LOS ALAMOS

2022 Community-Wide and County Operations Sector-Based Greenhouse Gas Emissions Inventories

December 2023

LOS ALAMOS
where discoveries are made

Contents

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GLOSSARY

Key Term	Definition
Activity data	Data which reflects the magnitude of activities which results in emissions. Examples of activity data might include amount of energy consumed, vehicle miles traveled, or tons of waste produced.
Baseline year	The starting year to measure emissions reduction targets from.
Denitrification	Conversion of nitrate to nitrogen gas.
Effluent	Liquid waste or sewage discharged into bodies of water such as a river or stream.
Emission factor	Values that are used to determine the amount of a specific greenhouse gas emitted based on one unit of activity data. Examples of emission factors include metric tons of carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), or CO_2 equivalence emitted per kilowatt hour of electricity consumed, per pound of refrigerant used, or per vehicle mile traveled.
Greenhouse gases (GHGs)	Gases that trap heat in the atmosphere. The Local Government Operations Protocol defines GHGs as the six gases identified in the Kyoto Protocol: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).
Metric ton ($MTCO_2e$)	Metric tons of carbon dioxide equivalent. The most common unit to measure and report greenhouse gases in.
Nitrification	Conversion of ammonia to nitrate.
Operational control	An approach that quantifies emissions from what an entity owns, operates, and has full authority to determine operational policies and processes.
Stationary combustion	Combustion that burns solid, liquid, or gaseous fuel for energy, such as the combustion of natural gas for heating.

EXECUTIVE SUMMARY

Los Alamos County completed a community-wide and County operations comprehensive greenhouse gas emissions baseline study using a 2022 inventory year to inform its first Climate Action Plan (CAP).

The **geographic community-wide emissions inventory** accounts for emissions that are produced by actions from residents, visitors, schools, County operations, and businesses within the county's geographic bounds within the 2022 calendar year. To the best of our ability, Los Alamos National Laboratory's (LANL) emissions are not included in the community-wide total, but their emissions impact on the community is considered for informational purposes within the study.

The **County operations emissions inventory** accounts for emissions that are produced by County owned and operated facilities and activities.

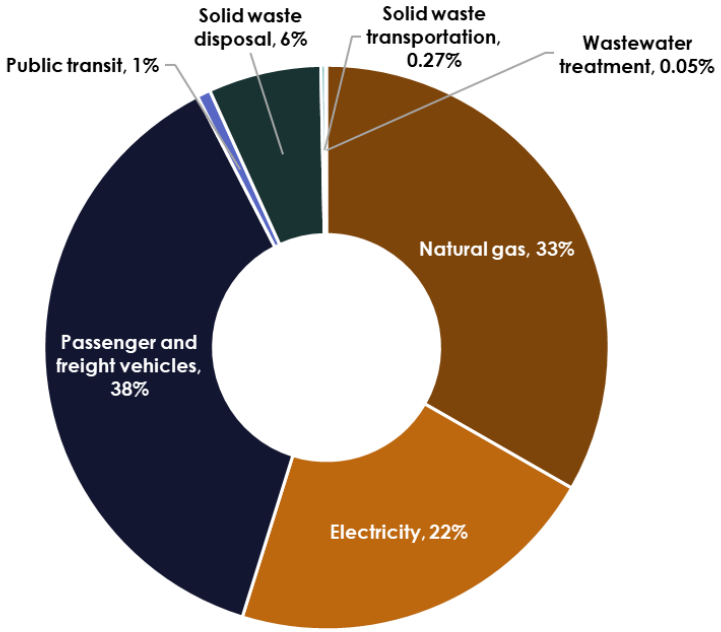
COMMUNITY-WIDE EMISSIONS

In 2022, Los Alamos County's **community** produced an estimated 137,670 metric tons of carbon dioxide equivalent ($MTCO_2e$), equating to approximately 7 $MTCO_2e$ per-capita.[1] Figure 1 shows the summary of the community-wide emissions, with the largest contributors being from:

Community **building energy consumption** (55%) stemming from natural gas (33%) and electricity (22%).

Transportation (38%) stemming from passenger and freight vehicles (38%) and public transportation (1%).

Figure 1. Los Alamos County community-wide emissions summary (2022).



[1] Based on a population of 19,187 (U.S. Census 2022 estimate).

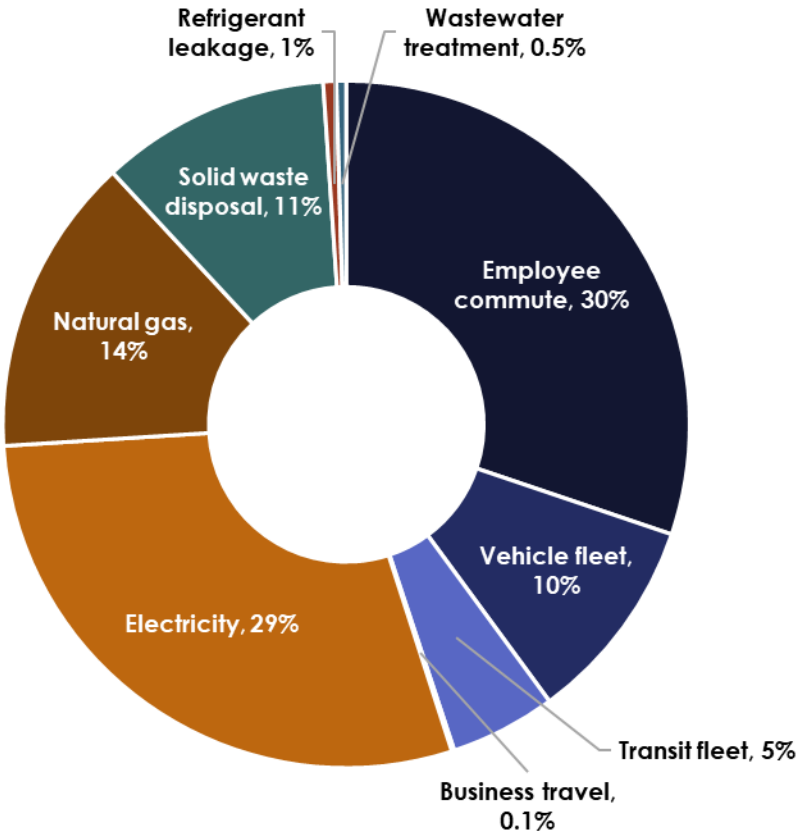
COUNTY OPERATIONS EMISSIONS

County operations were responsible for an estimated 15,031 $MTCO_2e$ in 2022. County operations emissions are not in addition to, but part of community-wide emissions. County operations emissions include emissions from County-owned buildings and facilities. Figure 2 shows the summary of County operational emissions with the top contributors being:

Transportation (45%) stemming from employee commute (30%), vehicle fleet (10%), transit fleet (5%), and business travel (0.1%).

County facility **building energy** (43%) stemming from electricity (29%) and natural gas (14%) consumption.

Figure 2. Los Alamos County operations emissions summary (2022).



INTRODUCTION

Los Alamos County is located on the Pajarito Plateau in northwestern New Mexico and is currently home to approximately 19,400 residents. Residents reside in the townsites of Los Alamos or White Rock within the county. Residents and visitors enjoy recreational activities such as hiking, biking, and skiing in the nearby national forests and mountains. The county is home to Los Alamos National Laboratory (LANL), the county's largest employer, which brings in over 8,000 commuters during the work week.[2]

COMMITMENT TO SUSTAINABILITY

The County has shown a commitment to sustainability in recent years through the creation of and partnership with the Los Alamos Resiliency, Energy, and Sustainability (LARES) task force. This task force identified sustainability initiatives to achieve net zero greenhouse gas emissions, such as the Climate Action Plan (CAP), increasing renewable energy, and creation of a Zero Waste Plan, among other recommendations. In 2022, the LARES task force published a report with their recommendations: LARES Task Force Report (2022).[3]

The County has also illustrated its dedication to sustainability through a variety of formal planning efforts including, but not limited to:

- Los Alamos Strategic Leadership Plan (2023 and 2024) – includes priorities for natural resource protection, GHG reduction, carbon-neutral energy supply, water conservation, and waste management.
- Los Alamos Energy & Water Conservation Plan (2022-2027) – outlines goals and objectives for conservation efforts needed from both the supply (Department of Public Utilities, DPU) and the demand (customers).
- Los Alamos Integrated Resource Plan (2022) - outlines a strategy for near-term and long-term power production and the transition to clean energy.
- Los Alamos Environmental Sustainability Plan (2017) – establishes a roadmap for meeting outlined quantifiable sustainability goals.

GREENHOUSE GAS INVENTORY AND ANALYSIS

Performing a comprehensive GHG study is an important first step to setting, reaching, and tracking emissions reduction goals in a CAP. The County performed a community-wide, County operations, and consumption-based inventory. The **community-wide geographic inventory** quantifies emissions that are produced by actions from residents, visitors, schools, County operations, and businesses within a community's geographic boundaries, such as heating and cooling buildings. The **County operations inventory** is an analysis that quantifies emissions that the government has operational control over, such as vehicle fleet. The **consumption-based inventory** quantifies emissions that occur anywhere in the world, so long as they are directly or indirectly a result of the activities of the residents of the county. For a more in-depth analysis of the consumption-based inventory please read the Consumption-Based Emissions Inventory Report.

[2] About Los Alamos - Los Alamos County (losalamosnm.us)
[3] Resiliency Energy & Sustainability Task Force - Los Alamos County (losalamosnm.us)

INVENTORY APPROACH

METHODOLOGY

Los Alamos County's **community-wide inventory** was performed in compliance with *U.S. Community Protocol for Accounting and Reporting of GHG Emissions (USCP)*.[4] This protocol, developed by ICLEI USA, is the industry standard for quantifying emissions from communities.

The **County operations inventory** was performed in compliance with the *Local Government Operations Protocol for the Quantification and Reporting of GHG Emissions Inventories (LGOP)*.[5] This protocol was developed to create a standardized method for local governments to quantify its operational emissions.

Emissions were quantified for the **2022 inventory year**, chosen as the most recent year with complete data at the time of this study. The inventory was performed in **ICLEI's ClearPath**, a GHG inventory calculation tool widely used by local governments to quantify community-wide and government operations emissions.[6]

For more information on data collection and inventory methodology see Appendix A: Inventory Methodology.

EMISSIONS SOURCES

Emissions are classified as either **"base sources"** or **"additional sources"**. Base sources are considered required by accepted protocols to be included in an inventory, whereas additional sources may be included voluntarily to represent emissions more completely. Table 1 shows the emissions sources analyzed for the purpose of this study with the base sources bolded.

Table 1. Community-wide and County operations inventory base and additional emissions sources.

Sector	Community-Wide	County Operations
Building Energy	• **Electricity** • **Natural gas**	• **Electricity** • **Natural gas**
Transportation	• **On-road** • Public transit	• **County fleet** • **County employee commute** • County business travel
Solid Waste	• **Landfill**	• **Landfill**
Wastewater	• Treatment processes	• Treatment processes
Refrigerants	• N/A	• County building refrigerants

[4] US Community Protocol | ICLEI USA
[5] Local Government Operations (LGO) Protocol | ICLEI USA
[6] ClearPath | ICLEI USA

COMMUNITY-WIDE EMISSIONS

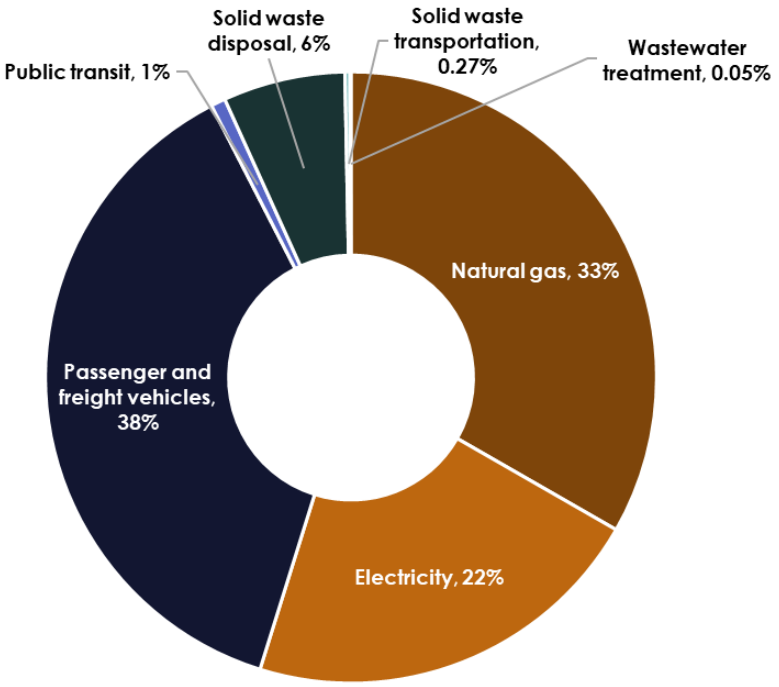
OVERVIEW

Community-wide emissions sources were responsible for an estimated 137,670 $MTCO_2e$ in 2022. These findings indicate that the community's emissions equate to approximately 7 $MTCO_2e$ per-capita, which was less than surrounding communities such as, Santa Fe (11 $MTCO_2e$) and Albuquerque (10 $MTCO_2e$).[7,8] Santa Fe and Albuquerque included additional emissions sources such as aviation, railway, and off-road that may drive part of this difference. These per-capita emissions are less than the consumption-based inventory's (21 $MTCO_2e$) due to the differences in emissions sources and boundaries between the geographic and consumption-based inventories. These per-capita emissions are based on U.S. Census population data and do not include individuals who work, but do not live, in the county or individuals who visit the county.

The community's largest emissions sources in 2022 were from the **building energy** (55%) and **transportation** (38%) sectors. The full breakdown of community emissions is shown in Figure 3.

To the best of our ability, Los Alamos National Laboratory's (LANL) emissions were not included in the community-wide total due to data limitations, but their emissions impact on the community is examined on page 13.

Figure 3. Los Alamos County community-wide emissions summary (2022).



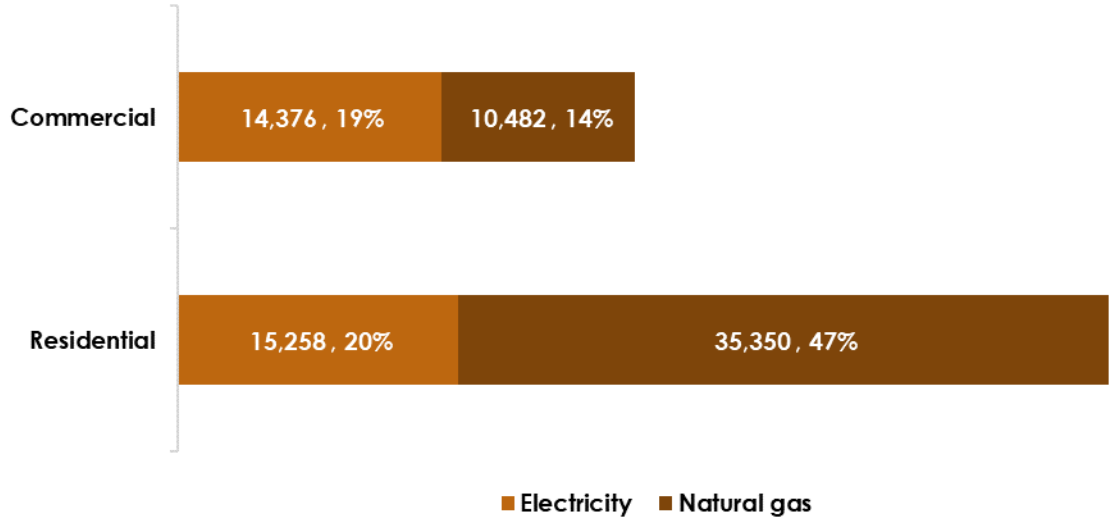
[7] Santa Fe Sustainability Dashboard (santafenm.gov)
[8] city-of-albuquerque-ghg-inventory-3.pdf (cabq.gov)

BUILDING ENERGY

Building energy consumption was responsible for the largest share of community-wide emissions in 2022, contributing an estimated 75,466 $MTCO_2e$ (55%). These emissions occur from the consumption of electricity and natural gas to cool, heat, and power homes and buildings.

- **Residential** energy consumption was the leading contributor to building energy emissions, responsible for an estimated 50,608 $MTCO_2e$ (67% of building energy). Natural gas was the leading source of emissions, contributing 70% to residential energy emissions (see Figure 4).
- **Commercial** energy consumption emitted approximately 24,858 $MTCO_2e$ (33% of building energy) in 2022. Electricity was the leading source of emissions, responsible for 58% of commercial energy emissions (see Figure 4).[9]
- **Natural gas** was the leading overall source of building energy emissions, responsible for approximately 45,832 $MTCO_2e$ (61% of building energy; see Figure 4).
- In 2022, the **electricity grid** was powered by a mix of coal and natural gas (86% of generation) and hydroelectricity (14% of generation).

Figure 4. Community-wide building energy emissions, by sector and fuel type (2022; in $MTCO_2e$).



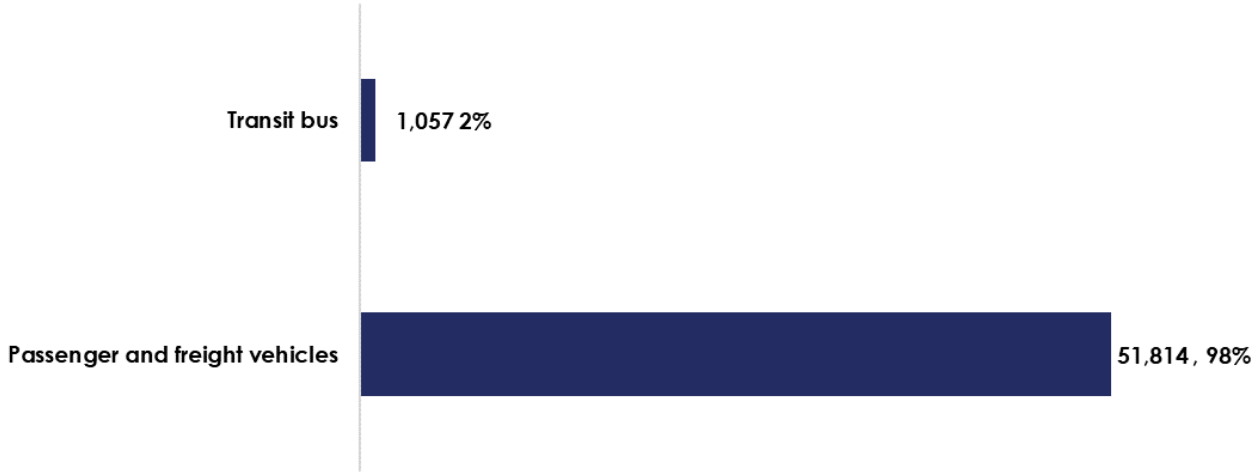
[9] Some multi-family consumption is classified under commercial rather than residential. Currently, data is unavailable to determine how much of commercial consumption comes from multi-family residential housing.

TRANSPORTATION

Transportation was responsible for the second largest share of 2022 community-wide emissions, contributing an estimated 52,871 $MTCO_2e$ (38%). Transportation emissions result from fuel used to power passenger and freight vehicles and public transit.

- **Passenger and freight transportation** was the leading contributor to transportation emissions, responsible for 51,814 $MTCO_2e$ (98% of transportation; see Figure 5). This stems from an estimated 100,142,740 vehicle miles traveled (VMT) in 2022.
- **Public transit** contributed 1,057 $MTCO_2e$ (2% of transportation) from Atomic City and Park n Ride routes within county boundaries (see Figure 5).

Figure 5. Community-wide transportation emissions, by source (2022; in $MTCO_2e$).



SOLID WASTE

Solid waste generation and disposal were responsible for an estimated 9,264 $MTCO_2e$ (7%) of 2022 community-wide emissions. Solid waste emissions occur from the transportation of waste to the landfill and from the decomposition of waste in the landfill, which releases methane—a potent greenhouse gas.

- **Disposal** emissions occur from solid waste decomposition in the landfill and was the leading source of solid waste emissions, responsible for an estimated 8,898 $MTCO_2e$ (96% of solid waste; see Figure 6). These emissions stem from the 14,537 tons landfilled in 2022, equating to approximately 0.76 tons per-capita.
- **Transportation** to the landfill contributed the remaining estimated 366 $MTCO_2e$ (4% of solid waste; see Figure 6).

Figure 6. Community-wide solid waste emissions, by source (2022; in $MTCO_2e$).

WASTEWATER

Wastewater treatment processes contributed an estimated 69 $MTCO_2e$ (0.05%) to 2022 community-wide emissions. These emissions were from the leakage of nitrogen through effluent discharge into waterways at the LA Canyon and White Rock wastewater treatment facilities. Emissions are additionally produced through nitrification (conversion of ammonia to nitrate) and denitrification (conversion of nitrate to nitrogen gas) at the LA Canyon facility.

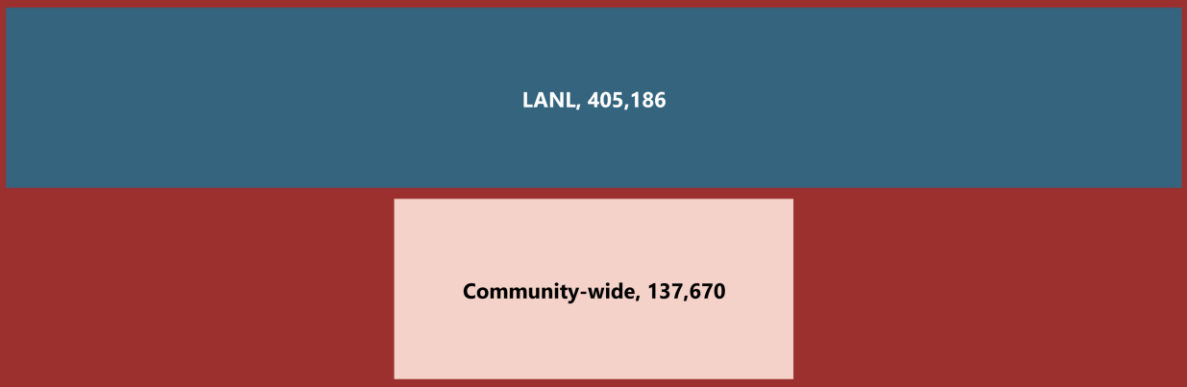
Discussion 1. Los Alamos National Laboratory emissions considerations.

LOS ALAMOS NATIONAL LABORATORY CONSIDERATIONS

The Los Alamos National Laboratory (LANL) is within the geographic boundaries of Los Alamos County and therefore is a contributor to emissions in the county. LANL's emissions were not included in the community-wide total due to data limitations, differing methodologies, and it not being under the County's jurisdiction, but it nonetheless has an emissions impact within the county (see Figure 7).[9] LANL is a federal entity governed by the Department of Energy and the National Nuclear Security Administration and is subject to specific emissions reporting protocols. In 2022, LANL reported emitting approximately 405,186 $MTCO_2e$.[10] Approximately 92,568 $MTCO_2e$ stems from electricity that is purchased from Los Alamos Public Utility.[11] Combustion of natural gas and fuel oil is responsible for approximately 77,243 $MTCO_2e$.[12]

While LANL is responsible for a large share of emissions in the county, it is subject to Executive Order 14057 which requires 65% emissions reduction by 2030 and carbon neutrality by 2050.[13] These goals are in line or greater than the state of New Mexico's emissions reduction goals which are to reduce emissions 45% by 2030.[14]

Figure 7. LANL's reported 2022 emissions compared to Los Alamos' 2022 community-wide emissions (in $MTCO_2e$).



[10] We excluded LANL's consumption of natural gas, electricity, water, and solid waste services. For the purpose of this study, we don't have the ability to separate properties that are being rented to LANL and deemed commercial or LANL's subcontractors whose utility consumption is not included under a LANL account.

[11] Goals & Progress | Environmental Sustainability (lanl.gov)

[12] Reports & Documents Library - Los Alamos County (losalamosnm.us)

[13] GHG Summary Report (epa.gov)

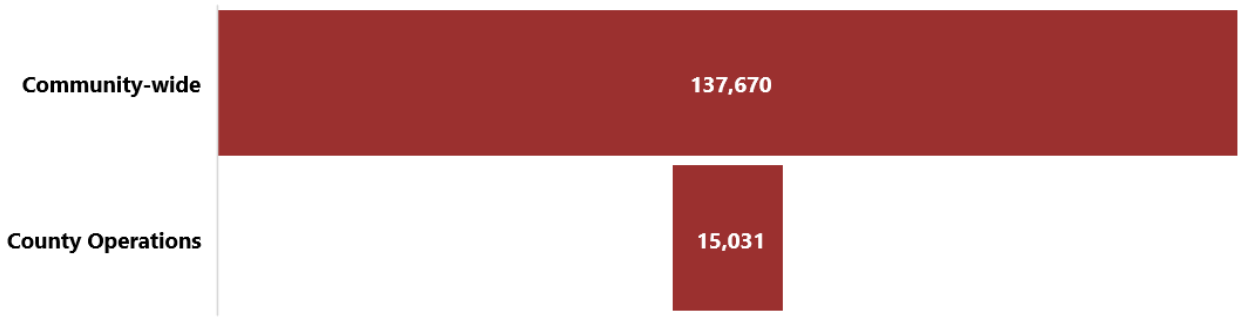
[14] FACT SHEET: President Biden Signs Executive Order Catalyzing America's Clean Energy Economy Through Federal Sustainability | The White House

COUNTY OPERATIONS EMISSIONS

OVERVIEW

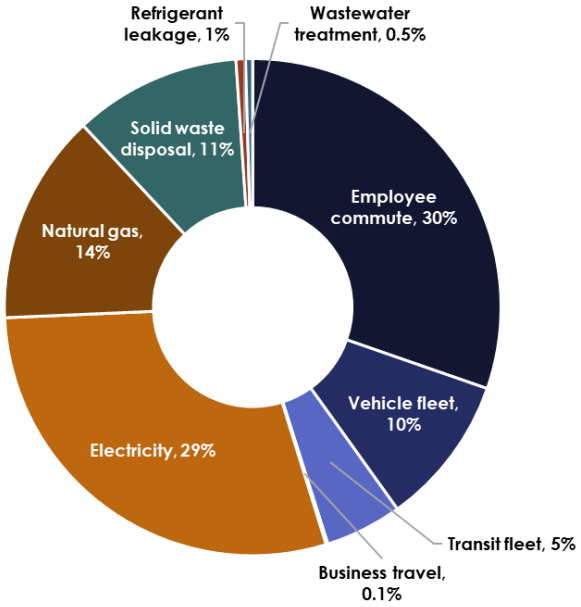
The **County operations inventory** quantifies emissions that the government has operational control over such as facility energy use and fleet vehicles. These emissions are included in the community-wide inventory and therefore are not in addition to community-wide emissions unless the source was not accounted for in the community-wide inventory, such as refrigerants. Of the community's emissions Los Alamos County operations accounted for approximately 15,031 $MTCO_2e$. Figure 8 provides a comparison of emissions from County operations and community-wide.

Figure 8. Community-wide 2022 emissions compared to County operations 2022 emissions (in $MTCO_2e$).



The County's largest emissions sources in 2022 occurred from the **transportation** (45%) and **building energy** (43%) sectors. The full breakdown of County emissions is shown in Figure 9.

Figure 9. Los Alamos County operations emissions summary (2022).



TRANSPORTATION

Transportation was the leading source of County operational emissions, responsible for an estimated 6,769 $MTCO_2e$ (45%) from employee commute, vehicle fleet, transit fleet, and employee business travel.

- **Employee commute** was the leading contributor to County transportation emissions, responsible for an estimated 4,537 $MTCO_2e$ (67% of transportation; see Figure 10). This estimate is based on an employee commute survey that asked staff to share about their commuting habits in 2022. The average one-way miles traveled was 29 miles with approximately 83% of employees driving alone (see Figure 11).
- **Vehicle fleet** contributed an estimated 1,464 $MTCO_2e$ (22%) to County transportation emissions (see Figure 10) from on-road and off-road sources. Examples of on-road sources include fleet vehicles such as trucks and examples of off-road sources include equipment such as construction equipment.
- **Transit fleet** contributed an estimated 749 $MTCO_2e$ (11%) to County transportation emissions (see Figure 10) from public transportation sources owned and operated by the County.
- **Employee business travel** contributed the remaining estimated 18 $MTCO_2e$ (0.3%) to County transportation emissions (see Figure 10).

Figure 10. County operations transportation emissions, by source (2022; in $MTCO_2e$).

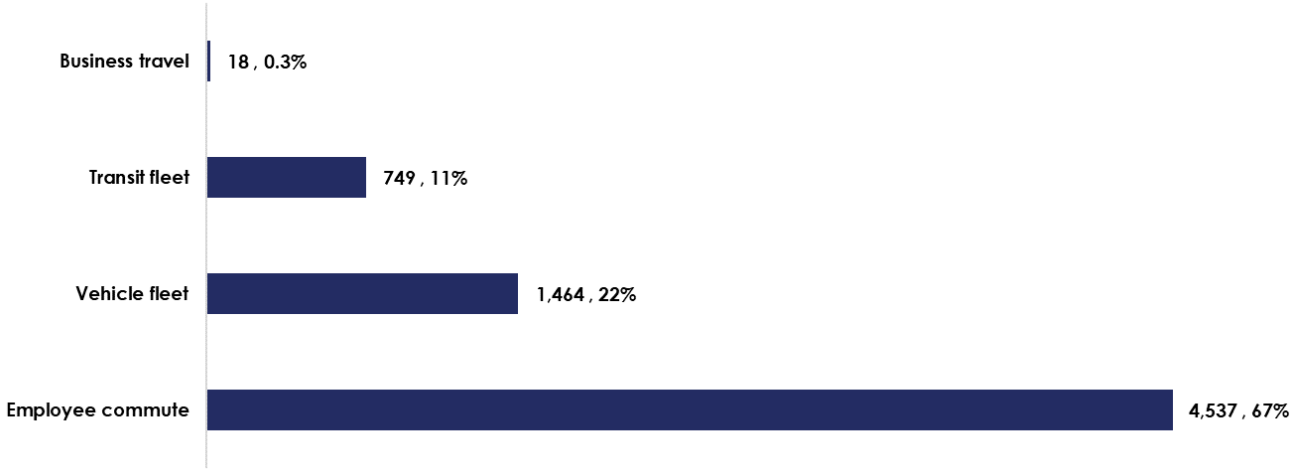
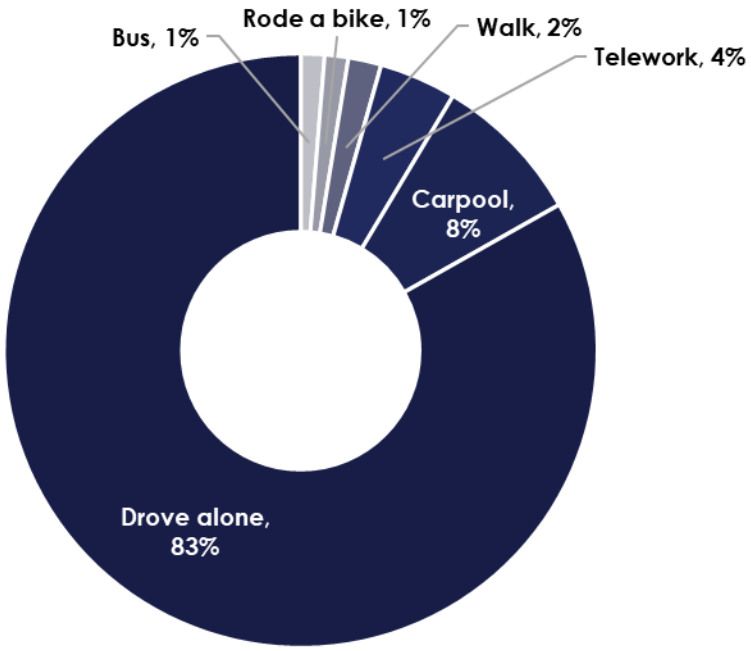


Figure 11. County operations employee commute, by transportation mode (2022).

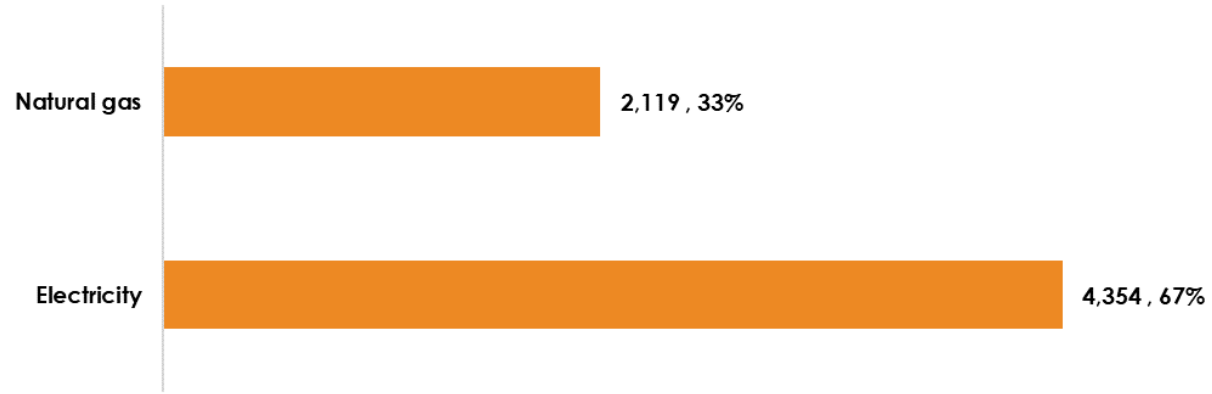


BUILDING ENERGY

Building energy consumption to power County facilities contributed an estimated 6,473 $MTCO_2e$ (43%) to 2022 County operations emissions. Water production was a significant contributor to these emissions. These emissions stem from the consumption of electricity and natural gas.

- **Electricity** consumption was the leading contributor to County building energy emissions, responsible for an estimated 4,354 $MTCO_2e$ (67% of building energy; see Figure 12).
- **Natural gas** consumption was responsible for the remaining 2,119 $MTCO_2e$ (33% of building energy; see Figure 12).

Figure 12. County operations building energy emissions, by source (2022; in $MTCO_2e$).



SOLID WASTE

Solid waste generation and disposal from County buildings and facilities in 2022 was responsible for an estimated 1,628 $MTCO_2e$ (11%). These emissions occur from methane leakage during solid waste decomposition in the Waste Management Rio Rancho Landfill.

REFRIGERANTS

Emissions from the leakage of **refrigerants** were responsible for an estimated 93 $MTCO_2e$ (1%) of 2022 County operations emissions.[15] Many refrigerants used in cooling equipment such as air conditioners and refrigeration units create very potent greenhouse gases when leaked from their respective systems.

WASTEWATER

Wastewater treatment was responsible for an estimated 69 $MTCO_2e$ (0.5%) of 2022 County operations emissions. Because the County owns and operates both LA Canyon and White Rock Wastewater facilities, all emissions from these facilities are under the County's jurisdiction and included in the County operations GHG inventory. These emissions stem from the leakage of nitrogen through effluent discharge into waterways, nitrification (conversion of ammonia to nitrate), and denitrification (conversion of nitrate to nitrogen gas).

[15] Emissions from refrigerants were not included in the geographic community-wide inventory because these emissions are an additional source and therefore are not required by protocols to be included. They are included in the County operations inventory because we were able to obtain specific consumption data from the County. This level of data was not available for the community.

RECOMMENDATIONS

The 2022 community-wide and County operations inventories were the County's first GHG inventory analyses. This baseline assessment revealed key focus areas for the greatest emission reduction impact in the CAP. This section presents overarching recommendations for County consideration based on the inventory process and findings.

COMMUNITY-WIDE

The county's largest sources of emissions in 2022 were **passenger and freight transportation** (51,814 $MTCO_2e$; 38%), **natural gas consumption** (45,832 $MTCO_2e$; 33%), and **electricity consumption** (29,634 $MTCO_2e$; 22%). Potential emissions reduction actions within those sectors include those aimed at:

- Reducing vehicle miles traveled per-capita through promotion and expansion of sustainable transportation options, such as biking, walking, and public transportation.
- Expanding electric vehicle infrastructure and adoption.
- Increasing energy efficiency.
- Increasing use of renewable energy.
- Promoting electrification retrofits.
- Considering all-electric building codes for new development.

COUNTY OPERATIONS

Los Alamos County's operations largest source of emissions in 2022 were **employee commute** (4,537 $MTCO_2e$; 30%), **electricity consumption** (4,354 $MTCO_2e$; 29%), **natural gas consumption** (2,119 $MTCO_2e$; 14%), **solid waste disposal** (1,628 $MTCO_2e$; 11%), and **vehicle fleet** (1,464 $MTCO_2e$; 10%). Potential emissions reduction actions within those sectors include those aimed at:

- Implementing commute-trip reduction strategies for County employees.
- Increasing energy efficiency.
- Increasing use of renewable energy.
- Performing electrification retrofits.
- Reducing waste generation and increasing waste diversion.
- Electrifying County fleet and equipment.

APPENDIX A: INVENTORY METHODOLOGY

This appendix provides a detailed description of the methodology used to complete the 2022 Los Alamos County geographic community-wide and County operations inventories. The protocols and calculation methods will be detailed below.

INVENTORY PROTOCOLS

Geographic Community-Wide Inventory Protocol

The **U.S. Community Protocol for Accounting and Reporting of GHG Emissions (USCP)** was selected as the calculation methodology for Los Alamos County's **2022 community-wide inventory**.[16] This protocol, developed by ICLEI, was developed for local governments as a guide for calculating GHG emissions from communities. The USCP can be used by communities for several reasons including to:

- Inform climate action planning,
- demonstrate accountability,
- track GHG emissions changes over time,
- and encourage community action.

Community emissions calculated following this protocol account for the GHG emissions occurring within the geographic boundaries of a community. The USCP represents best practices for community GHG inventories by meeting the following objectives:

Measurement	Policy and Actions	Consistency and Comparability
• Estimate and report GHG emissions and removals. • Measure progress towards emissions reduction goals. • Align with national and regional goals.	• Allows jurisdictions to make informed pathways on emissions reduction. • Aids in engagement with the community on reducing GHG emissions.	• Allows for consistency in inventory calculations • Allows comparability between future and past inventories. • Presents transparency in methodology.

[16] US Community Protocol | ICLEI USA

The USCP quantifies emissions as either "base sources" or "additional sources" defined by protocol requirements. The USCP requires inclusion of emissions from the following "base" emissions sources:

- use of electricity by the community,
- use of fuel in residential and commercial stationary combustion equipment,
- on-road passenger and freight motor vehicle travel,
- use of energy in potable water and wastewater treatment and distribution, and
- generation of solid waste by the community.

A local government may opt to include additional emissions sources in their inventories to represent their emissions footprint more accurately. Examples of some of these additional emission sources include those from agricultural activities, such as cropland management and fertilizer use, and emissions from wastewater treatment processes.

County Operations Inventory Protocol

The **Local Government Operations Protocol (LGOP)** was selected as the calculation methodology for Los Alamos County's **2022 County operations inventory**.[17] The LGOP allows a local government to complete its GHG inventory using either an operational or financial control approach for claiming responsibility for emissions. Los Alamos County used the **operational control approach** for the 2022 County operations inventory, as recommended by the LGOP. Under this approach, local governments report the GHG emissions that are produced by facilities and sources they own, operate, and have full authority to determine operational policies and processes.

This protocol provides the structure needed for relevant, complete, consistent, transparent, and accurate emissions reporting that can be credibly compared across local governments. The LGOP provides guidance, with multiple calculation methods, for emissions quantification for each emission source, based on the data available.

CALCULATION METHODOLOGY

Community-Wide Inventory

Building Energy

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
Electricity	kWh consumed	LAC Department of Public Utilities	Utility-specific	LAC Department of Public Utilities
Natural Gas	Therms consumed	LAC Department of Public Utilities	National average	ClearPath[18]

[17] Local Government Operations Protocol for Greenhouse Gas Assessments | California Air Resources Board
[18] ClearPath | ICLEI USA

Transportation

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
Passenger and freight	Vehicle miles traveled (VMT) within geographic bounds	NMDOT[19]	National average factors by state average fuel and vehicle types	EPA[20,21] EIA[22] BTS[23]
Public transit	Transit VMT and gallons consumed	Transit manager	National average by fuel and vehicle type	EPA

Solid Waste

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
Disposal	Tons landfilled	LAC Environmental Services Division	National averages by material type	EPA WARM[24] Los Alamos specific waste characterization
Transportation to landfill	VMT to landfill	LAC Environmental Services Division	Landfill specific	EPA WARM LAC Environmental Services

[19] NMDOT references the USDOT traffic monitoring guide as the methodology to determine VMT: Traffic Monitoring Guide - Policy | Federal Highway Administration (dot.gov)
[20] Download the State Inventory and Projection Tool | US EPA
[21] emission-factors_mar_2018_0.pdf (epa.gov)
[22] U.S. Energy Information Administration - EIA - Independent Statistics and Analysis
[23] Average Fuel Efficiency of U.S. Light Duty Vehicles | Bureau of Transportation Statistics (bts.gov)
[24] Versions of the Waste Reduction Model | US EPA

Wastewater

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
LA Canyon	Wastewater treatment type and gallons treated	LAC Department of Public Utilities	National average by treatment type	ClearPath
White Rock	Wastewater treatment type and gallons treated	LAC Department of Public Utilities	National average by treatment type	ClearPath

County Operations Inventory

Transportation

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
Employee Commute	VMT by County employees during their commute by vehicle type	Employee Commute Survey	National average by fuel and vehicle type	EPA
Vehicle Fleet	VMT and/or gallons consumed by County fleet	LAC Fleet Manager	National average by fuel and vehicle type	EPA
Transit Fleet	VMT and/or gallons consumed by Transit fleet	LAC Fleet Manager	National average by fuel and vehicle type	EPA
Business Travel	VMT and/or gallons consumed for business travel	LAC Procurement	National average by fuel and vehicle type	EPA

Building Energy

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
Electricity	kWh consumed at County-owned facilities	LAC Department of Public Utilities	Utility-specific	LAC Department of Public Utilities
Natural Gas	Therms consumed at County-owned facilities	LAC Department of Public Utilities	National average	ClearPath

Solid Waste

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
Disposal	Tons landfilled from County-owned facilities	LAC Environmental Services Division	National averages by material type	EPA WARM Los Alamos specific waste characterization

Refrigerants

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
Refrigerants	Volume of refrigerants used to refill cooling equipment in County-owned facilities	LAC Facilities Division	National averages GWP	California Air Resources Board (CARB)[25]

[25] High-GWP Refrigerants | California Air Resources Board

Wastewater

Emissions Source	Activity Data	Activity Data Source	Emissions Factor	Emissions Factor Source
LA Canyon	Wastewater treatment type and gallons treated	LAC Department of Public Utilities	National average by treatment type	ClearPath
White Rock	Wastewater treatment type and gallons treated	LAC Department of Public Utilities	National average by treatment type	ClearPath

APPENDIX B: INVENTORY SCOPES

Greenhouse gas (GHG) emissions can be categorized into three scopes:

- **Scope 1** emissions are direct emissions from stationary or mobile combustion which occur from sources such as natural gas consumption and vehicle miles traveled.
- **Scope 2** emissions are indirect emissions that occur from the purchase of grid electricity.
- **Scope 3** emissions are indirect emissions that occur from activities that occur outside of the county's geographic boundaries, such as from an out-of-boundary landfill or those which the County has less influence over such as employee commute.

The GHG emissions included in the community-wide and County operations are categorized by scope in the table below.

Scope	Community-Wide	County Operations
Scope 1	• Natural gas • Natural gas distribution loss • Passenger and freight transportation • Public transportation • In-boundary wastewater treatment	• Natural gas • Vehicle fleet • Transit fleet • Refrigerants • In-boundary wastewater treatment
Scope 2	• Grid-supplied electricity	• Grid-supplied electricity • Electricity transmission and distribution loss
Scope 3	• Electricity transmission and distribution loss • Out-of-boundary solid waste transportation and disposal	• Natural gas transmission and distribution loss • Employee commute • Employee business travel • Out-of-boundary solid waste disposal