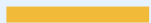




# 2022 Gerlach Community Scale Emissions Report



Jan 2024



# Contents

- 01** [Introduction: Why Now?](#)
- 02** [Project Overview](#)
- 03** [Emissions Report](#)
- 04** [Next Steps](#)

**01**

---

# **Introduction: Why Now?**

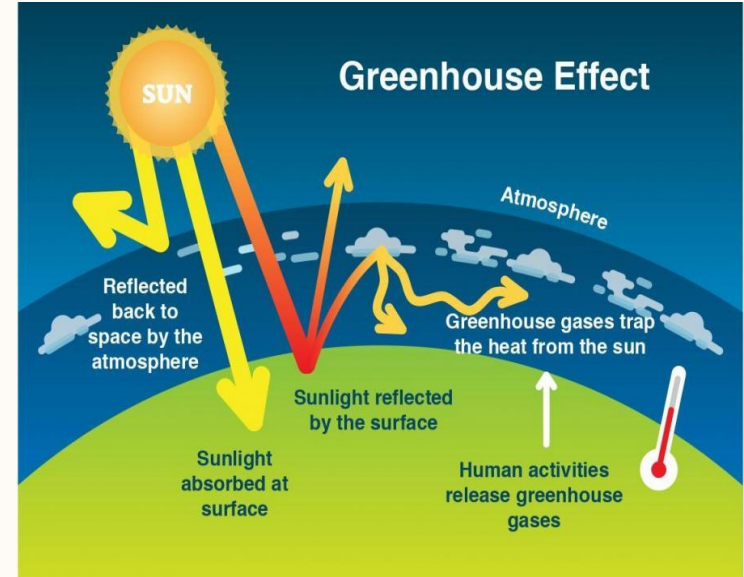


# Greenhouse Gases and Climate Change

Gases in the atmosphere that trap heat radiated from the Earth's surface are called greenhouse gases (GHGs). GHGs can be either naturally occurring or emitted due to human activities. The main GHGs are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and fluorinated gases.

- **Carbon dioxide** enters the atmosphere through burning fossil fuels (ie. coal, natural gas, oil), solid waste, trees and wood products, and as a result of certain chemical reactions (ie. manufacture of cement) and land use changes. Carbon dioxide is removed from the atmosphere (or “sequestered”) when it is absorbed by plants as part of the biological carbon cycle.
- **Methane** is emitted during the production and transport of energy sources such as coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and from the decay of organic waste in solid waste landfills.
- **Nitrous oxide** is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- **Fluorinated gases** are powerful man-made greenhouse gases that are emitted from a variety of industrial processes.

Each gas' effect on climate change depends on three main factors: the quantity of each gas in the atmosphere, how long they stay in the atmosphere, and how strongly they impact global temperatures. As the concentration of GHGs in the atmosphere increases beyond natural fluctuations largely as a result of human activities, particularly from the burning of fossil fuels, the global climate system shifts in ways that can have significant adverse impacts on environmental, economic, and social systems.



# Impacts of Climate Change in Nevada

	Historical Trends	Projected Trends and Confidence
Heat and Heat Waves	<p>Temperatures are increasing.</p> <p>Urban areas are warming faster than rural areas.</p>	<p>Average temperatures will rise. Heat waves will increase in frequency and severity.</p> <p><b>HIGH Confidence</b></p>
Precipitation	<p>Precipitation has not increased or decreased.</p>	<p>It's not clear how precipitation will change. Some models project more, some less, and some essentially no change, with the average across recent models suggesting a slight increase in precipitation over central and northern Nevada.</p> <p><b>LOW Confidence</b></p>
Drought	<p>Increasing evaporative demand due to higher temperatures has worsened droughts.</p>	<p>Drought will increase in frequency and severity, in part due to higher temperatures, even if precipitation remains the same or increases slightly.</p> <p><b>HIGH Confidence</b></p>
Loss of Snow	<p>Snowpack decreased between 1955 and 2016.</p>	<p>There will be a shift from snow to rain during the winter, and snow will melt earlier in the winter and spring.</p> <p><b>HIGH Confidence</b></p>
Floods	<p>There were no historical trends in flooding.</p>	<p>Flooding will be more frequent owing to a shift from snow to rain and more intense storms, even if precipitation does not increase.</p> <p><b>HIGH Confidence</b></p>
Wildfire	<p>Wildfire size and severity have been increasing.</p>	<p>Warmer temperatures will increase wildfire risk.</p> <p><b>HIGH Confidence</b></p>

This table offers a summary of the Climate Change in Nevada report, part of Nevada's State Climate Initiative. Currently, the release of carbon into the atmosphere is occurring at an unprecedented and rapid rate, unlike any time in the past 56 million years. Over the recent decades, Nevada has experienced **rising temperatures, severe droughts, reduced snowfall, an increase in evaporative demand (referred to as atmospheric thirst), and a significant number of large wildfires**. We are witnessing these changes in the present, and the most reliable projections indicate that these trends ***will persist***.

The extent of warming that Nevada will experience in the future depends on whether greenhouse gas emissions continue to increase or if they are rapidly reduced over the coming decades. Taking climate action now is more critical than ever to mitigate the impacts of climate change and secure a sustainable future for generations to come.

For more information: Read the full report here, [Climate Change Impacts in Nevada | Extension](#)



# 02

---

## Project Overview & Methodology

*The results from this inventory will help lay the foundation for climate action planning and performance tracking by Team Climate-Resilient Gerlach. This assessment draws upon guidance from the US Community Protocol and the Global Protocol for Community Scale Emissions Inventories which drives emphasis on GHG sources most relevant for community planning and the standards that communities worldwide use to hold themselves accountable.*



# Team Climate-Resilient Gerlach

Washoe County has earned recognition as one of the 67 recipients of the Energizing Rural Communities Prize, a flagship initiative led by the U.S. Department of Energy. Leading this effort is "Team Climate-Resilient Gerlach," a diverse alliance of stakeholders that includes the Gerlach Citizen Advisory Board, General Improvement District, Nevada Energy, Nevada Clean Energy Fund, UNR Department of Civil & Environmental Engineering, nZero, and the Burning Man Project. Their shared mission is to propel the small and remote community of Gerlach toward achieving a **net-zero greenhouse gas emissions status by 2050**.

This initiative explores the feasibility of implementing renewable energy generation, efficient energy storage solutions, building retrofits, and grid improvements, all with the aim of securing a **sustainable & thriving future for Gerlach**. nZero's role in this effort is to establish Gerlach's baseline emissions levels and provide data-driven insights to support the adoption of clean energy solutions. This baseline is essential for tracking progress, identifying opportunities to reduce emissions, and determining where collaboration with others is necessary.



# Purpose of this Report

The primary purpose of the Gerlach Greenhouse Gas Inventory Report is to assess, analyze, and understand the community's current greenhouse gas emissions. This report serves as a foundational tool for informed decision-making and sustainable planning within the Gerlach community. This report helps with:



## Strategic Planning

This report assists Gerlach project stakeholders to develop localized strategies for reducing greenhouse gas emissions across multiple sectors, including transportation, energy, water management, and waste reduction.



## Implementation Roadmap

This report empowers stakeholders to create an efficient implementation roadmap by providing data-driven insights for prioritizing actions, allocating resources, setting timelines, and coordinating efforts to execute greenhouse gas reduction strategies effectively.



## Monitoring & Reporting

The report sets a benchmark for continuous tracking and reporting, allowing for the measurement of progress in accordance with the community's reduction goals and the evaluation of the impact of the Gerlach Project's initiatives.



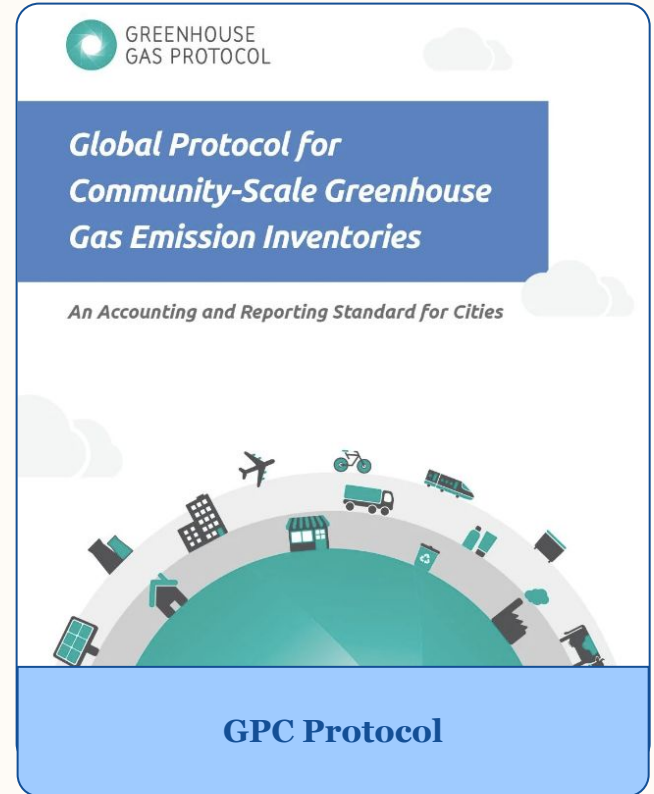


# GHG Inventory Methodology

Gerlach's first GHG community-scale greenhouse gas (GHG) emissions inventory was completed for the calendar year 2022, which will serve as their baseline. The 2022 community-scale GHG emissions inventory was conducted using the Global Protocol for Community-Scale GHG Emission Inventories (GPC). The GPC is a worldwide standard for inventorying city-induced GHG emissions developed by the World Resources Institute, C40 Cities Climate Leadership Group, and ICLEI.

The GPC categorizes direct and indirect GHG emissions into three sectors: Stationary Energy, Transportation and Waste. Direct GHG emissions occur within boundaries, while indirect GHG emissions are induced by activity within the City boundary. For Gerlach, the emissions relevant to them are:

- The **Stationary Energy Sector** includes GHG emissions that occurs from energy utilized in residential buildings, commercial buildings and facilities, and electricity transmission and distribution energy losses.
- The **Transportation Sector** includes GHG emissions from commercial and residential on-road transportation & non-road vehicle use within the boundary
- The **Waste Sector** includes GHG emissions from solid waste disposal & treatment, and wastewater treatment.



# Inventory Boundary

## Gerlach Boundary Information

Name of area	<b>Gerlach, NV</b>
Country	<b>USA</b>
Geographic Boundary	<b>Gerlach GID Boundary</b>
Inventory Year	<b>2022</b>
Land area (km2) within boundary	<b>3.12</b>
Resident population within boundary	<b>130</b>



Map of GHG Emission Boundary

# Data Collection

Emission Source	Data Source	Calculation Method
Stationary Energy: Commercial & Institutional	NREL ComStock & Gerlach Building Portfolio, Washoe County GIS Map	Hybrid-Regional fuel consumption adjusted for Gerlach's Building Portfolio (by use type and sq. footage)
Stationary Energy: Residential	EIA Residential Energy Consumption Survey (RECs)	Hybrid-Regional fuel consumption adjusted for Gerlach's household count and estimated percentage of fuel type utilized per household
Community Transportation	NDEP-State of Nevada, Transportation, Section 3.2	State-Level Transportation scaled down by population
Electricity: Commercial & Institutional	CBECs database, Gerlach Building Portfolio, nZero database	Hybrid- Regional & Actual electricity consumption adjusted for Gerlach's Buildings Portfolio (by use type & sq. footage)
Electricity: Residential	EIA Residential Energy Consumption Survey (RECs)	Hybrid-Regional fuel consumption adjusted for Gerlach's household count
Community-Generated Waste	Russell Bierle, Gerlach Public Works Supervisor	Volume of Waste Generation & Disposal Method
Community-Generated WasteWater	Russell Bierle, Gerlach Public Works Supervisor	Primary WWTP input data uploaded to the EPA Local Gov. Wastewater GHG Inventory Tool

## Data Sources

Data collection efforts were conducted by nZero, which identified the most suitable data collection methods and corresponding GHG calculation pathways for the collected information.

nZero collaborated with various stakeholders to obtain primary data, including:

- NDEP
- Washoe County
- Gerlach Public Works

For secondary data, nZero maintains a comprehensive database of processed EIA, NREL's ResStock and ComStock datasets. This resource is utilized to extract regional consumption data based on sampled buildings, enabling the estimation of consumption patterns when primary data is unattainable.



# Community Outreach

**Listening Session for Gerlach Residents:** Washoe County hosted a community listening session to understand the needs, concerns, and questions of local residents regarding the project.

**Community Survey Collaboration:** In collaboration with Washoe County, nZero conducted a community survey to gather primary data on heating and transportation behaviors in Gerlach.

**Survey Findings:** While survey participation was below the target, valuable information was collected, including:

Survey Topic	Findings
Heating Reliability, Cost	<ul style="list-style-type: none"><li>85% of respondents cited high energy bills as a key factor affecting the reliability of their heating systems.</li></ul>
Heating Reliability, Weather	<ul style="list-style-type: none"><li>43% of respondents cited weather-related issues as a key factor affecting the reliability of their heating systems.</li></ul>
Heating Reliability, Availability	<ul style="list-style-type: none"><li>The availability of deliveries, services, and fuel suppliers was identified key factors impacting heating reliability.</li></ul>
Alternative Heating Sources	<ul style="list-style-type: none"><li>Respondents expressed a willingness to consider alternative heating sources if they were affordable and easy to install.</li><li>A resident remarked, <i>"I think we lose a lot of heat through our windows, making it less efficient than it could be."</i></li></ul>
Alternative Transportation Options	<ul style="list-style-type: none"><li>There is interest in exploring in-town transportation options, including golf carts, e-bikes, and e-scooters to meet the community's in-town transportation needs</li></ul>



03



# Emissions Report

*GHG Baseline, Summary, & Breakdown*



# GHG Emissions Summary, by Sector

1,874 MT CO<sub>2</sub>e

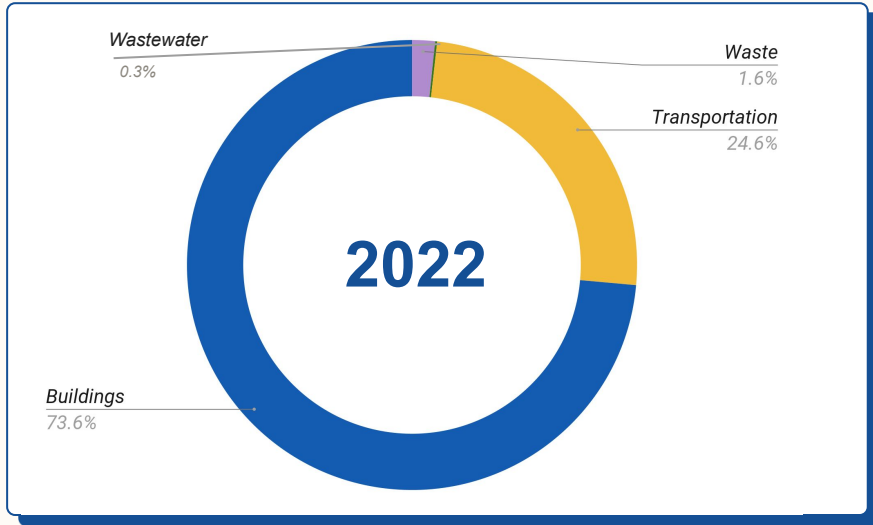


Figure 1: 2022 Emissions by Sector

In 2022, the Gerlach community-wide greenhouse gas (GHG) emission inventory found community GHG emissions totaling 1,874 metric tons of carbon dioxide equivalent. The sectors included in the inventory are:

- **Buildings:** Residential, commercial, and institutional buildings accounted for **73.6%** of communitywide emissions
- **Transportation:** Passenger, commercial, and off-road transportation accounted for **24.6%** of community-wide emissions
- **Solid Waste:** Community-generated solid waste accounted for **1.6%** of community-wide emissions,
- **Wastewater Treatment:** Emissions from the treatment of wastewater accounted for **0.3%** of community-wide emissions

# GHG Emissions Summary, by Sub-Sector

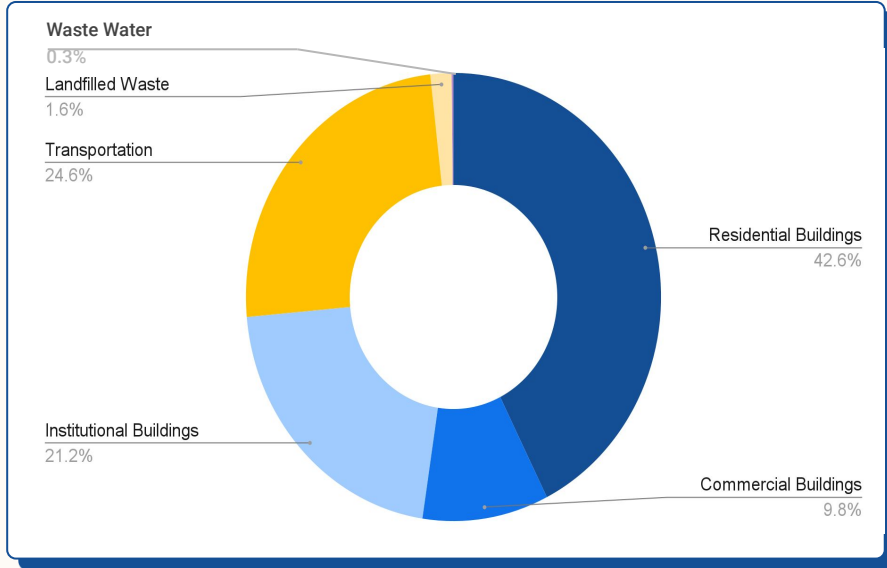


Figure 2: 2022 Emissions by Sub-Sector

Sector	Sub Sector	2022 MTCO <sub>2</sub> e	Emission Sources
Buildings (Stationary Energy)	Residential Buildings	797.8	Heating & Cooling: Propane, Wood, Electricity
	Commercial Buildings	184	
	Institutional Buildings	396.8	
Transportation	On-Road	461.7	Passenger & Commercial Vehicles & Equipment
Waste	Landfilled Waste	30.8	Community Generated Landfilled Waste
Waste Water	Process and Fugitive	2.8	Treatment of Gerlach Population Wastewater
<b>Total 2022 GHG Emissions</b>		<b>1873.9</b>	<b>MT CO<sub>2</sub>e</b>

# Buildings

Commercial	Institutional	Residential
Miners Club LLC	Gerlach Community Center	Single Family Residence
Brunos Country Club	Gerlach Health Center	Mobile Manufactured
Shell	Gerlach Roads/Equipment Services	
Bruno's Motel	Gerlach K-12 School (Library within)	
USPS	Gerlach Senior Center	
Joe's Gerlach Club	Washoe County Fire Station 242	
Burning Man Gerlach Office	Gerlach Sheriff Off-Jail	
Friends of Black Rock High Rock	Gerlach Fire Station	
Black Rock Desert Moto Club	Gerlach Old Maintenance Shop (quonset hut behind the Sheriff station)	
	Gerlach Sheriff Residence/Office	
	Gerlach Foreman Residence/Office	
	Gerlach Maintenance Shop	

## Building Characteristics

### Building Breakdown:

- 2/3 of households: Single-family
- 1/3 of households: Mobile & Trailer
- 12 Institutional Buildings (serving various community needs)
- 9 Commercial Buildings

### Electricity Sources:

- Households & Buildings are served by NV Energy

### Heating Sources:

- Approximately 1/3 of households use wood or pellet stoves as their primary heating source
- Remaining 2/3 of households use on-site fuel
- All commercial and institutional buildings use on-site fuel



# Buildings

**1,379 MT CO<sub>2</sub>e**

- The majority of emissions come from the Buildings Sector, in the form of electricity or propane usage. Buildings are responsible for 73.6% (1,379 MT CO<sub>2</sub>e) of the total greenhouse gas emissions in 2022
- Among these emissions, Residential Buildings stand out as the largest single source, responsible for 58% of emissions within the building sector

2022 Total Energy Consumption Across All Buildings	
Residential electricity (kWh)	1,187,058
Non-Residential (kWh)	800,449
Residential Propane (Gallons)	30,795
Residential Wood (MMBTu)	2,299
Non-Residential Propane (Gallons)	67,776

kWh = kilowatt hours; MMBtu = million British thermal unit

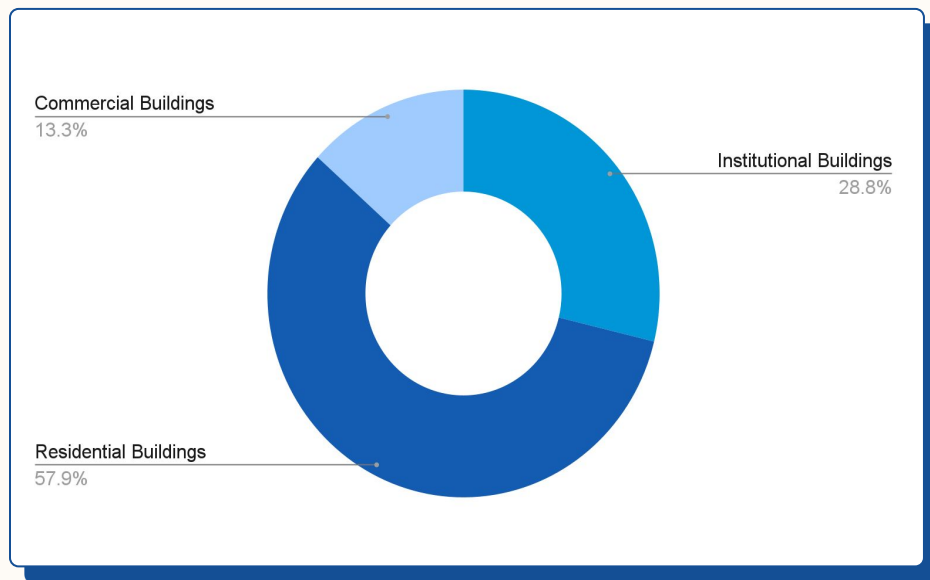


Figure 3: 2022 Building Emission Composition

# Buildings, Fuel & Emissions

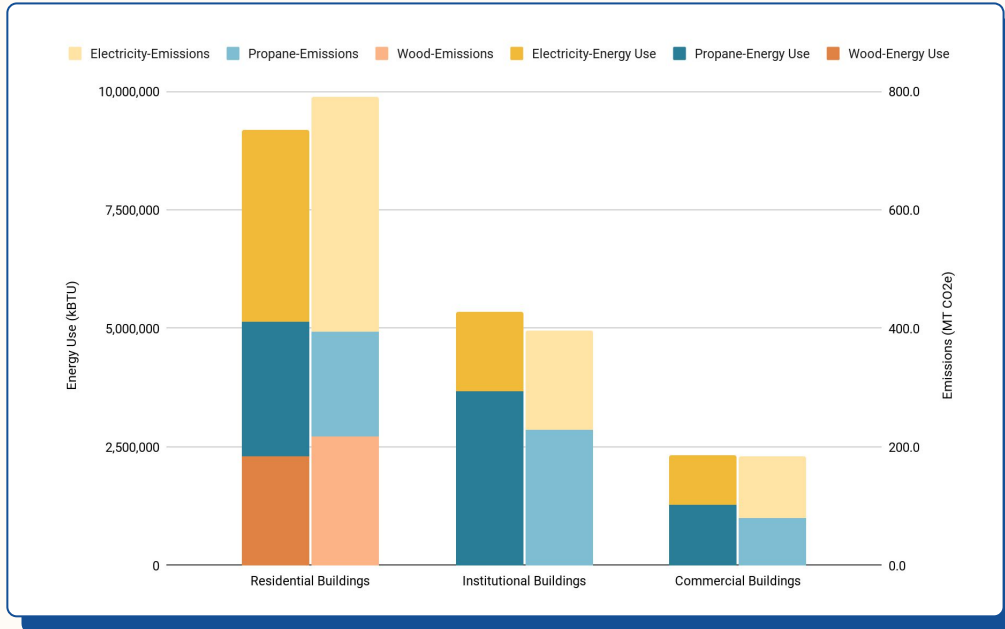


Figure 4: 2022 Building Fuel emission composition, by Building Category

**Building Emissions Sources:** Electricity contributes to **49%** of building emissions, followed by propane at **37%**, and wood at **14%**

## Energy Efficiency Considerations:

- Efficiency varies based on equipment & condition.
  - a. For ex. modern wood stoves can achieve 80% efficiency, while wood-burning fireplaces may only reach 15-30% efficiency.
  - b. In Gerlach, due to the average age of the buildings, energy efficiency measures are expected have a high impact on lowering emissions, such as weatherization efforts. One survey response stated *"I think we lose a lot of heat through our windows, making it less efficient than it could be."*

## Carbon Intensity Consideration:

- Propane is slightly less carbon intensive than electricity and wood per unit of energy produced in terms of emission intensity (emissions/energy unit).
- However, the Nevada grid is progressively becoming cleaner with increased adoption of renewables and continuous technological advancements. This is expected to continue to increase, further decreasing the carbon intensity of electricity (while propane will remain the same)

# On-Site Solar, in Action

- **Site: Gerlach K-12 School**
- **Address:** 555 East Sunset Blvd, Gerlach, NV
- **Year Built:** 1959
- **Solar Capacity:** 61.43 kW
- **Energy Generation (2022):** 107,640 kWhs
  - Solar Export: 56,998 kWhs (surplus energy sold back to the grid, contributing to a greener local energy market)
  - On-site Utilization: 50,642 kWhs
- **Environmental Impact:**
  - Emissions Avoided: 17.1 MT CO<sub>2</sub>e
  - Equivalent to powering 2.2 homes for one year
- **Financial Benefits:**
  - Cost Savings for the School

Gerlach K-12 is a prime example of the positive impact small-scale, on-site solar systems can have on both environmentally & economically in Gerlach

## Solar Generated



## Solar Export



# Transportation

461 MT CO<sub>2</sub>e

## Transportation Emissions in Gerlach:

- 461 MT CO<sub>2</sub>e, 24.6% of total annual GHG emissions, are attributed to transportation. This includes fuel usage for both on-road and off-road vehicles and equipment.

## Survey Insights:

- Majority of residents drive <25 miles within Gerlach weekly.
- 90% cover distances >100 miles outside of Gerlach on a weekly basis, notably due to the rural nature of the town
  - Emissions outside Gerlach are not part of this inventory.
- Residents express interest in alternative in-town transportation like small electric vehicles, e-golf carts, e-bikes, and e-scooters.

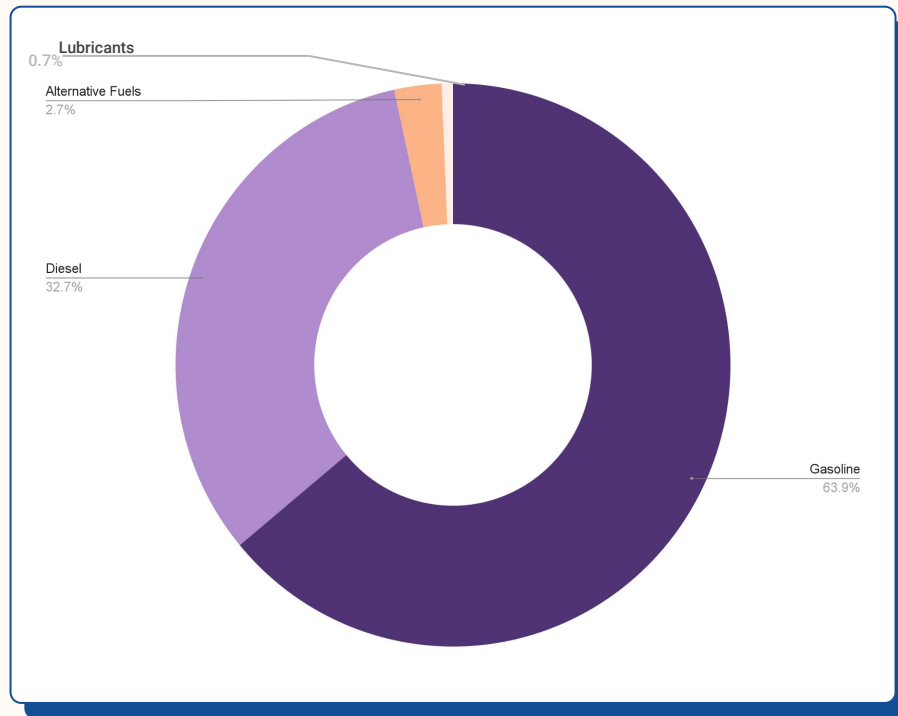


Figure 5: 2022 Transportation emission composition

# Transportation Habits, Survey Responses

## Number of Vehicles Used Weekly:

- Over half of respondents use two or more cars per week in their households.

## Types of Vehicles for Local Transportation:

- All respondents drive cars weekly, with 66.7% also using a second vehicle—typically a truck.
- One response mentioned using a Golf Cart for in-town transportation.

## Fuel Preferences for Household Vehicles:

- Gasoline is the primary fuel for all respondents.
- Diesel is also used by 33.3% of respondents.
- The use of a hybrid vehicle (gasoline + electricity) was mentioned in one response.

## General Transportation Preferences Within Gerlach (Survey Responses):

- 66.7% prefer to drive alone.
- 22.2% carpool with others.
- 11.1% choose to walk.

# Community Generated Waste

30.7 MT CO<sub>2</sub>e

## Landfilled Waste Emissions in Gerlach:

- 30.7 MT CO<sub>2</sub>e, representing 1.6% of the town's total annual GHG emissions.
- All landfill waste is transported to a central transfer station and then trucked to the Lockwood disposal site by residents.
- Recycling efforts by residents and businesses are active, but the associated emissions are unquantified due to a lack of available data.

## Waste Generation in 2022:

- Gerlach generated 128,240 pounds of waste in 2022, all directed to landfills.
- In the State of Nevada, each Nevadan produces 2920 pounds of waste per year. Gerlach's waste generation per person is notably lower at 986.5 pounds per year, assuming all the waste data is residential. When compared to the U.S. average of 1825 pounds per person per year, **Gerlach's waste output remains relatively low.**

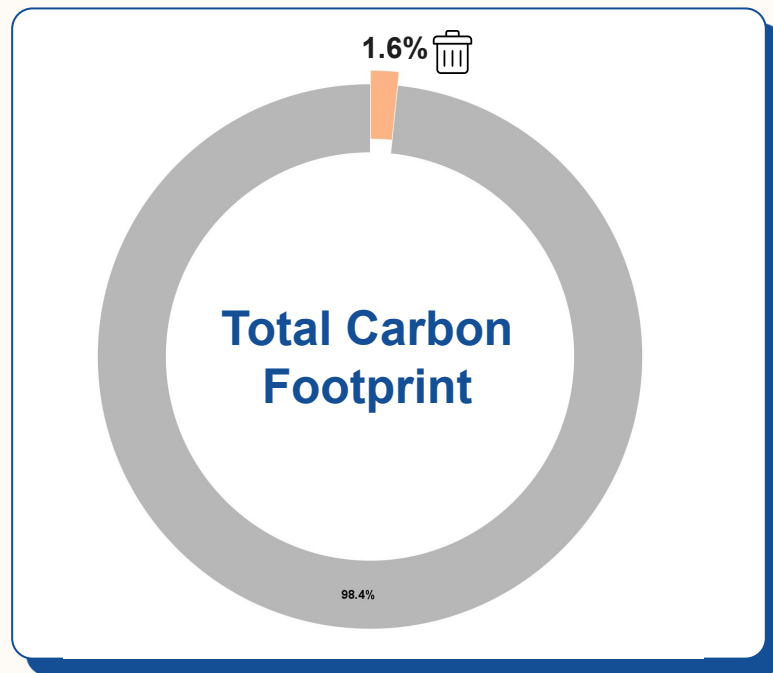


Figure 6: 2022 Waste to Total Carbon Footprint Comparison

# Wastewater Treatment, Process & Fugitive Emissions

2.8 MT CO<sub>2</sub>e

## Wastewater Process & Fugitive Emissions:

- 2.8 MT CO<sub>2</sub>e, representing 0.3% of total GHG emissions in Gerlach.

## Wastewater Treatment System:

- Gerlach operates a type 1 passive stabilization wastewater treatment system.
- The system includes two 1.4-acre ponds utilizing a 3-stage biological treatment process.
- Minimal sludge generation, requiring removal only every 10 years.

## Greenhouse Gas Emissions from Wastewater Treatment:

- Wastewater treatment can create a unique set of process, stationary, and fugitive greenhouse gas emissions. For Gerlach's WWTP, Nitrous Oxide (N<sub>2</sub>O) is the main greenhouse gas from its operations, & is a byproduct of regular treatment and specialized processes used to get rid of extra nitrogen in wastewater.

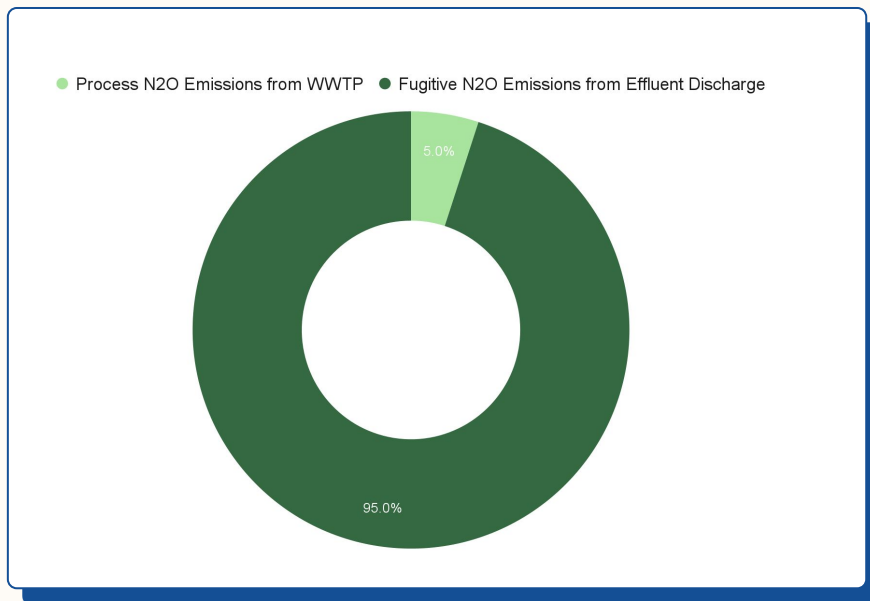


Figure 7: 2022 WasteWater GHG Emissions Breakdown

04

---

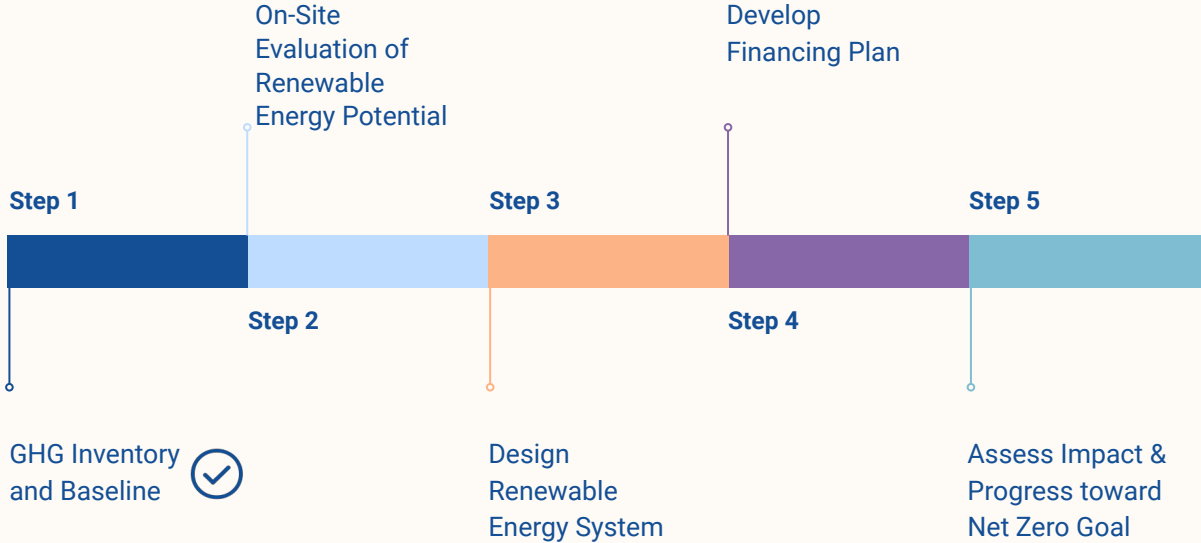
# Next Steps

*Team Climate-Resilient Next Steps*





# Team Climate-Resilient Gerlach



**Now that there is an established baseline, the Climate-Resilient Team will:**

1. Evaluate on-site renewable energy potential in Gerlach, considering wind, sun, and geothermal resources.
2. Design a resilient energy system, integrating generation and storage for future needs in adverse weather conditions.
3. Develop a financing plan to fund the necessary technology for project goals.
4. Throughout the project, conduct listening sessions and stakeholder meetings to gather input from residents regarding their desires and needs for their energy future, incorporating feedback at each step of the project.



## Building Insights

- **Climate Change Impact:**
  - ◆ Under extreme heat conditions, increased energy and utility costs burden housing systems.
  - ◆ Particularly affects neighborhoods with older or mobile homes lacking energy efficiency or air conditioning.
- **GHG Emissions:**
  - ◆ Majority of greenhouse gas (GHG) emissions come from electricity consumption.
  - ◆ NV Energy's Grid is becoming progressively cleaner each year, reducing electricity carbon intensity.
- **Residential vs Non-Residential Buildings:**
  - ◆ Residential energy contributes the most to building emissions (58%). Lots of older homes that aren't energy efficient.
  - ◆ The County may have more access & opp. for influencing and initiating changes in institutional buildings (29%).
- **Wood Heating:**
  - ◆ Wood is the least efficient fuel source utilized.
  - ◆ Residents may welcome programs to shift from wood heating due to challenges in wood availability/accessibility

## Next Step Considerations

- **Outreach and Education:**
  - ◆ Expand outreach and education on existing energy efficiency practices, programs, and financing options for both residential and non-residential users. Explore the possibility of new county-sponsored program creation.
  - ◆ Relevant IRA Funding:
    - *Battery Storage Installation, Geothermal Heating Installation, Rooftop Solar Installation, Heat Pump AC/Heater, Weatherization, Electric Panel*
- **Renewable Energy and Resilience:**
  - ◆ *For Both Residential & Non-Residential:*
    - **County-Run** Energy Efficiency Programs (including rebates, incentives, and education programs).
    - **Utility-Run** energy-saving improvement and rebate programs (collaboration with NV Energy).
    - **Federal-Run** Funding Access & Education (ie. rural energy programs, IRA).
  - ◆ *Large-Scale Renewable Energy Project:*
    - Implement a large-scale renewable energy project to reduce the community load from grid electricity use.
- **Overall Impact:** Combine energy efficiency efforts to reduce total energy use in the town with the transition to on-site renewable energy, will result in a **significant reduction in greenhouse gas emissions**



## Transportation Insights

Transportation GHG emissions makeup 24.6% of total emissions, with the majority from gasoline fuel usage (64%) and diesel (32.7%). It is the second-largest contributor to Gerlach's community GHG emissions, offering possible mitigation opportunities.

### Data Collection:

- Actual transportation data was challenging to obtain, and instead is built on Nevada regional data scaled down to rural population.
- Includes both On-Road (vehicles) & Off-Road (equipment) fuel use.
- Transportation often extends beyond community boundaries; GHG accounting considers Gerlach boundaries, but consideration of larger impact when planning is important for meaningful climate action

### Travel Patterns:

- In-town travel emissions are significantly smaller than out-of-town travel.
- Out-of-town travel occurs at high volumes (>100 miles) every week per household.

## Next Step Considerations

### Decreased Dependence on Cars & Increase Electric Mobility

**Options:** Explore the development of new county-led programs promoting electric micro-mobility devices (scooters, golf carts, electric bikes, EVs) for in-town transportation.

### Education, Outreach, Incentives:

- Raise awareness on existing transportation programs and funding opportunities
- Applicable IRA Funding:
  - Electric Vehicle Charger.
  - New & Used Electric Vehicles.

**Transportation Electrification Infrastructure:** Develop infrastructure supporting transportation electrification.

**Shuttle Services:** Explore county-sponsored shuttles at a scheduled cadence to reduce high volumes of >100 mile weekly trips from Gerlach.

*These efforts aim to create a more sustainable, accessible, and environmentally friendly transportation system for Gerlach, fostering a cleaner and healthier community.*



# Thank you

---

Jan 2024

