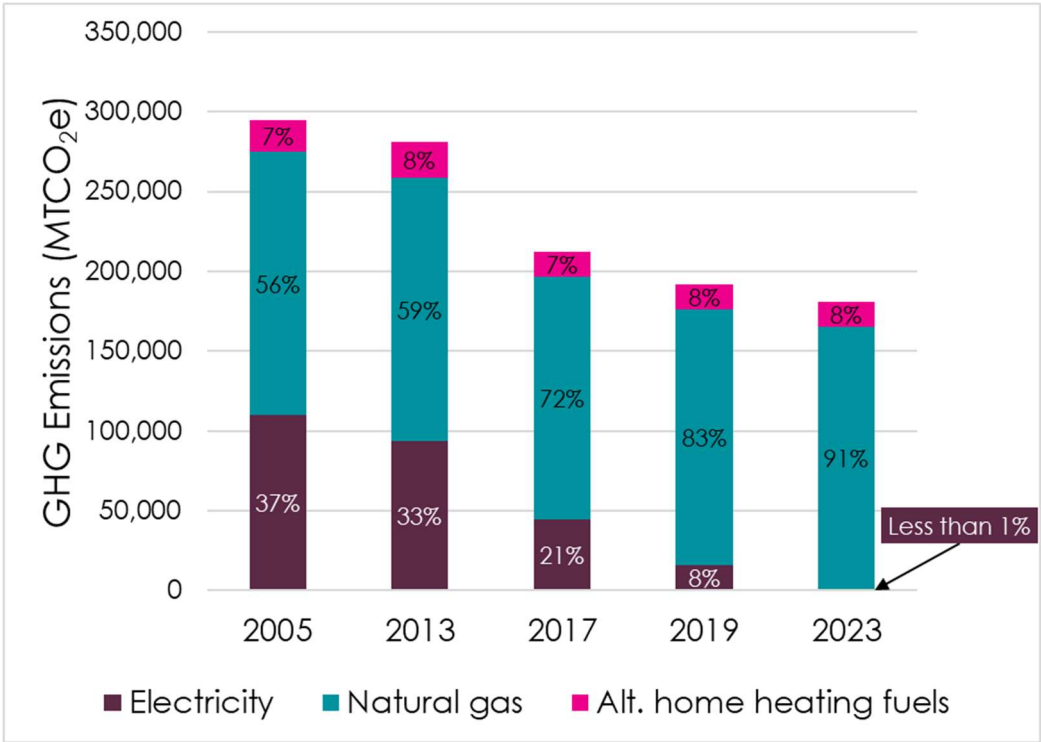


TABLE 7. RESIDENTIAL ENERGY ACTIVITY DATA AND GHG EMISSIONS BY SUBSECTOR, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Activity Data						
Residential PG&E electricity (kWh)	488,236,740	478,219,710	461,970,670	46,158,330	44,421,560	N/A*
Residential MCE electricity (kWh)	-	-	307,820	247,402,970	355,773,400	N/A*
<i>Total residential electricity (kWh)</i>	<i>488,236,740</i>	<i>478,219,710</i>	<i>462,278,490</i>	<i>293,561,300</i>	<i>400,194,960</i>	<i>-18%</i>
Residential natural gas (therms)	30,919,160	31,007,110	28,634,420	30,100,640	30,950,350	0%
Residential propane (gallons)	1,525,330	1,106,900	1,043,270	1,021,340	1,069,380	-30%
Residential kerosene (gallons)	13,160	10,960	8,030	16,320	10,880	-17%
Residential wood (MMBTU)	117,000	165,830	100,960	101,710	93,900	-20%
Emissions Factors						
PG&E Electricity (grams CO ₂ e/kWh)	226	195	96	108	6	-97%
MCE Electricity (grams CO ₂ e/kWh)	N/A	N/A	59	45	1.8	-97% ¹
Emissions (MTCO₂e)						
Residential PG&E electricity	110,120	93,380	44,510	5,000	280	N/A*
Residential MCE electricity	0	0	20	11,060	610	N/A*
<i>Total residential electricity</i>	<i>110,120</i>	<i>93,380</i>	<i>44,530</i>	<i>16,060</i>	<i>890</i>	<i>-99%</i>
Residential natural gas	164,570	165,040	152,060	159,850	164,360	0%
Residential propane	8,910	6,470	6,100	5,970	6,250	-30%
Residential kerosene	140	120	80	170	120	-14%
Residential wood	11,190	15,860	9,650	9,730	8,980	-20%
Total Annual MTCO₂e	294,930	280,870	212,420	191,780	180,590	-39%
Portion of total emissions	23%	22%	19%	19%	19%	-4%
* MCE began supplying electricity to customers in the county starting in 2017. Many PG&E customers were switched to MCE, therefore percent change values for PG&E and MCE electricity usage are not shown because the values may be misleading. 1: Percent change for this value is calculated from 2017 to 2023 because MCE did not provide electricity in the county prior to 2017. All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows. Percentages are rounded to the nearest single digit.						

Nonresidential Energy

GHG emissions from nonresidential energy comprised 7 percent of overall community-wide emissions in 2023. Emissions in this sector decreased 46 percent from 118,740 MTCO₂e in 2005 to 64,160 MTCO₂e in 2023. Electricity emissions from retail electricity suppliers (PG&E and MCE) have fallen significantly, due to a large increase in the portion of electricity provided by renewable and carbon-free sources (see **Table 8**). Total nonresidential electricity usage in the unincorporated county has increased 5 percent from 2005 to 2023, yet electricity-related emissions have decreased by 99 percent from 64,180 MTCO₂e in 2005 to 690 MTCO₂e in 2023. Nonresidential natural gas usage for the unincorporated county has not been reported by PG&E for data privacy reasons since 2013, so the reported usage in calendar years 2017, 2019, and 2023 has been trended to follow overall Contra Costa County nonresidential natural gas usage reported by the California Energy Commission using the known 2013 nonresidential natural gas usage as a baseline. This assumption was made because a large portion of industrial and commercial facilities in Contra Costa County are in unincorporated areas. In 2023, natural gas use accounted for almost all GHG emissions (99 percent) for nonresidential energy use, while electricity accounted for 1 percent of GHG emissions, as shown in **Figure 9**. **Table 8** provides a breakdown of the activity data and GHG emissions for nonresidential energy for unincorporated areas.

FIGURE 9. NONRESIDENTIAL ENERGY PROPORTIONS OF GHG EMISSIONS BY SUBSECTOR, 2005-2023

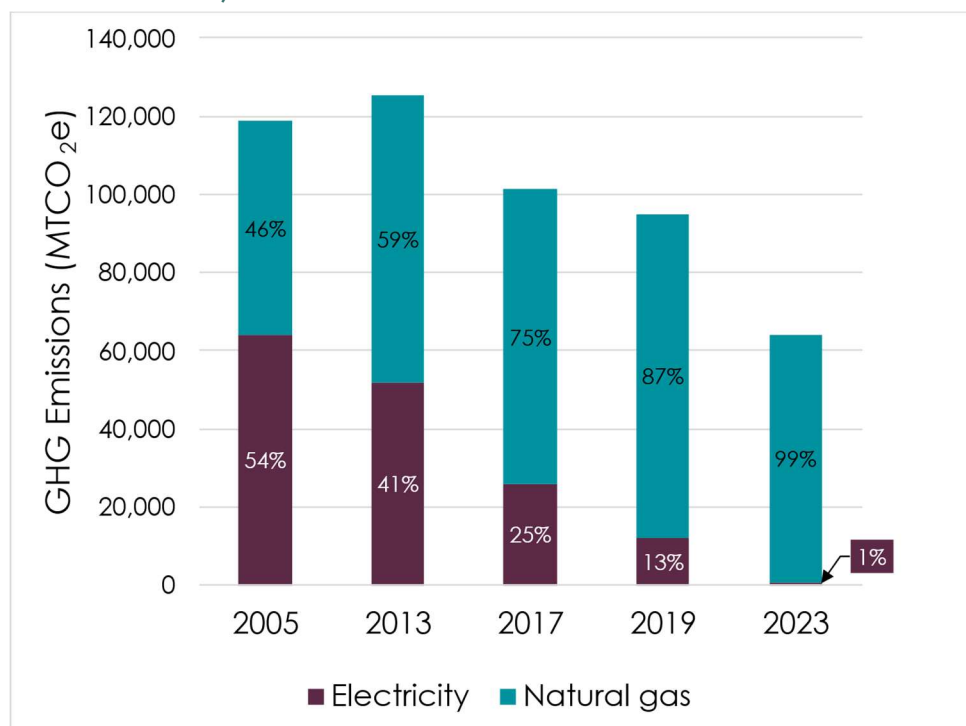


TABLE 8. NONRESIDENTIAL ENERGY ACTIVITY DATA AND GHG EMISSIONS BY SUBSECTOR, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Electricity Activity Data (kWh)						
Nonresidential PG&E electricity	284,558,070	266,216,660	266,216,660	29,062,250	36,757,068	N/A ¹
Nonresidential MCE electricity	0	0	28,730	200,181,720	264,427,110	N/A ¹
<i>Total nonresidential electricity</i>	<i>284,558,070</i>	<i>266,216,660</i>	<i>266,245,390</i>	<i>229,243,970</i>	<i>301,184,178</i>	<i>+6%</i>
Nonresidential natural gas (therms)	10,251,360	13,784,410	14,287,390*	15,538,050*	11,952,230*	+16%
Emissions Factors						
PG&E Electricity (grams CO ₂ e/kWh)	226	195	96	108	6	-97%
MCE Electricity (grams CO ₂ e/kWh)	N/A	N/A	59	45	1.8	-97% ²
Emissions (MTCO₂e)						
Nonresidential PG&E electricity	64,180	51,980	25,650	3,150	230	N/A ¹
Nonresidential MCE electricity	0	0	Less than 10	9,040	460	N/A ¹
<i>Total nonresidential electricity</i>	<i>64,180</i>	<i>51,980</i>	<i>25,650</i>	<i>12,190</i>	<i>690</i>	<i>-99%</i>
Nonresidential natural gas	54,560	73,370	75,873	82,515	63,472	+16%
Total Annual MTCO₂e	118,740	125,350	101,523	94,705	64,162	-46%
Portion of total emissions	9%	10%	9%	10%	7%	-2%
* Due to omissions in data reported by PG&E for the calendar years 2017, 2019, and 2023, the project team assumed that nonresidential natural gas use trended with overall Contra Costa County usage reported by the California Energy Commission. 1: MCE began supplying electricity to customers in the county starting in 2017. Many customers were switched from PG&E to MCE, therefore percent change values for PG&E and MCE electricity usage are not shown because the value may be misleading. 2: Percent change for this value is calculated from 2017 to 2023 because MCE did not provide electricity in the county prior to 2017. All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.						

Solid Waste

Solid waste sector emissions represented 25 percent of community-wide emissions in 2023. GHG emissions associated with solid waste include four subsectors:

- **Solid waste** is the material that is discarded by community members and reflects the actual waste generated by the community.
- **Alternative daily cover (ADC)** is organic material applied at landfills by the landfill operator as a means of controlling debris, odor, and pests.
- **Waste in place** is the existing solid waste and associated GHG emissions deposited in the County's landfills in previous years.
- **Flaring** accounts for GHG emissions from the combustion of gases generated by decomposing waste.

Between 2005 and 2023, total solid waste GHG emissions decreased by 9 percent due to decreases in solid waste generated and ADC applied at landfills. These decreases could be attributed to California Senate Bill (SB) 1383, which became effective on January 1, 2022, and requires all businesses and residents to separate organics and recyclable materials from trash to try to divert organic material to be composted rather than dumped in landfills. As shown in **Figure 10**, most emissions in the solid waste sector come from waste already in place in the landfills in the county. In the 2024 CAAP, it was forecasted that if all GHG emissions reduction targets are met by 2045, the waste-in-place at landfills will be the largest sector of GHG emissions. **Table 9** presents solid waste emissions for each inventory year for the unincorporated county.

FIGURE 10. SOLID WASTE PROPORTIONS OF GHG EMISSIONS BY SUBSECTOR, 2005-2023

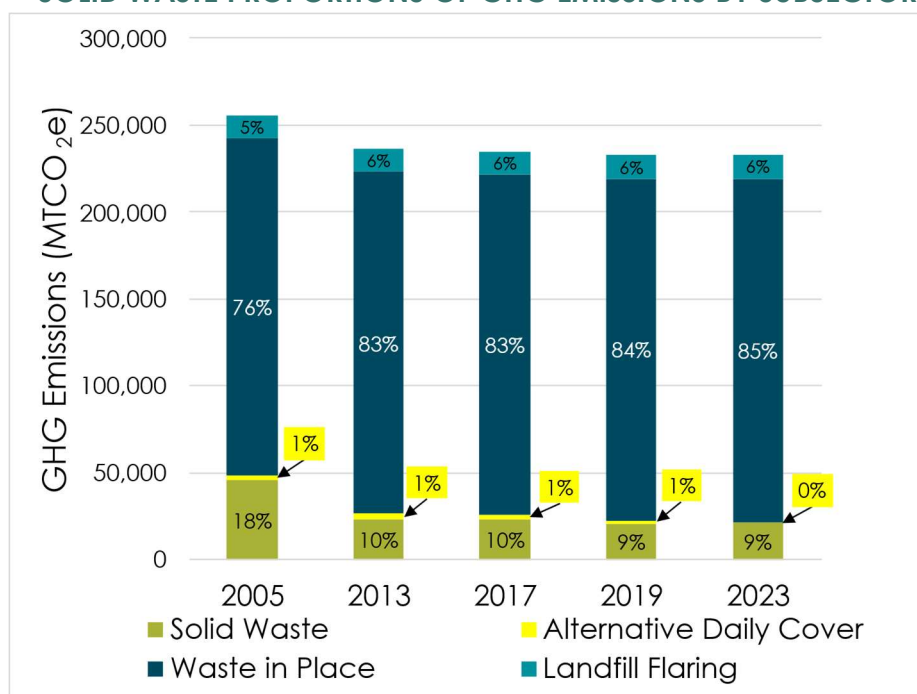


TABLE 9. SOLID WASTE ACTIVITY DATA AND GHG EMISSIONS BY SUBSECTOR, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Activity Data (Tons)						
Solid Waste	154,820	78,790	79,520	79,340	91,640	-41%
Alternative Daily Cover	15,950	13,990	11,470	7,580	0	-100%
Waste in Place	34,455,010	41,785,650	45,776,140	47,618,290	50,624,050	+47%
Landfill Flaring	5,270	5,260	5,250	5,270	5,310	+1%
Emissions (MTCO₂e)						
Solid Waste	45,390	23,100	22,750	20,760	21,199	-53%
Alternative Daily Cover	3,060	3,440	2,820	1,860	0	-100%
Waste in Place	193,950	196,500	196,000	196,610	198,175	-53%
Landfill Flaring	13,610	13,755	13,550	13,590	13,703	+1%
Total Annual MTCO₂e	256,010	236,795	235,120	232,820	233,077	-9%
Portion of total emissions	20%	18%	21%	24%	25%	+5%
All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows. Percentages are rounded to the nearest single digit.						

Off-Road Equipment

Off-road equipment emissions accounted for 6 percent of community-wide emissions in 2023. Off-road equipment emissions increased by 76 percent between 2005 and 2023. Off-road equipment types that indicate the largest increase in emissions since 2005 are agricultural equipment, transport refrigeration units, and pleasure craft. It is possible that changes in modeling methods across inventory years, as well as additional categories being tracked, may be causing a greater increase in emissions between 2005 and 2023 than reality. Note that the State provides these GHG emissions levels directly, so there is no data for equipment usage in hours used or distance traveled to display. Off-road equipment emissions in unincorporated areas of the county are shown in **Table 10**.

TABLE 10. OFF-ROAD EQUIPMENT GHG EMISSIONS (MTCO₂E), 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE, 2005-2023
Agricultural Equipment	1,200	1,190	1,180	10,170	9,890	+724%
Cargo Handling Equipment	900	380	330	310	1,010	+12%
Commercial Harbor Craft*	-	-	-	2,600	2,560	N/A*
Construction and Mining Equipment	6,780	7,170	8,880	7,200	1,860	-73%
Forklifts*	-	-	-	-	6,260	N/A*
Industrial Equipment	8,320	8,840	9,470	9,780	10,800	+30%
Lawn and Garden Equipment	3,580	3,280	3,760	3,880	2,820	-21%
Light Commercial Equipment	2,230	2,780	3,060	3,270	2,770	+24%
Locomotive	3,170	3,260	3,540	3,620	3,940	+24%
Oil Drilling	20	20	20	20	20	+21%
Pleasure Craft	1,890	1,810	1,800	1,830	7,420	+293%
Portable Equipment	4,830	6,240	6,700	6,970	7,610	+58%
Recreational Equipment	650	670	610	630	80	-87%
Transport Refrigeration Units	590	650	3,490	3,730	3,010	+411%
Total Annual MTCO₂e	34,150	36,300	42,850	54,010	60,050	+76%
Portion of total emissions	3%	3%	4%	5%	6%	+3%
* State modeling only provided emissions for commercial harbor craft and forklifts for the years shown, therefore percent change from 2005 to 2023 cannot be calculated. All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.						

Agriculture

GHG emissions associated with agriculture in the unincorporated county comprised 5 percent of community-wide emissions in 2023. Agriculture emissions increased by approximately 48 percent between 2005 and 2023. This increase is primarily due to an increase in the amount of cattle in the county. Only data pertaining to cattle and crops were available for the inventory years shown in **Table 11**, so emissions from apiary products (like honey) or other types of livestock (chickens, goats, etc.) were not accounted for in these GHG inventories. Between 2005 and 2023, both crop acreages and the amount of nitrogen applied to crops decreased. In 2023, digestive processes of cattle (enteric fermentation) and manure management accounted for approximately 92% of agriculture-related GHG emissions in unincorporated areas, which is a typical proportion compared to past inventory years.

TABLE 11. AGRICULTURE ACTIVITY DATA AND GHG EMISSIONS BY SUBSECTOR, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Activity Data						
Crops (acreage)	200,980	204,030	197,360	183,730	176,420	-12%
Nitrogen applied (pounds)	3,261,620	3,560,480	3,698,500	3,608,340	2,962,510	-9%
Livestock (annual population)	16,500	19,110	22,060	17,340	24,911	+51%
Emissions (MTCO₂e)						
Crops	3,920	4,280	4,450	4,340	3,561	-9%
Cattle enteric fermentation	28,510	33,920	39,160	30,790	44,221	+55%
Manure management	920	1,100	1,270	1,000	1,430	+55%
Total Annual MTCO₂e	33,350	39,300	44,880	36,130	49,210	+48%
Portion of total emissions	3%	3%	4%	4%	5%	+2%
All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.						

Water and Wastewater

Emissions associated with the water and wastewater sector represented less than 1 percent of community-wide emissions in 2023. Emissions in this sector are counted as indirect or direct emissions. Indirect water emissions refer to emissions created by the electricity required to treat and move water to where it is used. Indirect wastewater emissions refer to electricity needed to move wastewater to water treatment facilities, and to process and discharge it. Direct wastewater emissions refer to emissions produced directly by decomposing materials in wastewater.

GHG emissions from water and wastewater activity decreased 72 percent between 2005 and 2023. Community members used 36 percent less water in 2023 compared to 2005, despite population growth. Emissions associated with electricity used to move water and wastewater from one place to another, referred to as indirect emissions, declined by 99 percent from 2005 to 2023, as shown in **Figure 11**. This large decrease in indirect emissions is because electricity used to move water has been increasingly supplied by more renewable and carbon-free sources. Direct wastewater emissions did rise by approximately 199 percent from 2005 to 2023, but given that the amount of wastewater generated declined by 25 percent in this period, this is likely due to changes in modeling approaches and available data. The activity and emissions data for the unincorporated county are presented in **Table 12**.

FIGURE 11. WATER AND WASTEWATER PROPORTIONS OF GHG EMISSIONS BY SUBSECTOR, 2005-2023

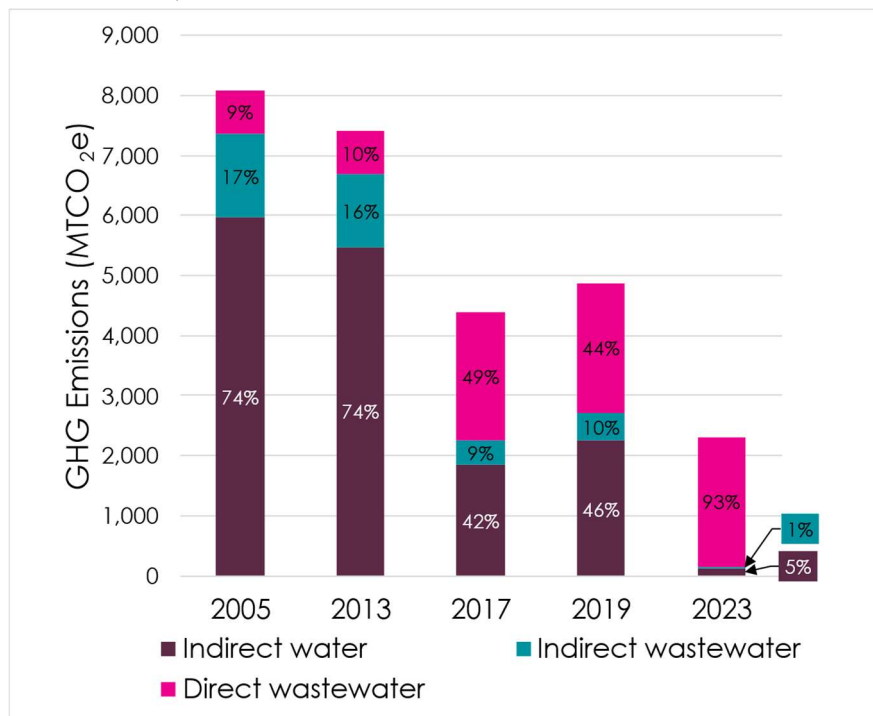


TABLE 12. WATER AND WASTEWATER ACTIVITY DATA AND GHG EMISSIONS BY SUBSECTOR, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Activity Data (Tons)						
Water use (million gallons)	11,530	11,650	7,380	8,010	7,380	-36%
Water electricity use (kWh)	26,443,770	28,004,290	19,137,620	20,783,930	19,151,500	-28%
Wastewater generation (million gallons)	4,560	4,610	3,150	3,170	3,430	-25%
Wastewater electricity use (kWh)	6,199,120	6,198,590	4,268,050	4,295,780	4,659,764	-25%
Emissions (MTCO₂e)						
Indirect water	5,960	5,470	1,840	2,250	120	-98%
Indirect wastewater	1,400	1,210	410	470	30	-98%
Direct wastewater	720	720	2,150	2,150	2,140	199%
Total Annual MTCO₂e	8,080	7,400	4,400	4,870	2,290	-72%
Portion of total emissions	1%	1%	Less than 1%	Less than 1%	Less than 1%	-1%
All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows. Percentages are rounded to the nearest single digit.						

BART

BART-related emissions accounted for less than 1 percent of overall community-wide emissions in 2023. GHG emissions associated with BART ridership in Contra Costa County decreased 72 percent between 2005 and 2023. This decline is attributable to shifts in BART's electricity portfolio toward renewable and carbon-free sources, as well as decreased ridership following the onset of the COVID-19 pandemic in 2020. BART ridership from community members in unincorporated Contra Costa County decreased 32 percent between 2005 and 2023, as shown in **Table 13** and **Figure 12**. In just one year from 2020 to 2021, BART ridership in Contra Costa County decreased by 78 percent. In 2023, BART ridership in Contra Costa only rebounded to around 50 percent of pre-pandemic levels. The decrease in BART ridership following the COVID-19 pandemic could be partially attributed to the increased adoption of remote work policies offered by employers and personal preference.

GHG emissions related to BART have also decreased partly due to BART's increased use of renewable and carbon-free sources of energy to power its operations. GHG emissions associated with one mile of travel for a passenger have decreased by 58 percent between 2005 and 2023. Notably, this emissions factor increased from 2023 to 2019. BART's 2023 Sustainability Report attributed this increase in emissions per passenger to increased market demand for renewables making it more difficult to purchase electricity from renewable sources, so electricity from unspecified sources was purchased instead.

The trends of county ridership and BART-related GHG emissions are shown in **Figure 12**.

FIGURE 12. BART GHG EMISSIONS AND RIDERSHIP, 2005-2023

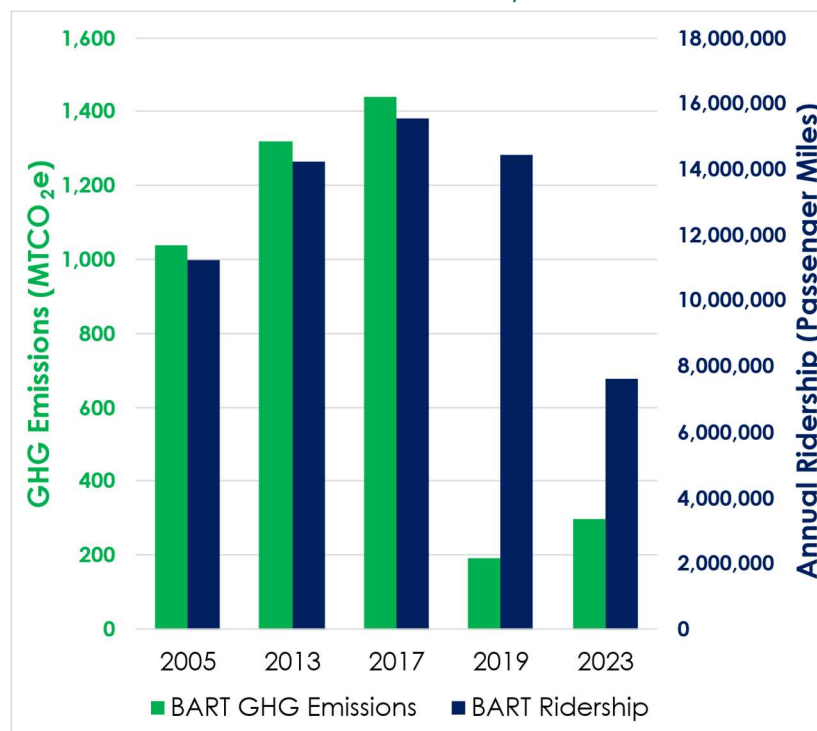


TABLE 13. BART ACTIVITY DATA AND GHG EMISSIONS BY SUBSECTOR, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE, 2005–2023
Activity Data						
BART Ridership (passenger miles)	11,231,870	14,228,420	15,528,840	14,444,740	7,633,660	-32%
Emissions Factor						
BART Emissions Factor (kg CO ₂ e / passenger mile)	93	93	93	13	38	-58%
Emissions (MTCO₂e)						
Total Annual MTCO₂e	1,040	1,320	1,440	190	300	-72%
Portion of total emissions	Less than 1%	Less than 1%	Less than 1%	Less than 1%	Less than 1%	0%
All numbers greater than 100 are rounded to the nearest 10. Percentages are rounded to the nearest single digit.						

Land Use and Sequestration

In 2023, the land use and sequestration sector absorbed approximately 8 percent of overall community-wide emissions. GHG emissions from land use and sequestration can be either positive (a source of emissions) or negative (removing emissions from the atmosphere, creating what is known as an emissions “sink”). Natural lands and trees in urban areas absorb carbon, storing it in wood, plants, and soil. As a result, when natural land is preserved or when more trees are planted, emissions from this sector are negative because GHGs are being removed from the atmosphere. However, developing natural lands or converting them to a different form (for example, replacing forests with crop land) or removing street trees causes carbon to be released, creating GHG emissions.

This sector includes emission sources and sinks from three types of activities: sequestration of GHG emissions in locally controlled forested lands, sequestration of GHG emissions in street trees in urbanized unincorporated areas, and emissions caused by permanently removing vegetation from natural lands or farmlands as a part of development.

Emissions and sequestered amounts were assumed constant from 2005 to 2023 for all three activities. Between the preparation of the 2019 and 2023 inventories, a new fine-scale vegetation map⁵ of Contra Costa and Alameda Counties was published in 2025, which presents the state of the landscape in 2020. The 2023 GHG inventory updated land use data for all previous inventory years with this new dataset. Acres of deciduous hardwood, eucalyptus, evergreen hardwood, forest, non-native forest, riparian forest, pine/cypress, and redwood/Douglas fir categories are totaled within unincorporated Contra Costa County as “forested land.” This dataset was not used to update the acreage of urban trees.

The sequestration capabilities of locally controlled forests and urban trees were assumed to not have been changed by human activities during the inventory period. While there was some development activity that caused a loss of sequestered GHG emissions, records of when the development specifically occurred are not available, and so the GHG emissions have been assigned equally to all inventory years prior to 2023, hence the lack of changes. Forests sequestered 61,770 MTCO₂e annually, while urban trees sequestered 12,750 MTCO₂e, for a total carbon sink of 74,520 MTCO₂e for the unincorporated area, as shown in **Table 14**.

⁵ East Bay Regional Park District, CAL FIRE, Tukman Geospatial LLC. 2025. “Alameda and Contra Costa County Fine Scale Vegetation Map.” Map available at: <https://experience.arcgis.com/experience/0827ad50653b48b891ce891dc34620c4>

TABLE 14. LAND USE AND SEQUESTRATION ACTIVITY DATA AND GHG EMISSIONS BY SUBSECTOR, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Activity Data (Tons)						
Acres of forested land	63,820	63,820	63,820	63,820	63,820	0%
Acres of urban trees	32,780	32,780	32,780	32,780	32,780	0%
Acres of land use changes	0	0	0	0	0	0%
Emissions (MTCO₂e)						
Forest sequestration	-61,770	-61,770	-61,770	-61,770	-61,770	0%
Street tree sequestration	-12,750	-12,750	-12,750	-12,750	-12,750	0%
Land use changes	0	0	0	0	0	0%
Total Annual MTCO₂e	-74,520	-74,520	-74,520	-74,520	-74,520	0%
Portion of total emissions	-5%	-5%	-6%	-7%	-8%	-3%
Note: Acres of forested land for all years were updated as part of the as new data became available from an updated vegetation map of Contra Costa County. This change in acreage of forested land was not attributed to land use changes, but rather a more accurate estimation of forested land in the county, so acres of land use changes were kept constant at zero acres for 2023. All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows. Percentages are rounded to the nearest single digit.						

Wildfire

Wildfires create GHG emissions by burning organic materials such as trees and plants, releasing the carbon sequestered in these materials. Larger fires and those that burn through forested areas, as opposed to less densely vegetated ecosystems, release more GHG emissions. The County reported wildfires in the unincorporated area in 2005, 2013, and 2019, but not in 2017 or 2023. The acreages and emissions of these fires for the unincorporated area are reported in **Table 15**. Although wildfire emissions and acreages were lower in 2019 than in 2005, wildfire activity varies widely from year to year and is generally expected to increase in future years due to climate change. Wildfire emissions are not calculated in the totals presented in this appendix and are for informational purposes only.

TABLE 15. WILDFIRE ACTIVITY DATA AND GHG EMISSIONS, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Activity Data (Tons)						
Acres burned	2,070	6,320	0	1,830	0	-100%
Emissions (MTCO₂e)						
Total Annual MTCO ₂ e	14,270	66,080	0	10,100	0	-100%
2005 wildfires: Bragdon Fire, BNSF Fire, Byron Fire, Vasco Airport Fire, and an unnamed fire south of Antioch. 2013 wildfires: Kirker Fire and Morgan Fire. 2019 wildfires: Marsh 3 Fire, Marsh 5 Fire, Marsh 6 Fire. All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.						

Stationary Sources

Stationary source emissions result from fuel use, such as natural gas or propane, at large industrial facilities. These facilities include refineries, power plants, factories, and similar installations. Natural gas use at these facilities may be included as part of the nonresidential natural gas use reported by PG&E. Emissions from these facilities are regulated by CARB and BAAD, not the County. Therefore, emissions from these facilities are not counted toward the unincorporated county’s total GHG emissions.

Table 16 shows the emissions from stationary sources for the unincorporated area. This information is directly reported by CARB as total emissions. Activity data for stationary sources is not reported by CARB, which would include amounts of fuel burned at these facilities. In 2020, an oil refinery formerly known as Tesoro/Golden Eagle Refinery in the unincorporated county shut down operations and in the following years transitioned to producing renewable biofuels under the name Marathon Martinez Renewable Fuels. This closing of the Tesoro/Golden Eagle oil refinery was a major contributor to the stationary source emissions decrease from 2019 to 2023. Other industrial facilities, such as Phillips 66 in Rodeo,

TABLE 16. STATIONARY SOURCE GHG EMISSIONS, 2005-2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Emissions (MTCO₂e)						
Total Annual MTCO ₂ e	13,983,030	11,956,000	11,232,290	10,867,670	8,569,850	-39%
All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.						

Direct Access Electricity

Direct access electricity data was not provided for the calendar year of 2023 due to data privacy reasons related to the CPUC’s 15/15 Rule. See the Contra Costa County Climate Action and Adaptation Plan 2024 Update for information on the previous inventory’s account of direct access electricity. Direct access electricity, supplied by an Energy Service Provider (ESP) to large nonresidential customers, is regulated by the CPUC. The identities of direct access customers and the specific ESPs from which they purchase electricity are not made available to the public. Given the County’s limited ability to monitor and regulate the sale and use of direct access electricity, as well as historical inconsistencies in how direct access electricity use is reported, direct access emissions have historically been reported for informational purposes only, when available.

Per-person GHG Emissions

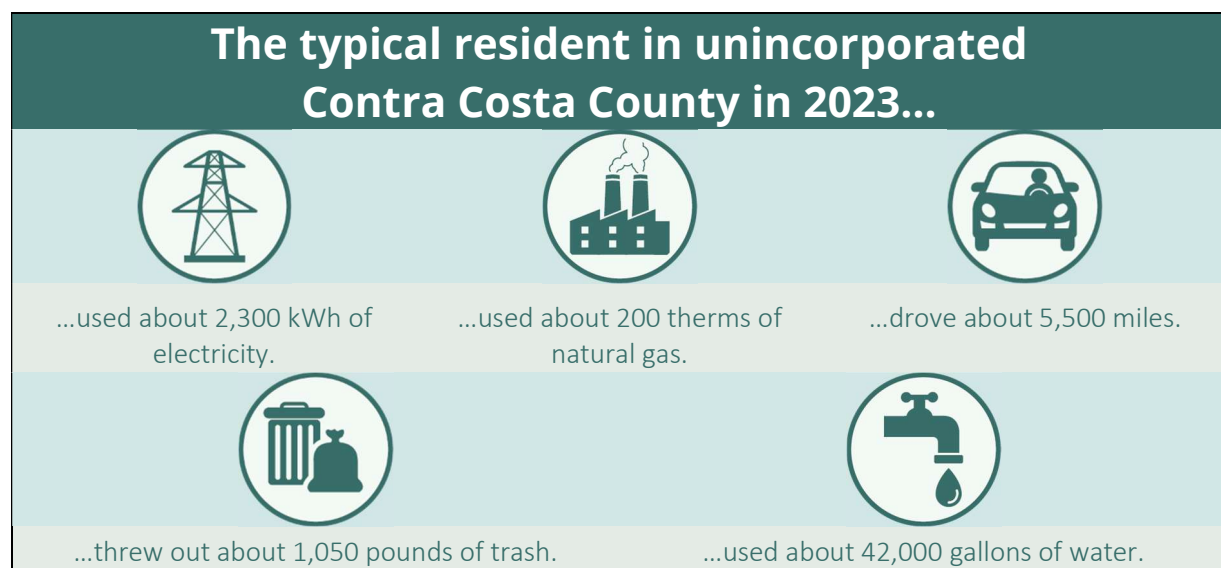
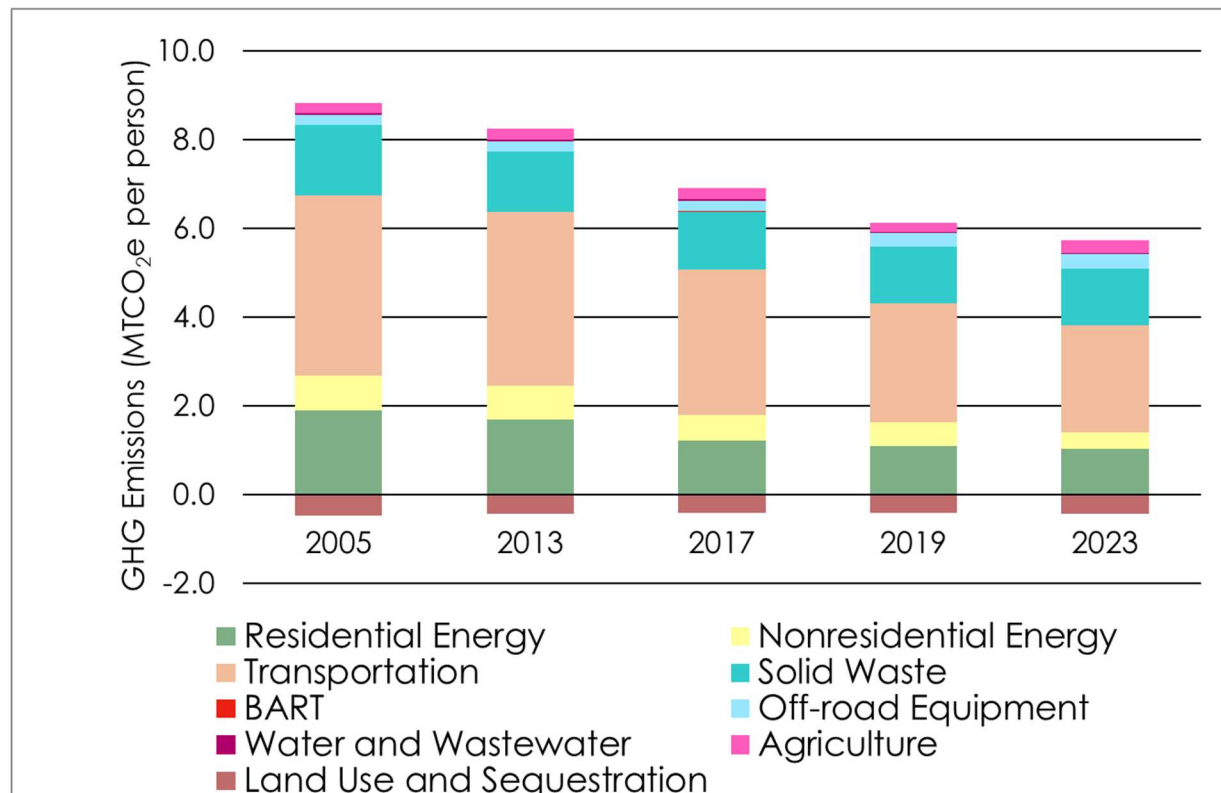
Along with the “absolute” GHG emission levels discussed previously, the per-person GHG emissions from the unincorporated county were assessed as well. Per-person GHG emissions were calculated by taking the absolute GHG emissions (shown earlier in **Table 3**) and dividing them by the number of residents in the unincorporated county for that inventory year. **Table 17** and **Figure 13** show the per-person emissions for the inventory years for the unincorporated county. Overall, per-person emissions declined 37 percent from 2005 to 2023. Most sectors saw per-person emissions decline. The two sectors that increased in per-person emissions, agriculture and off-road equipment, make up a relatively small portion of the overall emissions in the unincorporated county, as shown earlier in **Table 4**.

TABLE 17. PER-PERSON GHG EMISSIONS, 2005 TO 2023

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
Population						
Residents	154,270	165,700	174,110	174,150	174,978	+13%
Emissions (MTCO₂e per-person)						
Transportation	4.07	3.93	3.28	2.66	2.43	-40%
Energy - Residential	1.91	1.70	1.22	1.10	1.03	-46%
Energy - Nonresidential	0.77	0.76	0.58	0.54	0.37	-52%
Solid waste	1.58	1.36	1.29	1.28	1.26	-20%
Off-road equipment	0.22	0.22	0.25	0.31	0.34	+55%
Agriculture	0.22	0.24	0.26	0.21	0.28	+27%
Water and wastewater	0.05	0.04	0.03	0.03	0.01	-80%
BART	0.01	0.01	0.01	Less than 0.01	Less than 0.01	-83%
Land use and sequestration	-0.46	-0.43	-0.41	-0.41	-0.43	-7%
Total Annual MTCO₂e	8.37	7.82	6.51	5.73	5.30	-37%
Informational Items						
Stationary sources	90.64	72.15	64.51	62.40	48.98	-46%
Wildfire	0.09	0.40	0.00	0.06	0.00	N/A ¹
Direct access electricity	0.00	0.00	0.00	0.44	0.00	N/A ²

SECTOR	2005	2013	2017	2019	2023	PERCENT CHANGE 2005–2023
All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows. 1: Overall change between 2005 and 2023 is not calculated because of the high degree of year-to-year variability. 2: Overall change between 2005 and 2023 is not calculated because of limited availability of direct access electricity use data between 2005 and 2023.						

FIGURE 13. PER-PERSON ANNUAL GHG EMISSIONS BY SECTOR, 2005 TO 2023



COUNTY OPERATIONS INVENTORY

While GHG emissions from County government operations are a very small percentage of emissions countywide, it is important for the County to demonstrate in its day-to-day business its commitment to climate action.

General Methodology

CATEGORIES OF EMISSIONS ACTIVITIES

The County government operations emissions inventory assessed GHG emissions from the following 7 categories of activities, known as sectors.

- **Employee commute** includes GHG emissions created by County employees commuting to and from work, such as driving a car, taking public transit, walking, biking, etc.
- **Government fleet** includes GHG emissions created by the use of County fleet vehicles for County business, primarily from gasoline- or diesel-powered vehicles.
- **Buildings and facilities** includes GHG emissions attributed to the use of electricity and natural gas in County operated facilities.
- **Government-generated solid waste** includes the GHG emissions released from trash collected from County facilities that are taken to landfills.
- **Public lighting** includes GHG emissions attributed to the use of electricity for public lighting and traffic lights maintained by the County.
- **Refrigerants** includes GHG emissions from leaked refrigerants from County fleet vehicles, which often have a very high global warming potential when released into the atmosphere.
- **Water and wastewater** accounts for the electricity used to transport and process water and wastewater used or generated at County-run facilities, as well as direct emissions resulting from wastewater treatment activities.



County Operations Inventory Summary

Contra Costa County conducted government operations emissions inventories in 2006, 2017, and 2023. In 2006, County operations emissions totaled 54,090 MTCO₂e for the sectors reported in this inventory. In 2023, County operations emissions had decreased to 35,410 MTCO₂e, a 35 percent decrease in emissions despite a 33 percent increase in the number of County employees from 2006 to 2023. One of the most significant factors contributing to GHG emissions reductions for County operations from 2006 to 2023 was the shift in the sourcing of electricity in the county to almost entirely renewable sources.

Table 18 and **Figure 14** show the Contra Costa County government operations GHG emissions results of the three inventory years of 2006, 2017, and 2023. Some emissions results from the 2017 inventory (refrigerants, water/wastewater usage, and electricity usage) have been updated along with the publishing of the 2023 inventory results. The sectors that experienced the largest decrease in government operations GHG emissions between 2006 and 2023 were public lighting (99 percent), government fleet vehicles (64 percent), buildings and facilities (62 percent), and solid waste (58 percent). The sectors of refrigerants and water/wastewater were not included in the 2006 inventory but were included in the 2017 and 2023 inventories. Employee commute-related emissions only increased 3 percent from 2006 to 2023 despite a 33 percent increase in number of County employees.

Total County operations GHG emissions **decreased 35 percent** from 2006 to 2023, despite a 33 percent increase in number of County employees.

From 2017 to 2023, sectors of government operation-related emissions that decreased significantly were public lighting (99 percent), water/wastewater (88 percent), and buildings/facilities (43 percent). The decrease in each of these sectors can be mainly attributed to a significant increase in cleaner electricity provided by renewable energy sources rather than coal or gas-generated electricity. The County also switched from electricity provided by PG&E to electricity provided by MCE, which has more renewable energy content in its base plan power mix compared to PG&E. The GHG emissions associated with one kilowatt-hour (kWh) of electricity used by the County decreased 98 percent from 96 grams of CO₂e/kWh in 2017 to 1.8 grams of CO₂e/kWh in 2023.

Employee commute-related emissions have comprised the majority of the County operations GHG emissions in every inventory year and have increased 3 percent from 2006 to 2023. GHG emissions from escaped refrigerants have also increased from 2017 to 2023 due to an operational shift in how refrigerant is issued for fleet vehicles, but refrigerant emissions make up less than 1 percent of the overall MTCO₂e emissions.

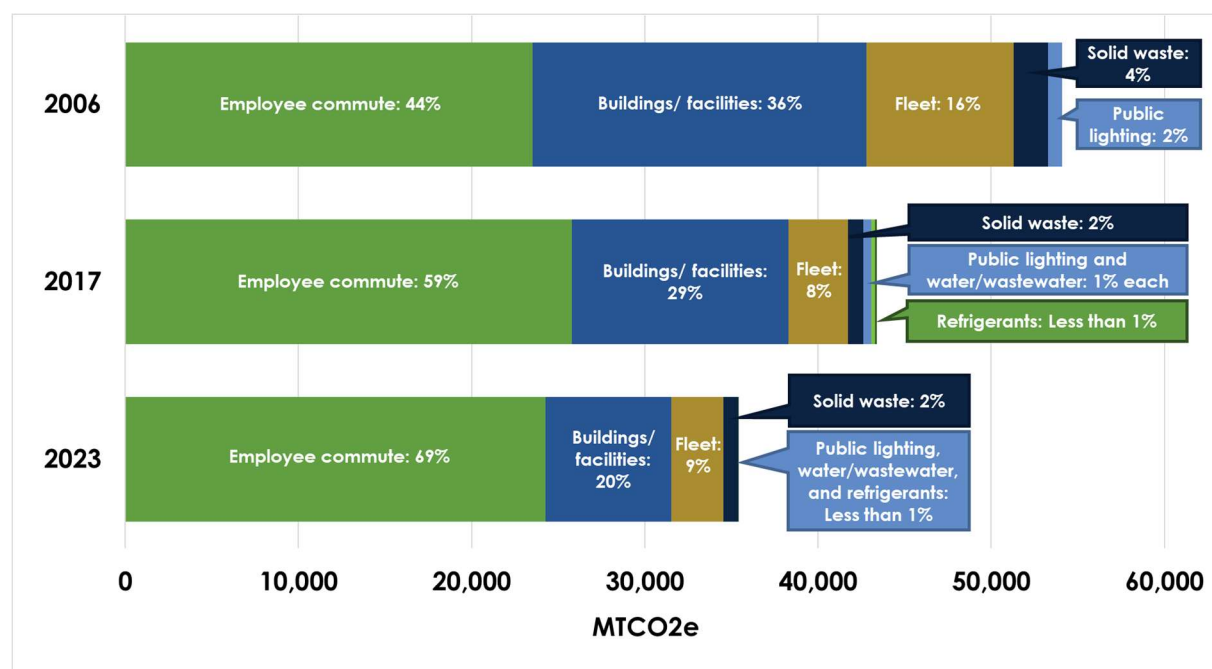
TABLE 18. COUNTY OPERATIONS GHG EMISSIONS SUMMARY, 2006 TO 2023

SECTOR	2006	2017	2023	PERCENT CHANGE 2006–2023
Employee commute	23,530	25,800	24,280	+3%
Buildings and facilities	19,260	12,500	7,250	-62%
Government fleet	8,500	3,430	3,020	-64%
Government-generated solid waste	1,980	900	840	-58%
Water and wastewater	Not included	220	30	-88%*
Public lighting	830	440	4	-99%
Refrigerants	Not included	1.2	1.6	+33%*
Total Annual MTCO₂e	54,090	43,380	35,410	-35%

Note: The estimated number of County employees increased 33% from 2006 to 2023.

*Refrigerants and water/wastewater sectors were not included in the 2006 inventory, so the percent change value shown is calculated from 2017 to 2023.

Numbers greater than 10 are rounded to the nearest 10. Numbers less than 10 are rounded to the nearest single digit. Totals may not equal the sum of individual rows.

FIGURE 14. COUNTY OPERATIONS ANNUAL GHG EMISSIONS BY SECTOR, 2006 TO 2023

The proportions of each GHG emissions sector compared to the total GHG emissions for each inventory year are presented in **Figure 14** and **Table 19**. The employee commute sector has consistently been the largest source of GHG emissions related to County operations, accounting for 69 percent of total County operations GHG emissions in 2023. County buildings and facilities are the second-largest source of emissions, comprising 20

percent of County operations emissions in 2023. Fuel usage by County fleet vehicles is the third largest emissions source, comprising 9 percent of emissions in 2023. Smaller emissions sectors of government-generated solid waste, water and wastewater treatment, refrigerants, and public lighting combined made up less than 3 percent of the County's emissions in 2023.

TABLE 19. SECTOR PORTIONS OF GHG EMISSIONS FOR COUNTY OPERATIONS, 2006 TO 2023

SECTOR	2006	2017	2023
Employee commute	44%	59%	69%
Buildings and facilities	36%	29%	20%
Government fleet	16%	8%	9%
Government-generated solid waste	4%	2%	2%
Water and wastewater	Not included	1%	Less than 1%
Public lighting	2%	1%	Less than 1%
Refrigerants	Not included	Less than 1%	Less than 1%
Total Annual MTCO₂e	100%	100%	100%
All percentages are rounded to the nearest single digit. Totals may not equal the sum of individual rows.			

Emissions by Sector

Employee Commute

Employee commute-related emissions made up the largest sector of County operations GHG emissions in 2023 by far, at 69 percent of total emissions. Although employees’ personal commute is not under the direct operational control of the County, there are a variety of tools and resources available to influence employees’ commute patterns. For this reason, emissions are included in this inventory. Employee commute accounted for in the emissions inventory includes travel via personal vehicles, carpool, biking, walking, and public transit.

In 2025, an employee commute survey was conducted to provide a sample of commute patterns and modes of transportation that County employees use to get to/from work. The survey was completed by 2,338 employees across 25 County departments, which is over 20% of the total number of County employees. The GHG emissions calculated from the survey responses were then scaled up to represent the emissions for all County employees in 2023. Notably, approximately 97 percent of commute-related GHG emissions came from employees driving alone in a gasoline-powered car in 2023. **Table 20** shows the employee commute-related emissions across the County operations GHG emissions inventory years of 2006, 2017, and 2023.

Employees **working from home, carpooling, and driving electric vehicles** in 2023 prevented enough emissions to equal taking **1,630 gas-powered cars off the road for one year.**

TABLE 20. EMPLOYEE COMMUTE ANNUAL GHG EMISSIONS, 2006 TO 2023

ACTIVITY/SOURCE	2006	2017	2023	PERCENT CHANGE 2006–2023
Total employee commute emissions (MTCO ₂ e)	23,530	25,800	24,280	+3%
Growth in number of County employees (from previous inventory)	Baseline	+19% (2006 to 2017)	+12% (2017 to 2023)	+33% (2006 to 2023)
Per-employee commute emissions (MTCO ₂ e/employee)	2.79	2.57	2.16	-22%
Portion of total County operations GHG emissions	44%	59%	69%	+25%
Percentages are rounded to the nearest single digit. Emissions results are rounded to the nearest 10. Totals may not equal the sum of individual rows.				

In 2023, County employees' commute to work contributed to 24,280 MTCO₂e. This was a 3 percent increase in GHG emissions from the 23,530 MTCO₂e reported in 2006 and a slight reduction from the 25,800 MTCO₂e reported in 2017. The County's number of employees grew by approximately 33 percent from 2006 to 2023. However, the per-employee commute-related emissions value decreased by 22 percent from 2006 to 2023. Factors that contributed to the decrease in per-employee commute-related emissions over this time were increased usage of electric vehicles; increased vehicle fuel efficiency; and the implementation of more work-from-home options for eligible employees at County facilities. It is estimated that 7,480 MTCO₂e in commute-related emissions were avoided in 2023 (a 24 percent reduction) due to employees working from home, carpooling, and driving electric vehicles. Electricity used to charge electric cars was counted as part of the community-wide GHG inventory. See **Table 21** for a summary of 2023 County employee commute activity data and GHG emissions.

TABLE 21. 2023 EMPLOYEE COMMUTE ACTIVITY DATA AND GHG EMISSIONS

ACTIVITY/SOURCE	ACTIVITY DATA	UNITS	GHG EMISSIONS (MTCO ₂ E)	PERCENT OF EMISSIONS
Driving alone (gas, diesel, and gas hybrid)	71,988,390	Vehicle miles	23,650	97%
Driving alone (electric)	8,818,520	Vehicle miles	0	0%
Carpool (gas, diesel, and gas hybrid)	1,049,890	Passenger miles	350	1%
Carpool (electric)	133,630	Passenger miles	0	0%
Public transit (BART, bus, ferry, and Amtrak)	1,711,200	Passenger miles	260	1%
Motorcycle	59,320	Vehicle miles	13	Less than 1%
Active transportation (walk, bike, scooter)	234,280	Miles	0	0%
Total	83,995,230	Miles	24,280	100%
<i>Informational Items: Estimated Emissions Reductions</i>				
Emissions avoided by working from home*	12,271,850	Vehicle miles	-4,050	-13%
Emissions avoided by driving electric vehicles*	8,952,150	Vehicle miles	-2,960	-9%
Emissions avoided by carpooling*	1,423,470	Vehicle miles	-470	-2%
Total miles and emissions avoided	22,647,470	Vehicle miles	-7,480	-24%
All numbers greater than 100 are rounded to the nearest 10. Percentages were rounded to the nearest single digit. Totals may not equal the sum of individual rows. * Emissions reduction estimates assumed that employees would have been commuting to work by driving alone in a gasoline-powered car.				

Buildings and Facilities

The buildings and facilities sector represented 20 percent of County operations emissions in 2023. This sector includes electricity and natural gas use at County-owned and operated buildings and facilities. Emissions from this sector totaled 7,250 MTCO₂e in 2023, a 62 percent decrease from the 19,030 MTCO₂e of emissions reported in 2006. Notably, emissions from electricity use decreased by 99 percent from 6,200 MTCO₂e in 2017 to just 64 MTCO₂e in 2023. This means that natural gas usage comprised over 99 percent of GHG emissions from energy use at County buildings and facilities in 2023. **Table 22** shows the energy usage and associated GHG emissions of electricity and natural gas usage at County buildings and facilities during the three inventory years.

TABLE 22. BUILDINGS AND FACILITIES ENERGY USAGE AND EMISSIONS, 2006 TO 2023

ACTIVITY/SOURCE	2006	2017	2023	PERCENT CHANGE 2006–2023
Activity Data				
Natural gas usage (therms)	N/A	1,183,830	1,352,620	+14% (2017 to 2023)
Electricity usage (kWh)	N/A	41,964,520	35,128,420	-16% (2017 to 2023)
Emissions Data				
Natural gas use emissions (MTCO ₂ e)	11,360	6,300	7,180	-37%
Electricity use emissions (MTCO ₂ e)	7,670	6,200	64	-99%
Total (MTCO₂e)	19,030	12,500	7,250	-62%
Portion of total County operations GHG emissions	35%	29%	20%	-15%
Percentages are rounded to the nearest single digit. Values greater than 100 are rounded to the nearest 10. Totals may not equal the sum of individual rows.				

Between 2017 and 2023, emissions related to electricity usage dropped by 98 percent. This decrease is attributed to a significant decrease of 97 percent in the MTCO₂e emissions per unit of electricity usage because electricity provided in the county was sourced from more renewable sources and is rapidly approaching zero-emissions. The County also switched energy providers from PG&E to MCE between 2017 and 2023. MCE offered a base plan energy mix in 2023 that had approximately three times less GHG emissions associated with electricity usage than PG&E's base plan energy mix. During this time, some County electricity accounts were opted into MCE's Deep Green electricity tier, which provides electricity from 100% renewable sources. Natural gas emissions in 2023 were slightly increased from 2017, but still 37 percent less than natural gas emissions reported in 2006.

Government (County) Fleet

Contra Costa's vehicle fleet emissions totaled 3,020 MTCO₂e in 2023(see **Table 23**), which represented 9 percent of County operations emissions. This was a 64 percent decrease from 2006's 8,500 MTCO₂e of emissions for fleet operations. The vehicles and equipment used in the County's daily operations burn unleaded gasoline, diesel, compressed natural gas, and E85, which contribute to GHG emissions. As of 2025, the County has also begun incorporating electric vehicles into the County fleet to phase out GHG-emitting vehicles used for County operations.

TABLE 23. GOVERNMENT FLEET VEHICLE EMISSIONS, 2006 TO 2023

ACTIVITY/SOURCE	2006	2017	2023	PERCENT CHANGE 2006–2023
Fuel consumption (gallons)	N/A	387,530	356,010	-8% (2017 to 2023)
Total fleet emissions (MTCO₂e)	8,500	3,430	3,020	-64%
Portion of total County operations GHG emissions	16%	8%	9%	-7%
Percentages are rounded to the nearest single digit. Emissions results are rounded to the nearest 10. Totals may not equal the sum of individual rows.				

Table 24 shows the County fleet vehicles' fuel usage data and associated emissions in 2023. Approximately 95 percent of County fleet GHG emissions in 2023 were from driving gasoline-powered vehicles.

TABLE 24. 2023 GOVERNMENT FLEET VEHICLE ACTIVITY DATA

TYPE OF FUEL	GALLONS USED	EMISSIONS (MTCO ₂ e)	PERCENT OF EMISSIONS
Unleaded gasoline	344,890	2,880	95%
Diesel	10,200	130	4%
Compressed natural gas	870	7	Less than 1%
E-85 (gasoline-ethanol blend)	50	0.4	Less than 1%
Total	356,010	3,020	100%
Percentages are rounded to the nearest single digit. Values greater than 10 are rounded to the nearest 10. Totals may not equal the sum of individual rows.			

Solid Waste

The solid waste sector represented 2 percent of County operations emissions in 2023. County operations generate solid waste during normal activity, much of which is eventually taken to landfills. Emissions from this sector are estimates of methane generation that will result in future years from the waste that was sent to landfills in the inventory year. As shown in **Table 25**, solid waste generated by County employees was estimated to total 840 MTCO₂e in the year of 2023, a 58 percent decreased from 2006. It should be noted that the solid waste going to landfills is not directly measured from County facilities, therefore making the amount of solid waste generated by County operations difficult to track. The 2023 estimate for GHG emissions from government-generated solid waste assumed that solid waste generated by the County had the same year-to-year trend as overall county waste data from the county’s community-wide inventory, which used solid waste data from CalRecycle. In other words, the same percent change (a 7 percent decrease) in unincorporated county solid waste generation from 2017 to 2023 was applied to County government-generated solid waste over the same timeframe to estimate 2023 County operations solid waste generation.

TABLE 25. COUNTY OPERATIONS SOLID WASTE EMISSIONS, 2006 TO 2023

SECTOR	2006	2017	2023	PERCENT CHANGE 2006–2023
Total government-generated solid waste emissions (MTCO ₂ e)	1,980	900	840	-58%
Portion of total County operations GHG emissions	4%	2%	2%	-2%
Percentages are rounded to the nearest single digit. Emissions results are rounded to the nearest 10. Totals may not equal the sum of individual rows.				

Public Lighting

Emissions from the energy use of public lighting owned by the County, such as streetlights, totaled 4 MTCO₂e in 2023, less than 1 percent of overall County operations emissions. This was a 99 percent decrease from the 830 MTCO₂e emitted in 2006. This decrease, like all other decreases in emissions related to electricity usage, was due to the sourcing of electricity from almost entirely renewable sources. **Table 26** shows the activity data and emissions from public lighting usage across the inventory years.

TABLE 26. PUBLIC LIGHTING USAGE AND EMISSIONS, 2006 TO 2023

ACTIVITY/SOURCE	2006	2017	2023	PERCENT CHANGE 2006–2023
Public lighting electricity usage (kWh)	N/A	2,390,140	2,130,340	-11% (2017-2023)
Emissions (MTCO₂e)	830	440	4	-99%
Portion of total County operations GHG emissions	1.53%	1.01%	0.01%	-1.52%
Values greater than 10 are rounded to the nearest 10. Totals may not equal the sum of individual rows.				

Water and Wastewater

The water and wastewater sector comprised less than 1 percent of County operations emissions in 2023. This sector includes the emissions from the electricity needed to move and process the water used and the wastewater generated by County government facilities (indirect water and wastewater), along with direct emissions caused by the processing of County-generated wastewater. Lack of reliable data for water usage in 2017 made it difficult to explain the 29 percent decrease from 2017 to 2023. A high margin of error may be present with the 2017 data, but the team was more confident with the accuracy of 2023 water usage data. Water use and wastewater generation at County facilities generated a total of 25 MTCO₂e in 2023, an 89 percent decrease from 2017, shown in **Table 27**. The water and wastewater sector was not included in the 2006 baseline inventory.

TABLE 27. WATER AND WASTEWATER USAGE AND EMISSIONS, 2006 TO 2023

ACTIVITY/SOURCE	2006	2017	2023	PERCENT CHANGE 2017–2023
Activity Data				
Water usage (gallons)	Not included	206,305,440	146,131,280	-29%
Wastewater generation (gallons)	Not included	94,412,860	67,220,390	-29%
Emissions				
Indirect water emissions (MTCO ₂ e)	Not included	178	2	-99%
Indirect wastewater emissions (MTCO ₂ e)	Not included	23	0.5	-98%
Direct wastewater emissions (MTCO ₂ e)	Not included	22	24	+9%
Total emissions (MTCO₂e)	Not included	223	25	-89%

ACTIVITY/SOURCE	2006	2017	2023	PERCENT CHANGE 2017–2023
Portion of total County operations GHG emissions	Not included	0.51%	0.07%	-0.44%
Percent change is rounded to the nearest single digit. Values greater than 10 are rounded to the nearest 10. Totals may not equal the sum of individual rows.				

Refrigerants

Escaped refrigerants comprised less than 1 percent of County operations emissions in 2023. Vehicles with air conditioning use refrigerants that can leak from the air conditioning system during normal operations or maintenance. These refrigerants are often GHGs that trap a very large amount of heat per unit of gas, known as gases with a very high global warming potential. Refrigerant recharge data and subsequent GHG emissions from the 2017 inventory were updated after reviewing and verifying the 2017 data.

Refrigerant emissions contributed to 1.6 MTCO₂e in 2023. This is an increase from the 1.2 MTCO₂e emitted in 2017 because of one large refrigerant recharge in 2023 issued to the machine that refills refrigerant in fleet vehicles' air conditioning systems. Between 2017 and 2023, the County changed the internal process for tracking issued refrigerant. As of 2025, the refrigerant recharged is tracked by refilling the air conditioning machine that cycles and refills vehicles' refrigerant during service operations. The 44 ounces of refrigerant reported for 2023 was calculated by assuming the 88-ounce recharge to the machine in 2023 would last approximately 2 years, because the machine had not been refilled again as of July 2025. Emissions from refrigerants accounted for less than 1 percent of the overall County operations GHG emissions for 2023, as shown in **Table 28**.

TABLE 28. REFRIGERANT USAGE AND EMISSIONS, 2006 TO 2023

ACTIVITY/SOURCE	2006	2017	2023	PERCENT CHANGE 2017–2023
Activity Data				
Refrigerant used (ounces of R-134a)	Not included	33	44	+33%
Emissions				
Refrigerant emissions (MTCO₂e)	Not included	1.2	1.6	+33%
Portion of total County operations GHG emissions	Not included	0.003%	0.005%	+0.002%
Percent change is rounded to the nearest single digit. Values greater than 10 are rounded to the nearest 10. Totals may not equal the sum of individual rows.				

APPENDIX

Protocols

A series of guidance documents, called protocols, provide recommendations on how to adequately assess GHG emissions. The project team prepared the new GHG inventories and updates to past GHG inventories consistent with the guidance in widely adopted, standard protocol documents. These protocols provide guidance on what activities should be evaluated in the GHG inventories and how emissions from those activities should be assessed. Using standard methods also allows for an easy comparison of GHG emission levels across multiple years and communities.

- The County operations GHG inventory relies on the Local Government Operations Protocol (LGOP), which was first developed in 2008 and was updated in 2010. The LGOP is a tool for accounting and reporting GHG emissions of local government (municipal) operations and is used throughout California and the United States. The LGOP includes guidance from several existing programs as well as the state's mandatory GHG reporting regulations.
- The community-wide GHG inventory uses the United States Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol), which was first developed in 2012 and updated most recently in 2019. The California Governor's Office of Planning and Research encourages cities and counties in California to follow the U.S. Community Protocol for community-wide GHG emissions.
- A third protocol, the Global Protocol for Community-Scale Greenhouse Gas Inventories (Global Protocol) was first developed in 2014 and is intended for use in preparing international community-scale GHG inventories. It is largely consistent with the U.S. Community Protocol, although it contains additional guidance and resources to support a wider range of activities that may be found in other countries. The project team has used the Global Protocol to assess GHG emissions from sources that are not covered in the U.S. Community Protocol.

GHG inventories are estimates of GHG emissions based on these standard methods and verified datasets. While they are not direct measurements of GHG emissions, the use of the standard methods identified in the protocols, in combination with accurate data from appropriate sources, allows GHG inventories to provide reliable estimates of local emission levels. Due to potential data limitations, some inconsistencies in methods may remain. Any concerns about inconsistent methods are noted in the appropriate sector discussion.

Community-Wide Inventory Data Collection Methods

TABLE 29. 2023 COMMUNITY-WIDE INVENTORY DATA COLLECTION METHODS

GHG EMISSIONS SOURCE	COLLECTION METHODS
Residential, Commercial, and Industrial Electricity and Natural Gas Use	- Obtain usage data for unincorporated county from PG&E, as three sector totals. - Electricity usage in kWh was multiplied by the carbon emissions factor (using correct units) for each electricity service provider (MCE or PG&E) from each provider's Power Content Label reported to the California Energy Commission. - Carbon emissions factor for natural gas usage was 11.7 lbs CO₂e/therm, provided by PG&E. Natural gas usage was multiplied by this emissions factor to yield GHG emissions.
Nonresidential Natural Gas Usage	- This would typically be included in the PG&E data mentioned above, however, it has not been provided for the unincorporated county since 2013 due to the California Public Utilities Commission's 15/15 Rule for customer data privacy. - Annual nonresidential natural gas usage data is available for the entirety of the county from the California Energy Commission, so the unincorporated county nonresidential natural gas usage for 2023 was estimated by starting at the known 2013 usage and applying the same annual percent change each year as the overall county nonresidential natural gas usage from the CEC.
Alternative Home Heating Fuels	- Overall county data and statewide data of the number of households powered by alternative home heating fuels (propane gas, kerosene, coal or coke, wood, etc.) was obtained from the <u>U.S. Census Bureau's House Heating Fuel Survey 5-Year Estimate Table B25040</u>. - Number of households in the unincorporated county using each fuel type was calculated by taking the overall county data and subtracting the data for all incorporated cities. - Statewide data from the <u>U.S. Energy Information Administration's State Energy Data System</u> was utilized to obtain the annual statewide usage of propane, kerosene, wood, and distillate fuel oil for home heating.

GHG EMISSIONS SOURCE	COLLECTION METHODS
	• The average usage of each fuel type per household that is heated by that fuel type was calculated by taking the overall statewide usage for each fuel type divided by overall statewide household numbers for each fuel type. • Unincorporated county home heating fuel usage for each fuel type was calculated by multiplying the statewide average of usage of each fuel type per household using that fuel type times the number of unincorporated county households using that fuel type.
Transportation	• Total daily vehicle miles traveled (DVMT) data derived from Contra Costa County's 2023 data from the CARB's EMFAC2025 V2.0.0 model for on-road transportation. The EMFAC model outputs the DVMT for each type of vehicle, so overall county DVMT is calculated by summing the DVMT from each vehicle type. In the 2019 inventory, the DVMT for the unincorporated county was calculated by multiplying the overall county DVMT by 12.5%, so this same method was used for the 2023 inventory.
Solid Waste	• Total waste tonnage and total alternative daily cover were obtained from CalRecycle's Report 1: Overall Jurisdiction Tons for Disposal and Disposal Related Uses data tool. The quarterly sum for 2023 for the jurisdiction of "Contra Costa – Unincorporated" was input to retrieve data. • The statewide 2021 Disposal-Facility-Based Characterization of Solid Waste in California from CalRecycle was the most updated study as of July 2025. The waste characterization study data was used to calculate the weighted average of GHG emissions per ton of waste generated. This allowed the tons of waste produced in the unincorporated county to be multiplied by the GHG emissions per ton of waste generated factor to yield the GHG emissions associated with solid waste generated in the unincorporated county • Waste in place data was updated from the previous inventory by importing new annual amounts of waste deposited at the Keller Canyon and Acme landfills for the years 2020-2023 from CalRecycle's Report 3: Disposal Facility Summary of Total Tons For Disposal and Beneficial Reuse Material Streams. • Waste in place emissions were calculated using the county's own customized version of the California Air Resources Board's Landfill Tool, which calculates

GHG EMISSIONS SOURCE	COLLECTION METHODS
	annual emissions from tons of waste in place and alternative daily covered applied at the three landfills in the county: Acme Landfill, Keller Canyon Lanfill, and West Contra Costa Landfill (now out of service).
Water and Wastewater	• Annual water usage for unincorporated county customers was provided by East Bay Municipal Utility District (EBMUD) and Contra Costa Water District (CCWD), the two largest suppliers of water in the county. • Wastewater generated in gallons was calculated using the amount of water supplied multiplied by the ratio of average amount of water in CA used indoors divided by the sum of water used indoors and outdoors. • Indirect emissions for both water and wastewater were calculated by using studied electricity usage coefficients of average amount of electricity needed to move a specific amount of water for EBMUD and CCWD, multiplied by the emissions coefficient from MCE (MTCO₂e/kWh), assuming the electricity was provided by the Light Green electricity tier. • Direct emissions from wastewater treatment were calculated by parsing out the types of wastewater treatment used in the county: activated sludge, advanced, and advanced with nitrification. Specific calculations were used to calculate emissions from digesters, lagoons, systems with or without nitrification, and septic tanks.
BART	• BART ridership for the month of April 2023 was obtained from BART's Ridership Reports. April has been chosen in past GHG inventories as a representative month for average ridership to project to the entire year. • Entries/exits at each BART station in Contra Costa were summed in the same manner as previous inventories to determine the average monthly passenger miles in the county. • BART's 2023 Sustainability Report provided information on total annual vehicle revenue miles (VRM), total passenger miles, total energy use per VRM, and total GHG emissions per 1000 VRM. These values were used to compute the emissions per passenger mile. • Knowing both annual passenger miles in the county and BART's emissions factor of MTCO₂e emissions per

GHG EMISSIONS SOURCE	COLLECTION METHODS
	passenger mile, the two values were multiplied to yield BART-related GHG emissions.
Off-Road Equipment	• CARB's Off-Road Emissions Inventory, using the EMFAC2025 v2.0.0 model, was queried to obtain off-road equipment data for the entirety of the county. • Each equipment type's CO₂/day, CH₄/day, and N₂O/day were summed for the county. MTCO₂e/year were calculated for each equipment type. Emissions at this point were calculated for the overall county, both incorporated and unincorporated areas. • To calculate emissions for unincorporated areas, the emissions per year for each equipment type were allocated by varying methods, such as acres of agricultural land, acres of industrial land, service population, and jobs. This methodology is consistent with the 2019 GHG inventory. • For example, agricultural equipment emissions for the unincorporated county were allocated by multiplying the emissions for the overall county by the ratio of agricultural acres in unincorporated areas to the agricultural acres in the overall county.
Agriculture	• Crop and livestock data were obtained from Dept. of Agriculture / Weights & Measures in the annual <u>Crop and Economic Report</u>. • Crop acreage was summed for each crop type, and an emissions coefficient associated with average amounts of nitrogen applied were used to calculate crop-related emissions. Equipment-related emissions were accounted for in the "Off-road equipment" sector, not in this one. • Livestock population for each type of livestock were summed, but only cattle were accounted for in this inventory. Emissions related to manure management and enteric fermentation were calculated from the number of cattle present in the county.
Land Use and Sequestration	• Previously, the acres of each type of land use were assumed constant for all GHG inventories prior to 2023. The Alameda and Contra Costa Fine Scale Vegetation Map was published in 2025 by the East Bay Regional Park District (EBRPD), so County staff analyzed this dataset to update the acres of trees in the unincorporated areas of the county. • The GIS team at Dept. of Conservation and Development analyzed the 2025 EBRPD dataset and calculated the acres of different types of trees

GHG EMISSIONS SOURCE	COLLECTION METHODS
	present in unincorporated areas of Contra Costa county. The same methodology of previous GHG inventories was used to calculate the metric tons of carbon sequestered by different types of trees (urban trees, deciduous, and evergreen) in the unincorporated county.
Wildfire	CalFire's <u>Historical Fire Perimeters</u> database was utilized to search for both controlled burns and wildfires that occurred within the unincorporated county for the inventory year. Acres of fires were summed up for four ecosystem types (forest, shrubland, woodland, and grassland) and emissions were calculated using emissions coefficients for each ecosystem type.
Stationary Sources	Emissions from large industrial sources were obtained from CARB's Pollution Mapping Tool, which displays the location of every facility that is required to report emissions to CARB and their reported annual MTCO₂e emissions. These emissions were summed only for facilities that exist in the unincorporated areas of the county.
Direct Access Electricity	Historically, direct access electricity has been provided alongside the residential and nonresidential electricity usage data from PG&E. For 2023, PG&E did not provide direct access electricity usage for data privacy reasons (the 15/15 Rule established by the California Public Utilities Commission's Decision No. 97-10-031).

County Operations Inventory Data Collection Methods

TABLE 30. 2023 COUNTY OPERATIONS INVENTORY DATA COLLECTION METHODS

GHG EMISSIONS SOURCE	COLLECTION METHODS
Employee Commute	- Employee commute survey of 2,338 employees conducted in 2025 by the Dept. of Conservation & Development and 511 Contra Costa. This survey collected information on modes of transit that employees take to get to work, how often they commute to work or work from home, and the distance they must travel in their commute. Survey results were used to calculate the annual GHG emissions associated with each survey response. Annual emissions were then summed within each transportation mode category (driving alone in a gas car, taking BART, etc.). Each mode's emissions were then multiplied by a scaling factor to estimate the entire County's employee commute results. - The factors of GHG emissions per vehicle mile traveled were obtained using Contra Costa County's 2023 data from the CARB's EMFAC2025 V2.0.0 model for on-road transportation. These emissions factors include those for vehicles classified as plug-in hybrid, diesel, gasoline, and bus. The emissions factors for BART and Amtrak were obtained from the BART 2023 Sustainability Report and Amtrak 2023 Sustainability Report, respectively. - Employment data (to scale survey sample results to all employees) was obtained from the County Administrator's Office. Specifically, the number of filled, regular positions on July 1 of the inventory year was used as the total number of County employees.
Buildings and Facilities	- Usage data for all County accounts from PG&E. - Obtain list from MCE of County accounts receiving electricity and their tier of service (Light Green, Deep Green, etc.). - Match County accounts with their electricity tier for MCE. All accounts apply toward buildings and facilities, except those with rate codes that contain "LS", which are street lights that are accounted for in the Public Lighting sector. - Use MCE's Power Content Label (available from the California Energy Commission website) to assign the

GHG EMISSIONS SOURCE	COLLECTION METHODS
	proper emissions factor for each calculation of GHG emissions for each County facility account.
Government Fleet Vehicles	- Fuel consumption data for all fleet vehicles, parsed out by fuel type, from the Public Works Dept. Fleet Maintenance Manager. - Obtain the emissions factors for each fuel type from Contra Costa County's 2023 data from the CARB's EMFAC2025 V2.0.0 model for on-road transportation. Multiply the gallons of each fuel used by the correct emission factor to obtain GHG emissions for each fuel type.
Solid Waste	Solid waste from County facilities is not weighed, so this sector is estimated. Apply the same year-to-year percent change from unincorporated county solid waste emissions to County operations solid waste emissions over the same timeframe of the last GHG inventory to the current GHG inventory. This appears to be how the 2017 County operations solid waste generation number was calculated, so the same methodology was used for the 2023 inventory.
Public Lighting	- Usage data in kWh for all County accounts provided by PG&E. - Repeat same steps listed above for Buildings and Facilities, but only using accounts with rate codes that begin with "LS" to signify street lighting.
Water and Wastewater	- For water usage, obtain data for all County accounts from Finance team in Public Works Dept. - Sum usage in gallons (and convert CCF to gallons, if necessary) for all County accounts. - Wastewater was calculated using the same methodology as the community-wide inventory, using the water usage data as a starting point.
Refrigerants	- Sum ounces of refrigerant provided in log of refrigerant Inventory Issue Journal obtained from the Public Works Dept. Fleet Maintenance Manager. - In 2023, a large dispersal of 88 ounces of refrigerant was logged, which was dispensed to the machine in the maintenance shop that refills the refrigerant in vehicles' air conditioning systems. Because the 88 ounces of refrigerant will likely last for multiple years before the machine needs to be refilled again, the team decided to conservatively estimate that the 88 ounces will last two years. This assumption led the team to estimate that 44 ounces of refrigerant escaped from vehicles in 2023.

REFERENCES

- 511 Contra Costa (2025). "Contra Costa County Employee Commute Survey." Retrieved response data from 511 Contra Costa representative.
- Bay Area Rapid Transit (2024). "Calendar Year 2023 Annual Report: Sustainability." Retrieved from: <<https://www.bart.gov/sites/default/files/2024-07/2023%20Sustainability%20Report-071124a.pdf>>
- Bay Area Rapid Transit (2025). "Ridership Reports – April 2023" Retrieved from: <<https://www.bart.gov/about/reports/ridership>>
- California Air Resources Board (2025). "CARB Pollution Mapping Tool." Version 2.6. Retrieved from: <<https://ww2.arb.ca.gov/resources/carb-pollution-mapping-tool>>
- California Air Resources Board (2025). "Off-Road Emissions Inventory." Retrieved from: <<https://arb.ca.gov/emfac/offroad/emissions-inventory/47ab6a5c937b039319a63afd7df94ec503ccd733>>
- California Air Resources Board (2025). "On-Road (EMFAC) – Mobile Source Emissions Inventory." Retrieved from: <<https://ww2.arb.ca.gov/our-work/programs/msei/on-road-emfac>>
- California Department of Resources Recycling and Recovery (CalRecycle) (2024). "2021 Disposal-Facility-Based Characterization of Solid Waste in California (DRRR-2024-1737)." Retrieved from: <<https://www2.calrecycle.ca.gov/Publications/Details/1738>>
- California Department of Resources Recycling and Recovery (CalRecycle) (2025). "Recycling and Disposal Reporting: Reports List." Retrieved from: <<https://www2.calrecycle.ca.gov/RecyclingDisposalReporting/Reports>>
- California Energy Commission (2024). "Annual Power Content Labels for 2023." Retrieved from <<https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label>>
- California Energy Commission (2025). "Light-Duty Vehicle Population in California." Data last updated May 16, 2025. Retrieved from <<https://www.energy.ca.gov/zevstats>>
- California Energy Commission (2025). "Zero Emission Vehicle and Infrastructure Statistics." Data retrieved from report published in September 2023. Retrieved from <<https://www.energy.ca.gov/zevstats>>
- Contra Costa County Dept. of Agriculture / Weights & Measures (2025). "2023 Contra Costa Agricultural Crop Report." Retrieved from: <<https://www.contracosta.ca.gov/2207/Crop-and-Economic-Reports>>

East Bay Regional Park District, CAL FIRE, Tukman Geospatial LLC. 2025. "Alameda and Contra Costa County Fine Scale Vegetation Map." Map available at: <https://experience.arcgis.com/experience/0827ad50653b48b891ce891dc34620c4>

ICLEI – Local Governments for Sustainability USA (July 2019). "U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions." Version 1.2. Retrieved from: <https://iclei.org/us-community-protocol/>

Pacific Gas & Electric (2024). "Community Wide GHG Inventory Report for UNINC CONTRA COSTA CO 2005 to 2023." Data last updated 8/15/2024. Retrieved from PG&E Representative.

U.S. Census Bureau (2004). "B25040 - House Heating Fuel - Census Bureau Tables." Retrieved from: <https://data.census.gov/table?q=B25040&g=040XX00US06>

U.S. Energy Information Administration (2025). "State Energy Data Systems (SEDS): 1960-2023 (complete)." Retrieved from: <https://www.eia.gov/state/seds/seds-data-complete.php?sid=US>