



2022 San Francisco Sector-based Greenhouse Gas Emissions Inventory At-A-Glance

San Francisco Environment Department

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Summary

In 2022, San Francisco's sector-based* communitywide greenhouse gas (GHG) emissions totaled 4.12 million mtCO₂e (see page 5). This is 48% below emissions levels in 1990 (the city's baseline year). In other terms, per capita emissions were less than half per person as seen in 1990. These reductions have come despite a 12% increase in population over the same period.

Note on the impacts of Covid-19

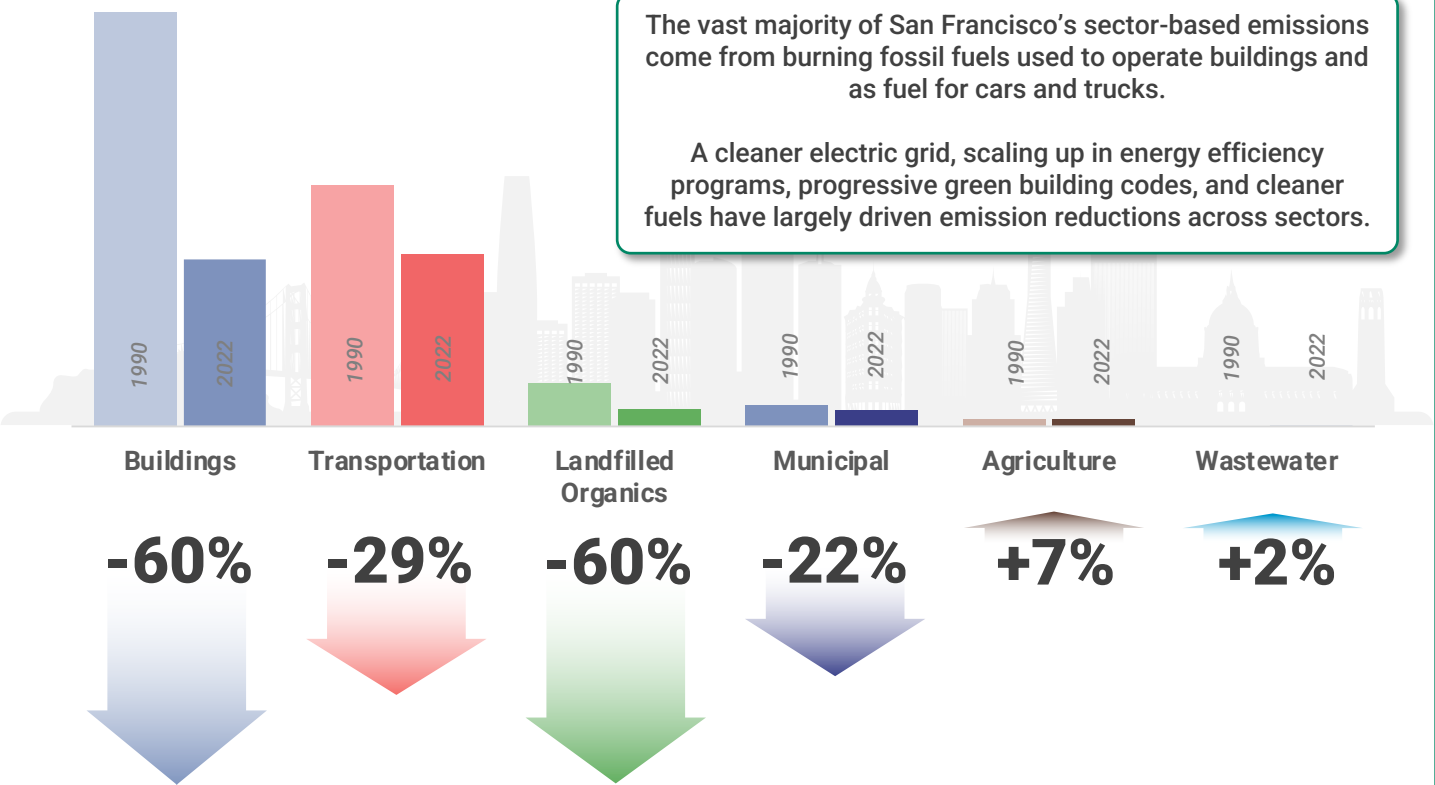
In 2022, San Francisco began its journey of recovery, reopening its economy and lifting the COVID-19 restrictions that protected public health in 2020-2021. The pandemic brought about a host of unique circumstances and behavioral changes that have had a lasting influence on the city's emission levels. Notable examples include the continuation of remote work, significant changes to travel patterns, and other economic shifts in business operations and consumer behavior. As we navigate the post-pandemic landscape, it is crucial to recognize that these changes are not static and will likely influence San Francisco's emissions trajectory for years to come.

* Since 1990, sector-based (i.e. geopolitical) GHG inventories have been calculated and reported in accordance with the ICLEI U.S. Community Protocol (USCP) for Accounting and Reporting of Greenhouse Gas Emissions. The methodology and sectors tracked were third-party verified in inventory year 2012, and all subsequent inventories were completed according to the guidance of the verifiers. In 2015, the City began reporting emissions in compliance with the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC), which incorporated new emissions categories. While ICLEI protocols are used to calculate emissions, the GPC framework aligns San Francisco with other cities and supports transparent disclosure of emissions to the global community.

2022 San Francisco Emissions by Sector

The vast majority of San Francisco's sector-based emissions come from burning fossil fuels used to operate buildings and as fuel for cars and trucks.

A cleaner electric grid, scaling up in energy efficiency programs, progressive green building codes, and cleaner fuels have largely driven emission reductions across sectors.



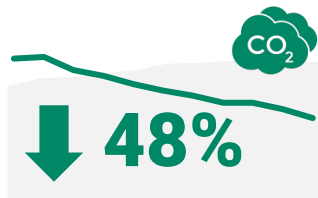
1990-2022 San Francisco Context

San Francisco's population has grown 12% since 1990



808,437 people
12% increase since 1990

Our city's overall emissions decreased 48% in that time



4,119,853 mtCO₂e
48% reduction since 1990

This equates to per-capita emissions reduction of 53%



5.10 mtCO₂e per capita
53% reduction since 1990



Emissions Overview

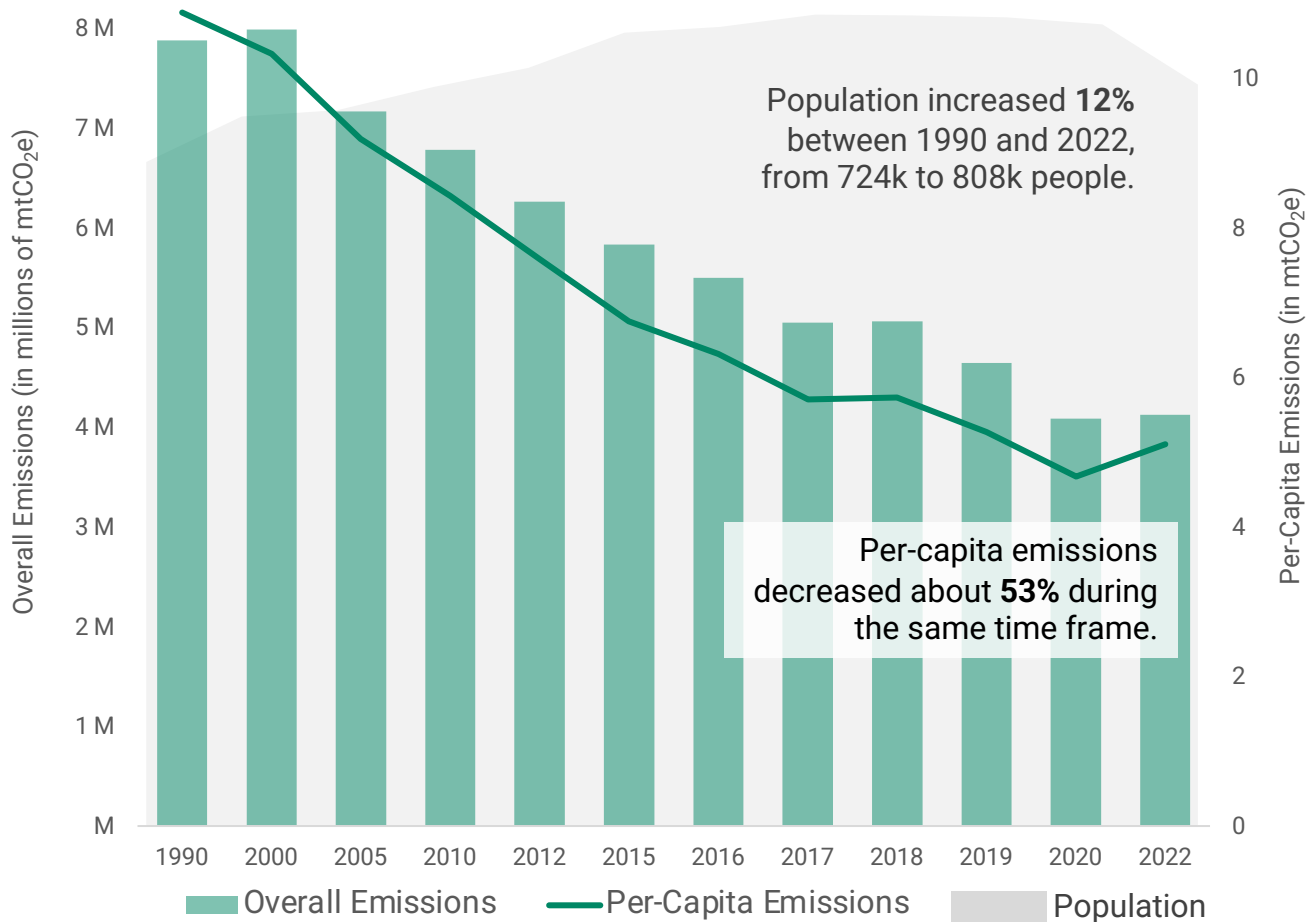
Emissions Trends

In 2022, San Francisco's emissions were 48% below 1990 levels, from 7.9 million mtCO₂e to 4.12 million mtCO₂e. These reductions came despite a 12% increase in population, and during the city's recovery from the COVID-19 pandemic.

As a result, San Francisco's emissions per capita was 5.10 mtCO₂e/person in 2022, less than half of the 11 mtCO₂e/person seen in 1990.

Emissions fell in five of the seven sectors tracked. While acknowledging the varied impacts of the pandemic and the subsequent economic recovery, other key drivers included:

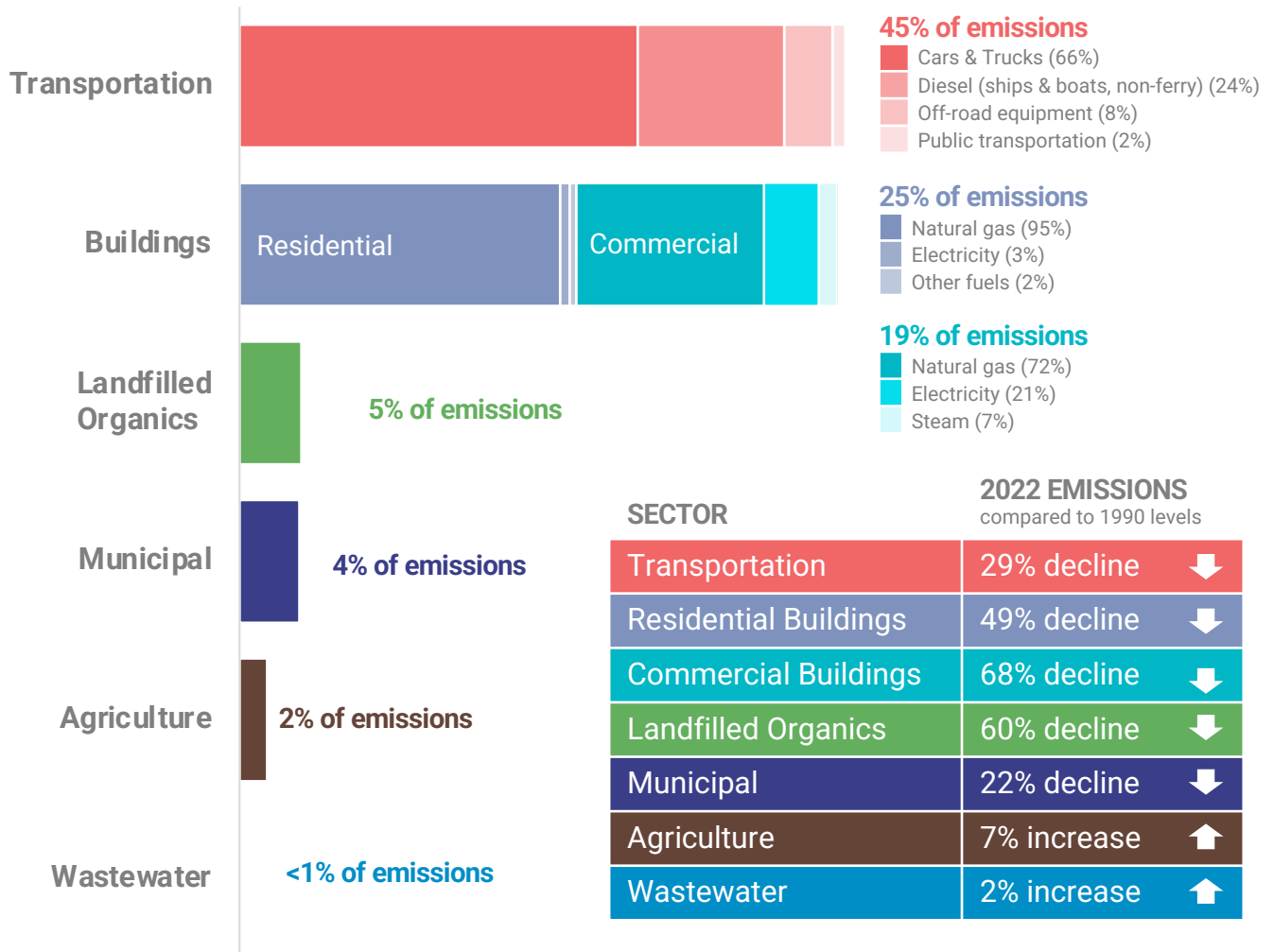
- A cleaner electric grid for all of San Francisco
- A scaling up of building electrification and energy efficiency programs
- Progressive green building codes
- Cleaner vehicle and fuel efficiency standards along with the push towards electrical vehicles



Emissions Overview

Emissions Trends (continued)

Emissions are categorized into **seven sectors** in the 2022 inventory.



Emissions in 2022 were less than 1% higher than in 2020. Between 2020 and 2022, transportation sector emissions rose by 5%. Overall building sector emissions also increased by 1% due to increased activity from commercial buildings. These changes reflect the reopening of San Francisco’s economy following the COVID-19 pandemic, including the return to office work, increased travel, and heightened economic activity.

Emissions Overview

Emissions Reduction Drivers

Emissions reductions can be attributed to a variety of factors, such as by implementing specific technologies, policies, and programs, as well as by external forces such as weather and in the case of 2022, the global COVID-19 pandemic and subsequent economic recovery. Key drivers of emission reductions observed between 1990 and 2022 are described below.

More renewable electricity. CleanPowerSF, San Francisco's Community Choice Aggregation program, has continually expanded its renewable electricity portfolio and customer base while reinvesting ratepayer funds into local renewable energy resources. In 2022, 89% of electricity supplied to San Francisco came from renewable sources. Achieving 100% renewable electricity by 2025 will be critical to eventually eliminate fossil fuel emissions from buildings and vehicles.



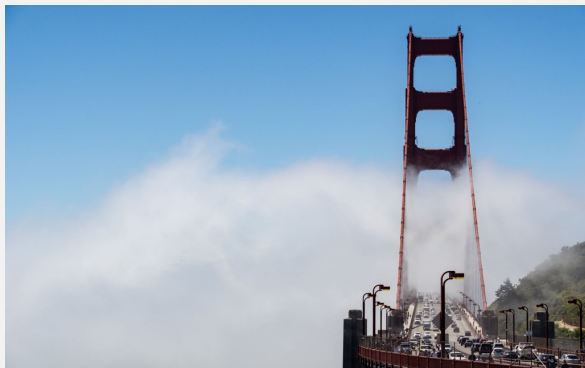
Making buildings more energy efficient and all-electric. Recently, building electrification has emerged as a key climate strategy, as electricity continues to get cleaner and more plentiful while alternatives to gas building equipment become less expensive and more accessible. The city has implemented policies requiring all new constructions to be all-electric, eliminating on-site fossil fuels, and is encouraging existing buildings to replace gas appliances with electric alternatives. This effort has been coupled with longstanding offerings from BayREN residential and commercial programs and the SFPUC for energy-efficient appliances and improved weatherization.

Emissions Overview

Emissions Reduction Drivers (continued)

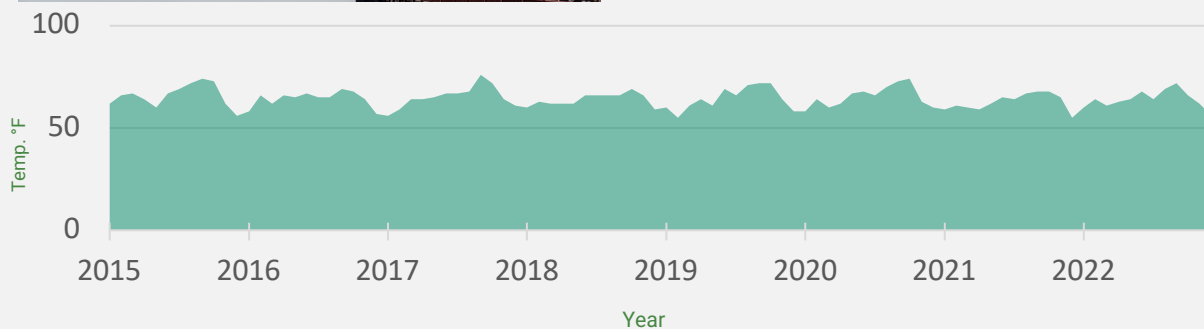
San Francisco, long known for its pioneering zero waste efforts, has increasingly focused on recovering organic waste from going to landfills, which end up releasing methane to the atmosphere. This has been achieved by implementing aggressive collection policies (mandatory recycling and composting requirements), offering incentives (discounted rates for reduced landfill discards), and providing new programs that promote re-use. New policies and programs will address responsible production and consumption by transitioning more non-reusables to reusables, increasing food waste reduction and edible food donation (including a mandatory edible food recovery ordinance implemented in 2022), and facilitating greater material recovery and reuse in high-impact areas such as construction.

Increasing low-carbon trips and vehicle electrification. During the height of the pandemic, travel behavior changed dramatically, and the effects are still being felt today. Historically, San Francisco’s per-capita daily miles traveled by passenger vehicles have been the lowest of all Bay Area counties. However, as the city continues to grow and support the region, more must be done to reduce emissions, address road congestion, and protect public health. In 2022, 28% of all private vehicle purchases in San Francisco were zero-emission vehicles. Additionally, there is a push towards equitable investments in EV charging infrastructure. The city also has longstanding efforts to reduce transportation emissions by promoting public transit and active transportation with a key goal of having at least 80% of local trips be low-carbon—meaning mainly trips by transit, walking, or biking instead of driving.



Impact of Weather on Emissions

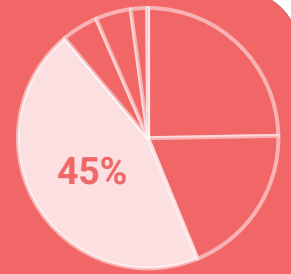
Weather can impact emissions levels and lead to short-term, year-to-year variations as San Francisco continues to make progress toward longer-term reduction targets. For example, warmer temperatures compared to a previous year can drive down energy consumption needed to heat buildings, while colder seasonal temperatures would increase energy usage.



Source: www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/

Transportation

2022 Emissions = 1.8 million MTCO₂e

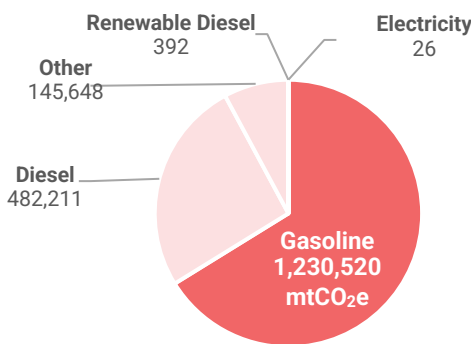
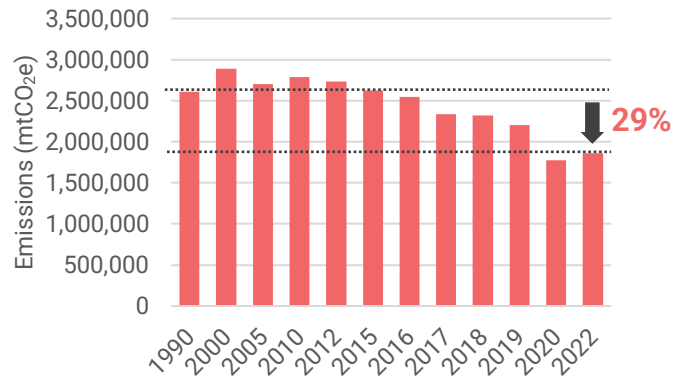


Emissions from fossil-fuels used to operate on- and off-road vehicles and equipment, ships, and boats.

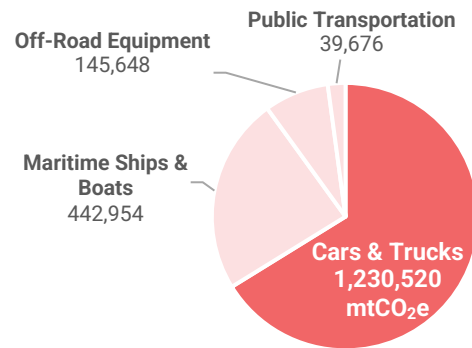
Transportation emissions have declined **29%** since 1990.

Key Drivers:

- Higher fuel efficiency standards
- Decarbonization of fuels (i.e. electrification)
- Expansion and higher use of low-carbon modes (transit, walking, biking)



BY FUEL TYPE: 66% of transportation emissions (tons CO₂e) are from gasoline consumption in road vehicles.



BY MODE: 66% of transportation emissions (tons CO₂e) are from private cars and trucks.

Facilitating the shift from driving to transit, walking, biking and other low-carbon modes, and supporting electric vehicle adoption through the provision of charging infrastructure will drive down these emissions over time.

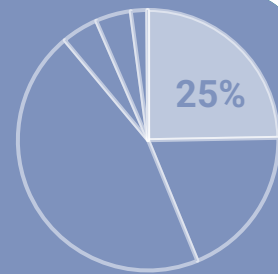
Key Data Sources

- California Air Resources Board: 2018 Emissions Profile; SF County Transportation Authority (SFCTA)*; SF Municipal Transportation Agency; BART; Caltrain; SF Public Utilities Commission (SFPUC); Bay Area Air Quality Management District (BAAQMD); U.S. Dept. Of Transportation

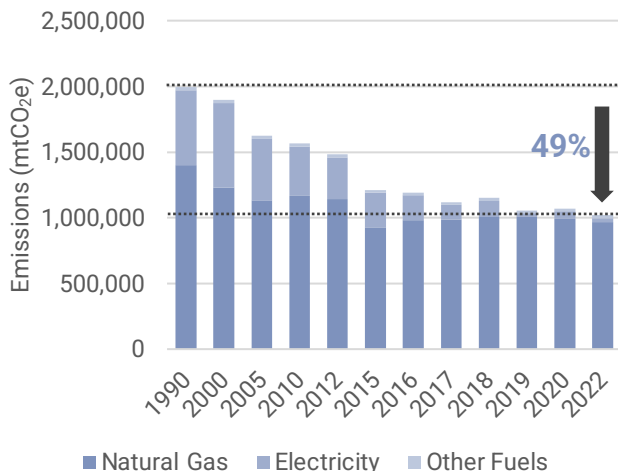
* SFCTA now provides vehicle miles travelled (VMT) data via an improved methodology ("Covid Congestion Tracker")

Residential Buildings

2022 Emissions = 1 million MTCO₂e



Emissions from fossil-fuels used to heat household spaces, provide lighting and hot water, and power appliances.



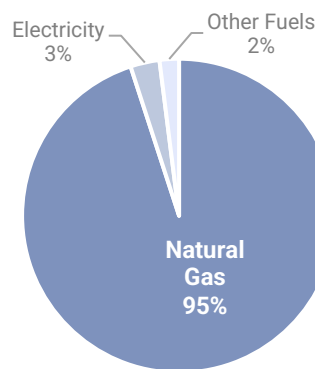
Residential emissions have declined **49%** since 1990.

Key Drivers:

- Improved building energy codes
- Citywide energy efficiency programs
- Cleaner electrical grid

95% of residential emissions are from natural gas use.

Transitioning away from natural gas use in new and existing buildings will help continue to reduce residential building emissions.



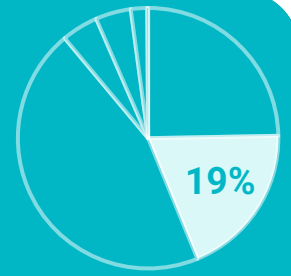
Key Data Sources

- Pacific Gas and Electric (PG&E) "Community Wide GHG Inventory Report for San Francisco"
- CleanPowerSF

Electricity emissions will continue to decline with San Francisco's push towards providing only 100% renewable electricity.

Commercial Buildings

2022 Emissions = 787,000 MTCO₂e

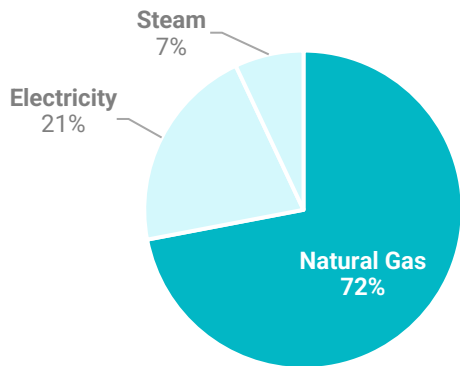
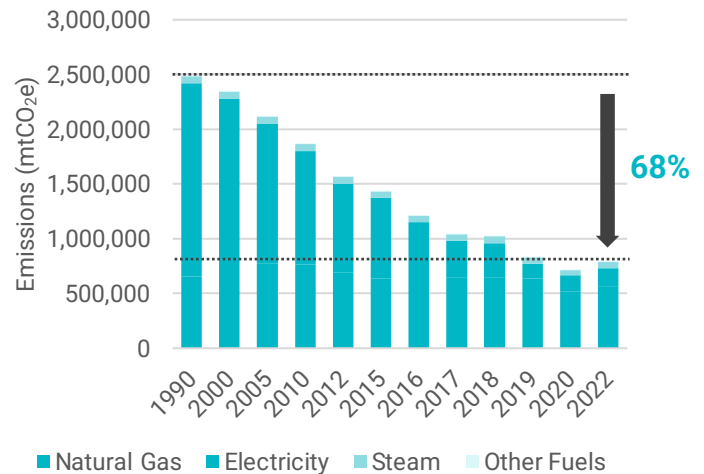


Emissions from fossil-fuels resulting from electricity and natural gas consumption by commercial and industrial utility, direct access, district, and steam loop customers.

Commercial emissions have declined **68%** since 1990.

Key Drivers:

- Improved building energy codes
- City-wide energy efficiency programs
- Cleaner electrical grid



72% of commercial emissions are from natural gas use.

Transitioning away from natural gas use in new and existing buildings paired with energy efficiency measures will help continue to reduce commercial building emissions.

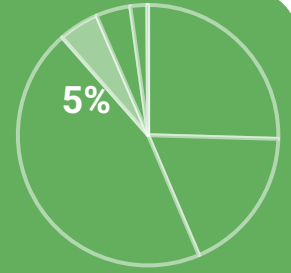
Key Data Sources

- PG&E "Community Wide GHG Inventory Report for San Francisco"
- SFPUC
- CleanPowerSF
- EPA Facility Level Information on Greenhouse Gases (FLIGHT) Tool

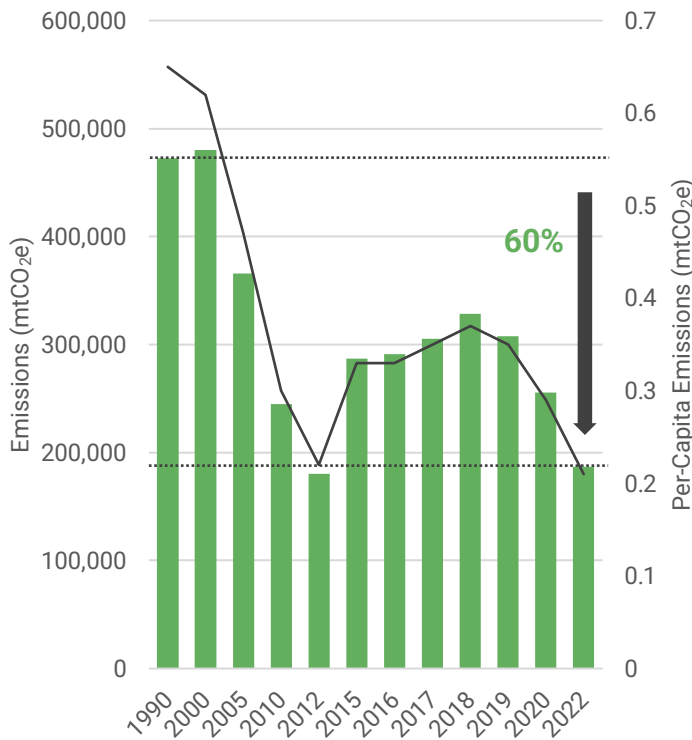
68% of commercial electricity was sourced from CleanPowerSF, resulting in lower emissions. This percentage will increase with the implementation of Env. Code Chapter 30, which phases in a requirement for commercial buildings to obtain all electricity from 100% renewable sources.

Landfilled Organics

2022 Emissions = 187,000 MTCO₂e



Methane emissions from decomposition of organic materials sent to landfill.



Landfilled organics emissions have declined **60%** since 1990.

Key Drivers:

- Improved resource recovery
- Decline in tonnage of organics sent to the landfill

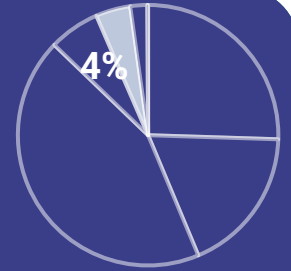
Key Data Sources

- California Department of Resources Recycling and Recovery (CalRecycle)
- SF Environment Department

Per capita emissions from landfilled organics has gone from 0.65 mtCO₂e per person in 1990 to 0.21 mtCO₂e per person in 2022, a decrease of 67%.

Municipal

2022 Emissions = 181,000 MTCO₂e



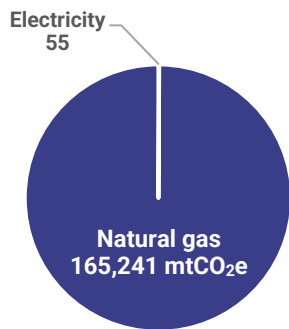
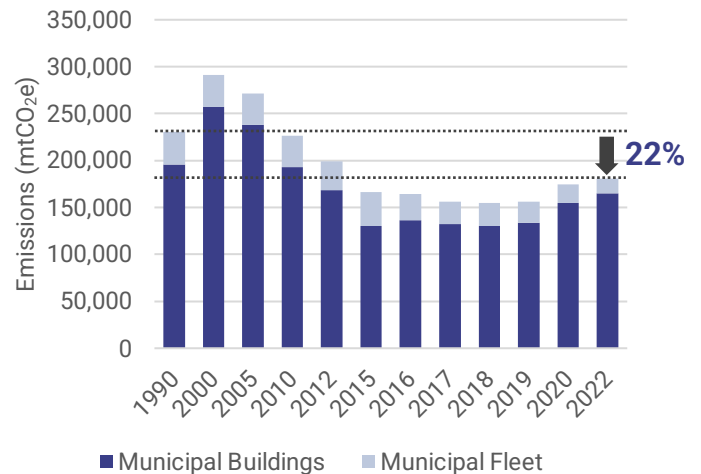
Emissions from fossil-fuels used to provide heating, hot water, and lighting, to power appliances for municipal buildings and facilities, and to operate municipal fleets and equipment.

Municipal emissions have declined **22%** since 1990.

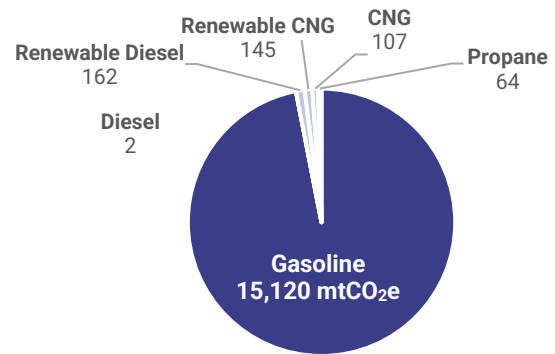
91% of emissions are from city-owned buildings. 9% are from city fleet.

Key Drivers:

- Using 100% renewable electricity
- Fuel efficiency standards
- Renewable diesel replacing traditional diesel



Essentially 100% of our city building emissions come from natural gas use. Continuing to use renewable electricity, increase energy efficiency and move away from natural gas will help decrease municipal building emissions.



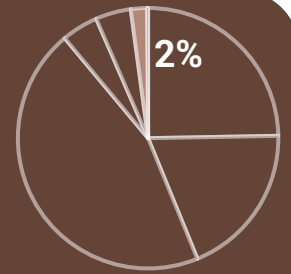
97% of our city fleet emissions come from gasoline use. Continuing to electrify the fleet and use renewable diesel will help further decrease municipal fleet emissions.

Key Data Sources

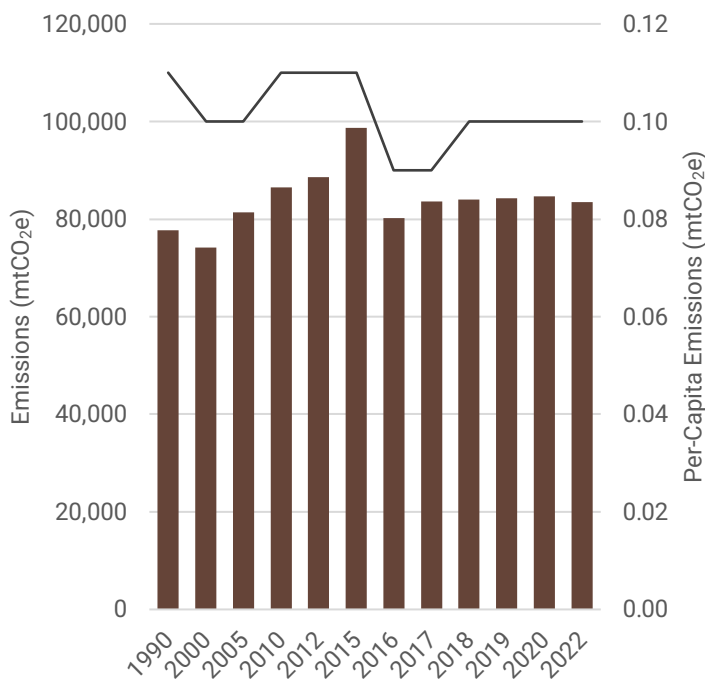
- PG&E "Community Wide GHG Inventory Report for San Francisco"
- SFPUC
- City and County of San Francisco, multiple departments

Agriculture

2022 Emissions = 83,000 MTCO₂e



Emissions released from animal waste, biomass burning and urban soil management.



Emissions from agriculture still comprises only a small fraction of San Francisco emissions.

Since 1990, agriculture emissions have increased **7%** overall, but decreased **4%** per-capita (even with significant population growth) and is stabilizing at about 0.10 mtCO₂e per-capita.

Key Data Sources

- Bay Area Air Quality Management District (BAAQMD)

Sources of agricultural emissions include:

- Animal waste (from domestic animals and other native animals such as dogs, cats, coyotes, deer, etc.)
- Biomass burning (namely the accidental burning of vegetation in city boundaries)
- Soil management

Wastewater

2022 Emissions = 4,400 MTCO₂e

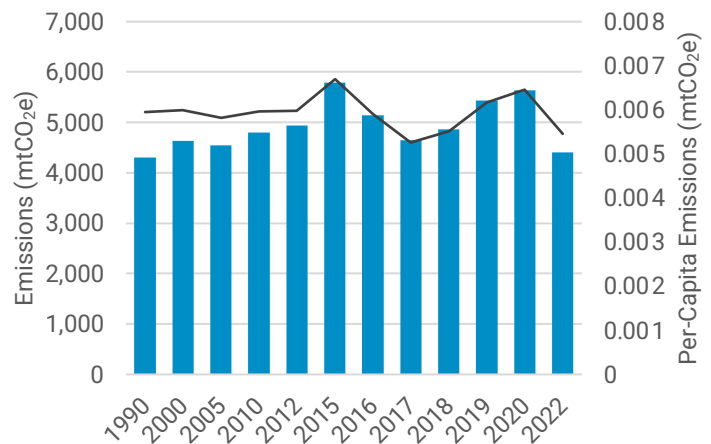


Emissions released from liquid waste discharge, treatment process, and gases released during digestion from the Southeast, Oceanside and North Point Wastewater Treatment Plants.

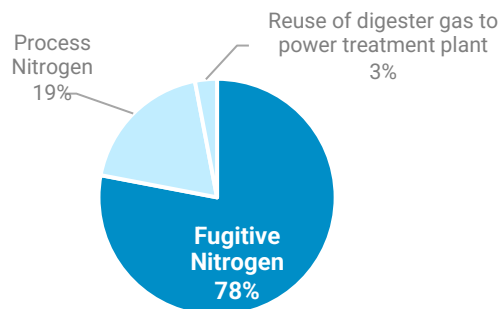
Wastewater emissions have increased 2% since 1990.

Key Drivers:

- Emissions have increased due to a concurrent 12% increase in population.
- Emissions are mainly fugitive emissions from liquid waste discharging to a body of water.
- Remaining emissions come from:
 - Energy and processes used to treat wastewater
 - Gases released during digestion



While total wastewater emissions have increased by 2%, **per capita emissions** have decreased by 8%



Emissions Breakdown:

- Fugitive Nitrogen: 78%
- Process Nitrogen: 19%
- Reuse of Digester Gas to Power Treatment Plant: 3%

Key Data Sources

- San Francisco Public Utilities Commission (SFPUC)

Sources of Wastewater Emissions:

- The City's three wastewater treatment facilities - the Oceanside and Southeast treatment plants, and North Point wet weather plant - all operated by SFPUC.