

City of Columbia, Missouri

Greenhouse Gas Inventory Report

Community and Municipal Inventories for Calendar Year 2022



Greenhouse Gas (GHG) Inventory Report Definitions

Community Contribution Analysis:

A greenhouse gas emissions inventory comparison tool used by Office of Sustainability staff to determine drivers of emissions increases and decreases between individual inventory years.

Community Emissions:

Scope one and two greenhouse gas emissions associated with activity within Columbia. Sources of emissions from the Columbia community include commercial, residential, and industrial energy use; transportation; and waste and wastewater.

Carbon Dioxide Equivalent (CO₂e):

The amount of CO₂ which would have the same global warming impact for any gas. CO₂e reports the global warming impact of multiple gases with just one metric.

Emissions Factors:

The quantity of greenhouse gases emitted per unit of energy used.

Emissions Inventory:

A quantification of the greenhouse gases emitted to the atmosphere during a specific period of time. Inventories allow for the tracking of emissions by sector and can be used to plan actions to reduce emissions.

Fugitive Emissions:

Greenhouse gas emissions from natural gas distribution/system leakage.

Greenhouse Gas (GHG) Emissions:

Atmospheric gases released when burning fossil fuels to produce electricity and heat, to power vehicles, and in the decomposition of waste.

Municipal Emissions:

Emissions produced by the day-to-day operations of the City as an organization. Includes building and facility energy use, waste produced, and fuel use by vehicles and equipment.

MMBtu:

One million metric British thermal units; a common energy unit used to measure energy from both electricity and natural gas. One British thermal unit is equal to the amount of energy needed to raise the temperature of one pound of water by one degree Fahrenheit.

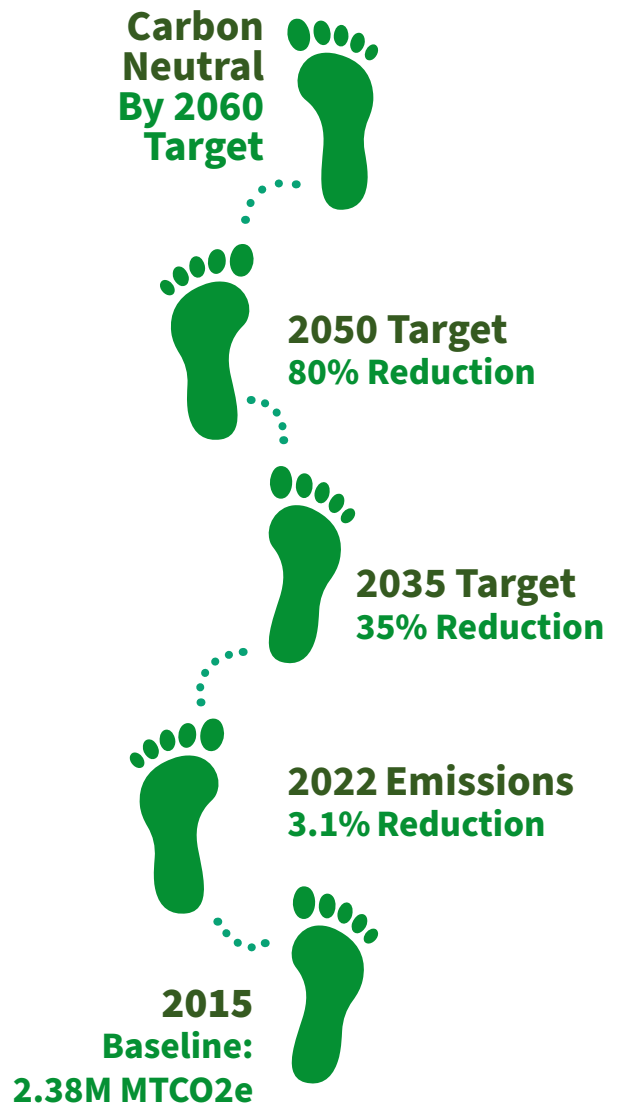
Explore the Sustainability Data Dashboard:

The Office of Sustainability's webpage (CoMo.Gov/Sustainability) hosts a dashboard with 2015-2022 greenhouse gas emissions inventory data. There are now downloadable and screen reader-friendly CSV tables of the data in the dashboard.

Introduction:

Columbia City Council reaffirmed Columbia’s commitment to take action to reduce climate pollution (Resolution 89-19A) on June 17th, 2019, by adopting the Climate Action and Adaptation Plan (CAAP). One of the main purposes of the CAAP is to reduce GHG emissions community-wide through targeted municipal, residential, industrial, and commercial activities. This document reports community emissions (emissions from the activities within the city limits of Columbia) and municipal emissions (contains a community greenhouse gas inventory report and the municipal greenhouse gas inventory report).

The methodology used for our GHG inventories is the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. This protocol was developed through ICLEI-Local Governments for Sustainability USA (a U.S. nonprofit corporation organization) and is widely used by municipalities in over seventy countries. GHG emissions are organized in the following sectors: residential energy, commercial energy, industrial energy, transportation, solid waste, water and wastewater, and process and fugitive emissions from natural gas.



What are the Scopes of GHG Emissions?

This report focuses on scope 1 and 2 emissions.

Scope 1

Emissions produced within the city limits and released into the community atmosphere (e.g., smokestacks and tailpipes in Columbia).

Scope 2

Indirect energy-related greenhouse gases that are emitted outside of Columbia as a direct result of activities within Columbia (e.g., grid-supplied electricity).

Scope 3

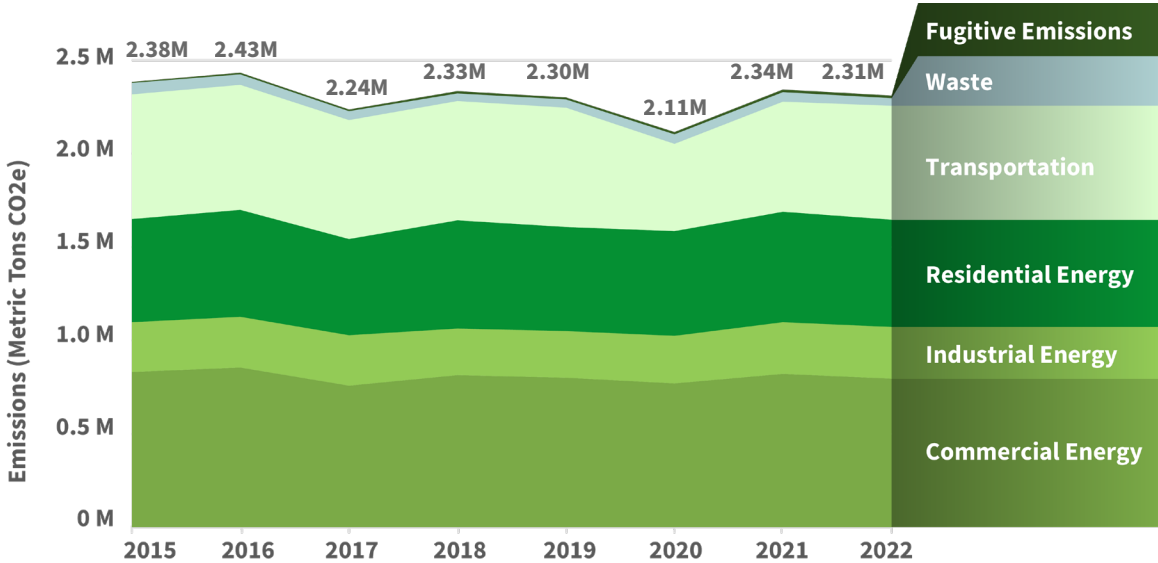
Other indirect emissions not covered in scope 2 (e.g., emissions from the production of goods produced elsewhere).



City of Columbia, Missouri
Community Greenhouse Gas Inventory Report - 2022

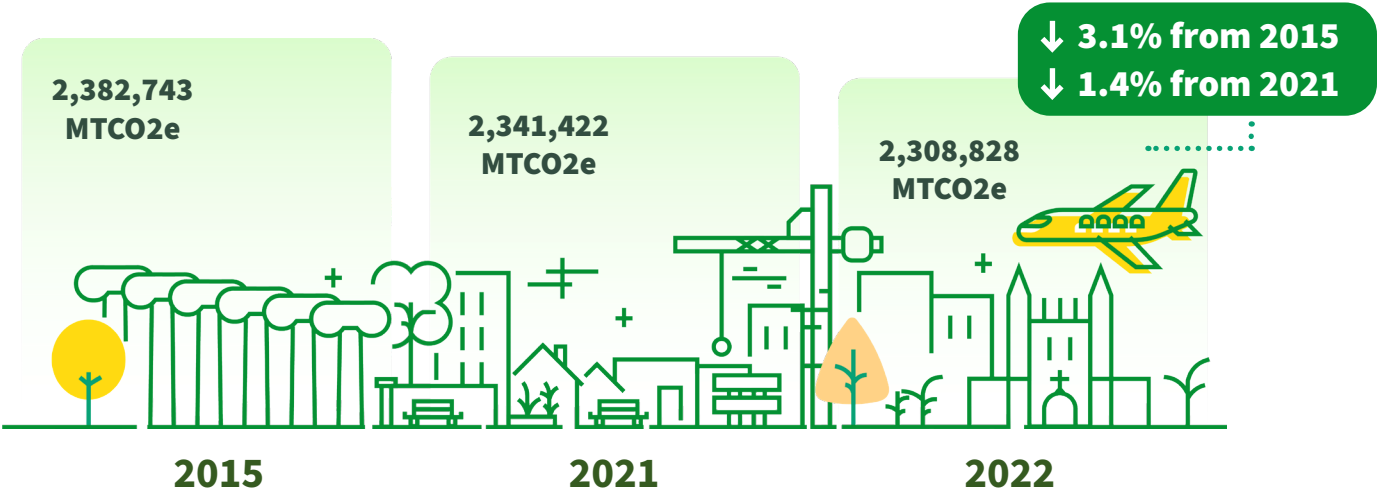


Community Greenhouse Gas Emissions



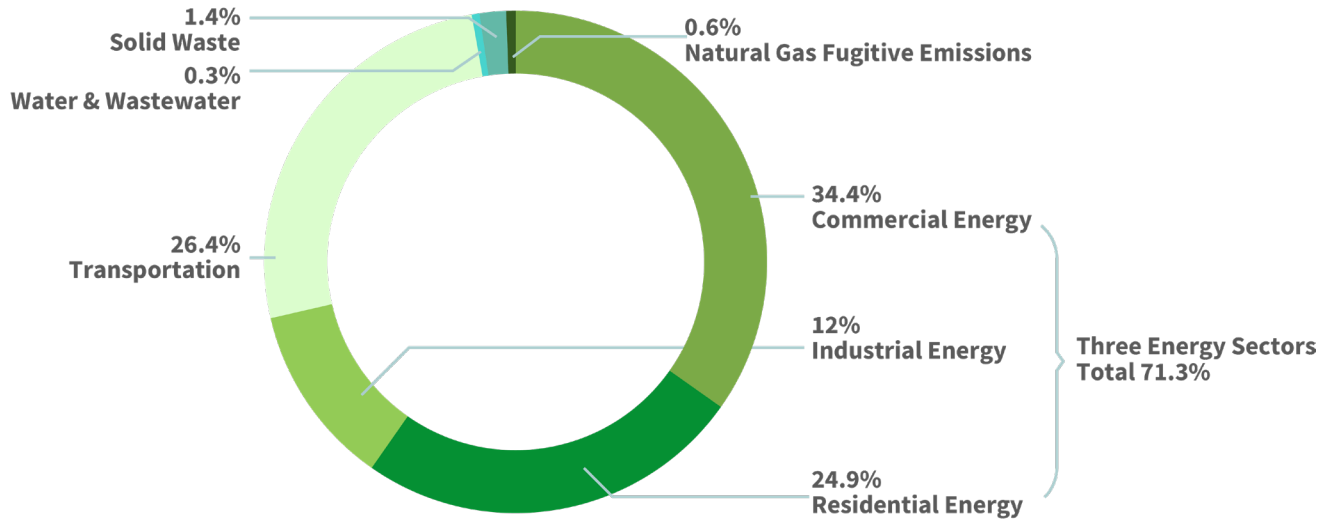
The total for 2022 community greenhouse gas (GHG) emissions was 2.31 million metric tons of carbon dioxide equivalent (MTCO2e).

How Have Emissions Changed Since the 2015 Baseline?



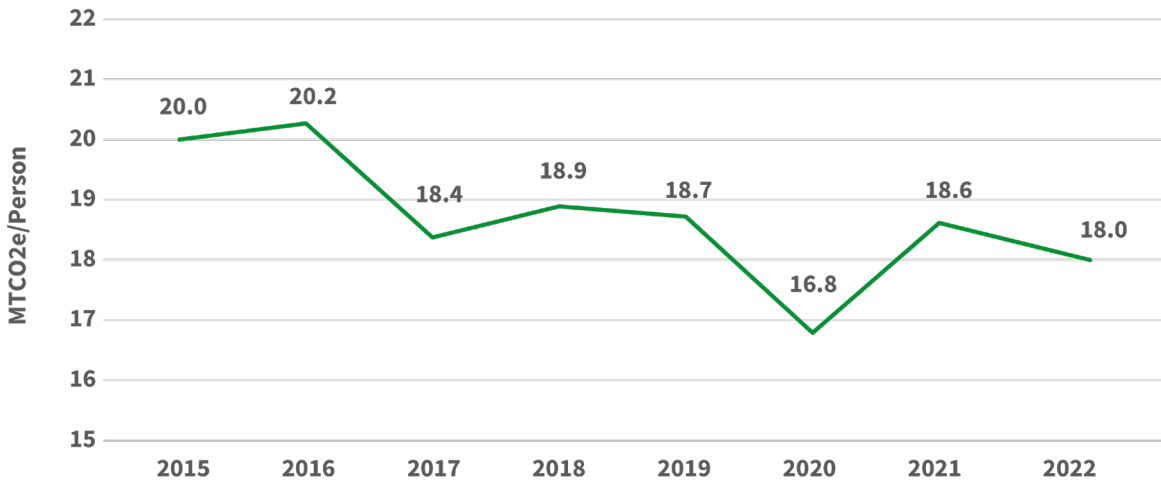
- Emissions decreased by 3.1% between the 2015 and 2022 inventories.
- Between 2021 and 2022, waste emissions decreased by 21.7%.
- Electricity used in the City of Columbia was 5.9% less carbon intensive in 2022 than in 2021, resulting in decreased energy emissions.

2022 GHG Emissions by Sector



The energy sector, made up of commercial, residential, and industrial energy, is the largest contributor to community greenhouse gas emissions. In 2022, the energy sector accounted for 71.3% of community emissions. Transportation made up 26.4% of total emissions, and solid waste and other emissions accounted for less than 3% of the inventory.

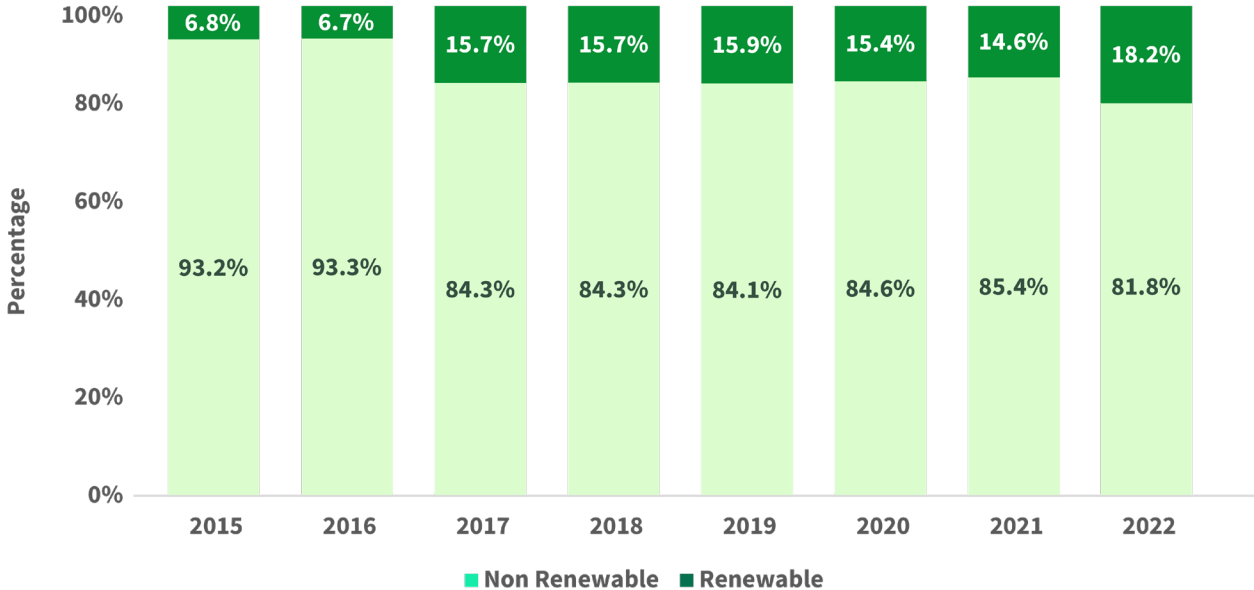
Per Capita Emissions



Community GHG emissions are related to community size. As Columbia continues to grow, more energy, vehicles, and jobs will be needed. Per capita emissions help us understand how our community GHG emissions are changing in relation to changes in population size.

The City of Columbia’s per capita emissions have decreased by 10% between 2015 and 2022. To reach our goals, Columbia’s emissions will need to decrease faster than the population increases. Systemic changes, such as increasing the supply of renewable electricity, have a large impact on reducing per capita emissions. Individual actions can also help reduce emissions.

City of Columbia Electric Utility Renewable Energy



The City of Columbia’s electric utility is the largest provider of electricity in Columbia, making the use of renewable energy by the utility vital for reducing energy sector emissions. In 2022, the 18.2% of renewable energy used by the utility resulted in an estimated 157,794 avoided MTCO_{2e}.

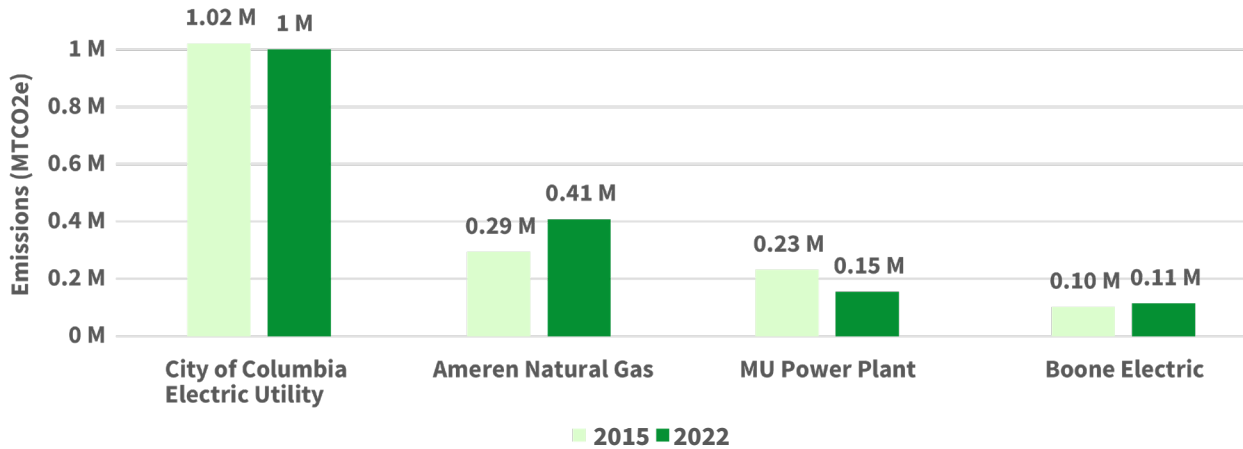
Exploring Changes in Emissions: The Community Contribution Analysis

The Community Contribution Analysis models community-wide emissions changes between inventory years to help explain complex drives of the changes. Factors such as weather, population, economic metrics, and activity data (such as energy consumed and vehicle miles driven) are taken into account. The following are the top drivers of emissions decreases between 2021 and 2022 as determined by the contribution analysis:

Top drivers:

- 1 ↓ **55.7k MTCO_{2e}** Cleaner Electricity
- 2 ↓ **11k MTCO_{2e}** Decreased commercial kWhs consumed per job in the community
- 3 ↓ **4.5k MTCO_{2e}** Decreased commercial therms consumed per job in the community
- 4 ↓ **3.2K MTCO_{2e}** Energy efficiency programs

Energy Emissions by Utility



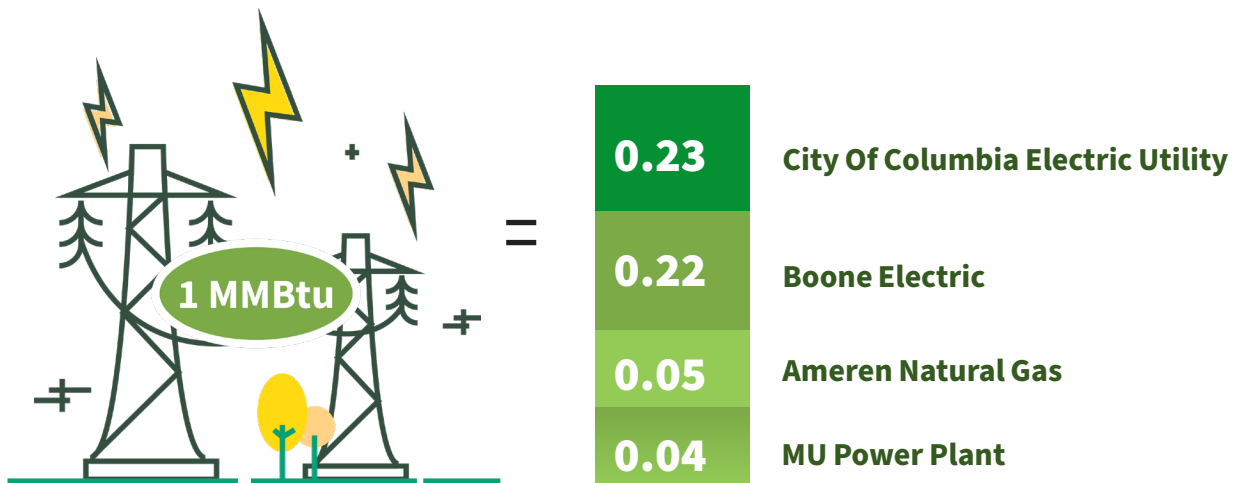
The City of Columbia’s electric utility has remained the largest provider of electricity and the largest single source of GHG emissions since the 2015 baseline year. Emissions from the City of Columbia’s electric utility have decreased by 12.4% since 2015. MU Power Plant emissions have decreased by 86k metric tons of CO₂e (MTCO₂e), or 37%, and Ameren Natural Gas emissions have increased by 117k MTCO₂e, or 40%, since the 2015 baseline. In total, energy emissions in 2022 were similar to energy emissions in 2015, with less than a 1% decrease.

How much CO₂e is Emitted per Unit of Energy Provided?

Emissions factors (EFs) represent the amount of greenhouse gases emitted per unit of energy provided. Here, emissions are expressed in units of MTCO₂e, and energy is expressed in units of MMBtu (one million British thermal units).

Differences in EFs are caused by differences in fuel sources- for example, coal produces much more CO₂e per unit of energy than natural gas, and renewable energy sources produce no direct emissions. Sourcing from an increasing percentage of renewable energy is fundamental to reducing EFs and achieving community emissions reduction goals.

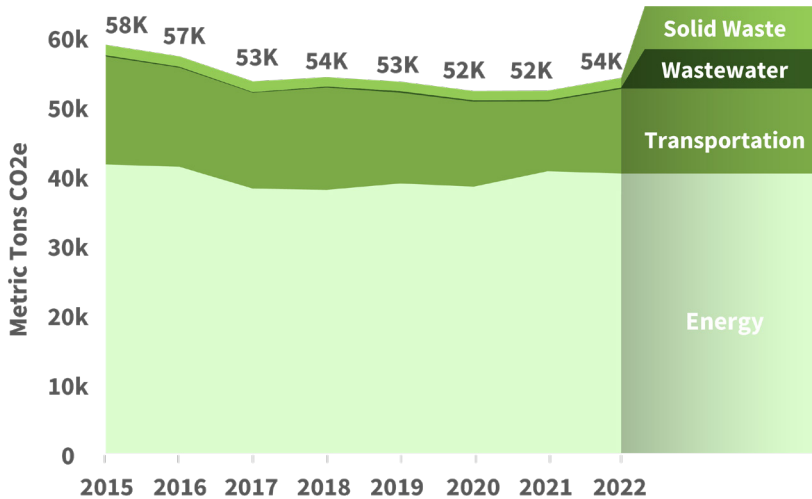
Emissions Factor by Utility(MTCO₂e/MMBtu)



City of Columbia, Missouri
Municipal Greenhouse Gas Inventory Report - 2022



2022 City of Columbia Municipal Emissions

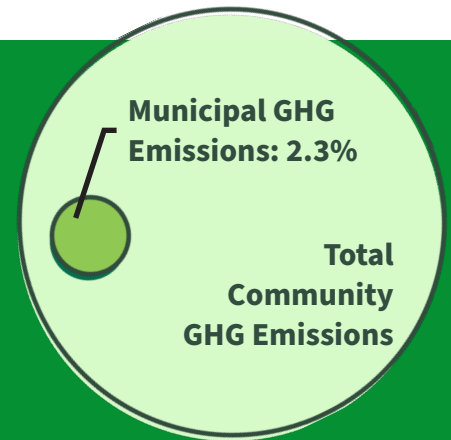


The City of Columbia’s municipal operations emissions have decreased by 8.1% since the 2015 baseline.

The City of Columbia plans to continue reducing its municipal emissions through activities outlined in the Climate Action and Adaptation Plan (CAAP). These activities will lay the foundation for reducing community emissions as well. To learn more about CAAP programs and progress, find the plan and the 2022 Annual CAAP Report at [CoMo.gov/sustainability/reports-documents/](https://www.columbiaga.gov/sustainability/reports-documents/)

How do Municipal Emissions Relate to Community Emissions?

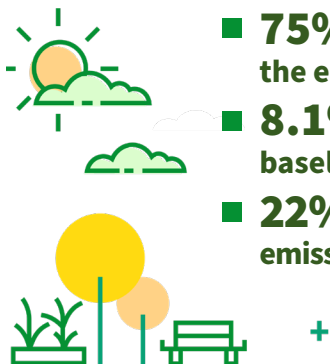
In 2022, municipal emissions made up 2.3% of the total community emissions. The municipal distribution across sectors resembles the community’s inventory, with energy being the largest sector, followed by transportation and waste.



2022 Municipal Inventory Highlights

The emissions reported here represent the impact of City of Columbia operations as an organization. This report includes greenhouse gas (GHG) emissions associated with energy use, transportation (including employee commute), and waste produced by municipal operations only.

- **54,034 MTCO2e in 2022 for municipal operations**
- **75% of emissions in 2022 came from the energy sector**
- **8.1% total decrease from 2015 baseline emissions**
- **22% reduction in transportation emissions since 2015**



Emissions by Sector & Sources

Ten sources of emissions are categorized into three sectors to calculate annual GHG emissions from City of Columbia municipal operations. This table displays the total MTCO₂e and the percentage of total emissions for each source and sector in calendar year 2022.

Facility electricity is the largest source of energy emissions and is composed of electricity used by municipal buildings and water and wastewater treatment facilities. Several new municipal facilities have been added since 2015, while many existing facilities have undergone energy improvement projects. With these two factors at play, facility electricity emissions have remained relatively consistent throughout inventory years.

Sector	% of Total	MTCO ₂ e
Energy	74.6%	40,307
Buildings & Facilities	63.2%	34,127
Street Lights & Traffic Signals	11.4%	6,146
Fugitive Emissions	0.1%	34
Transportation	22.6%	12,195
Employee Commute	5.8%	3,144
Transit Fleet	2.2%	1,197
Vehicle Fleet	14.5%	7,854
Waste	2.8%	1,532
Solid Waste Facilities	2.5%	1,344
Water & Wastewater Treatment Facilities	0.3%	188
Total of Three Sectors		54,034

What Were the Largest Sources of Municipal Emissions in 2022?

City of Columbia staff is developing new tools to provide insight into municipal GHG emissions and guide progress towards reduction goals. Benchmarking municipal building energy is one tool that is being used to prioritize energy efficiency projects and renovations. The first municipal benchmarking report can be found at CoMo.gov/sustainability/internal-sustainability/. Tools for gaining insight into vehicle and transit fleet are also being developed.



[This page is intentionally left blank]



701 E. Broadway, P.O. Box 6015
Columbia, MO 65205-6015