



# 2020 San Francisco Sector-based Greenhouse Gas Emissions Inventory At-A-Glance

San Francisco Environment Department

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# Foreword

Climate change is undeniably present in all parts of the globe. Here in San Francisco, we have already experienced the visceral realities of global warming in the form of punishing droughts, dangerous floods, extreme heat days, rising seas, and poor air quality due to wildfires. This report is San Francisco's greenhouse gas (GHG) inventory which tracks the City's emissions and contributions to global climate change. Understanding the sources of emissions is an essential data point in any climate action plan.

GHG peaked in 2000. Since then, the City has set an ambitious goal to be a net-zero emission city by 2040 and implemented a range of policies and programs to achieve this target. The good news is that the City is almost halfway to its goal. San Francisco has risen to the climate challenge and reduced its emissions by 48% over the 1990 baseline. This track record of success rests not only on a successful foundation of climate action but also on an economic realignment towards a greener economy. San Francisco has been a leader in promoting a low-carbon economy in recognition of the fact that reducing emissions is not only essential for the environment but can also spur economic development.

San Francisco has shown that a low-carbon economy and economic development are not mutually exclusive. By implementing policies that reduce GHG emissions while promoting clean energy, eliminating fossil fuels from buildings, and encouraging zero waste and low carbon transportation options, the City is creating jobs, saving money, and improving the quality of life for its residents, all while contributing to the fight against climate change.

While San Francisco is taking steps to mitigate and adapt to the impacts of climate change, it still needs to do more. The City is suffering from the aftershocks of the pandemic—budget and affordable housing shortages, work-from-home practices that have depleted the downtown core, and much more. Fostering climate-friendly industries to support San Francisco's pandemic recovery is crucial. Fortunately, San Francisco already has an emerging climate technology market with a diverse array of companies developing innovative technologies to address climate change.

The City's deep history with environmentalism will continue to sustain the conditions that give birth to revolutionary new ideas and technologies that are usable by climate tech ventures and researchers. In fact, the climate tech industry is projected to add potentially 22 million jobs globally by 2030 and achieve a market size of \$3 trillion by 2050. With its rich history in climate action, San Francisco is uniquely poised to retain and attract new climate tech-focused companies. The City has long been an incubator for startups and established companies. It's the very reason why many of the world's carbon capture startups are already within the City.

San Francisco's commitment to climate action has provided a supportive ecosystem for climate tech companies and global environmental organizations. San Francisco has a strong ecosystem of universities, research institutions, startups, and investors, which creates an ideal environment for companies to network and collaborate on solutions to environmental challenges.

New policies, like the all-electric mandates to transition appliances and personal vehicles away from fossil fuels, are already driving economic development and new industries. Additionally, they can create a pathway to ameliorate some of San Francisco's post-pandemic challenges. Coupling innovative and smart economic activity with San Francisco's sustainable backbone, such as its public transportation system and green buildings, will foster an environmentally sustainable and economically viable city where we can all thrive.

## Summary

In 2020, San Francisco's sector-based\* communitywide greenhouse gas (GHG) emissions totaled 4.1 million mtCO<sub>2</sub>e (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 21% increase in population over the same period.

### Note on the impacts of Covid-19

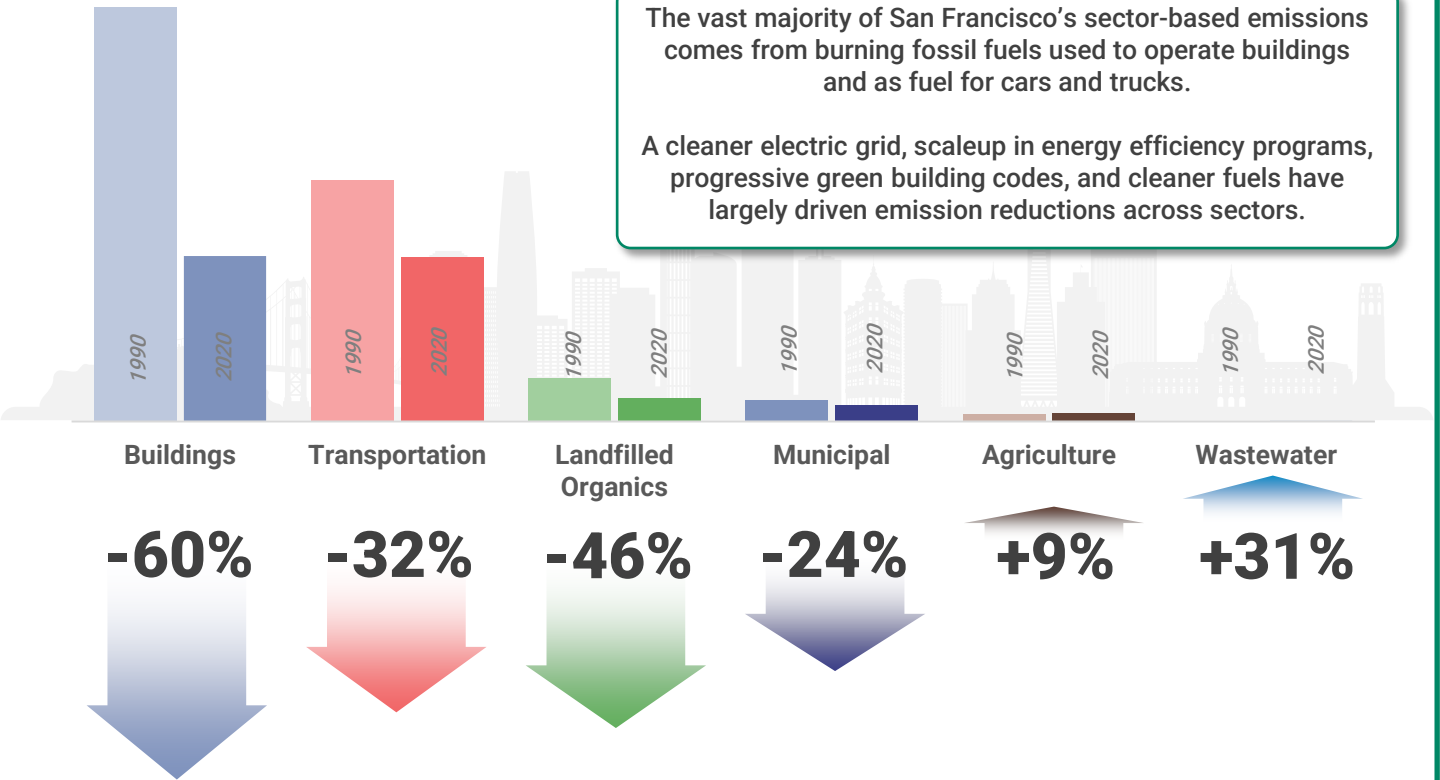
The initial response to the COVID-19 pandemic, especially in 2020-21, led to many unique circumstances and changes in behavior that could impact emissions. Notable examples include: the large and sudden increase in people working from home, commercial business closures, significant changes to local and regional travel, and other widespread economic impacts. As society adapts to a post-pandemic world, it's important to keep in mind that these impacts will continue to evolve and reverberate 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.

# 2020 San Francisco Emissions by Sector

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

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



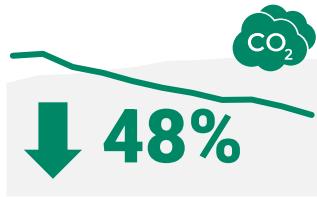
## 1990-2020 San Francisco Context

San Francisco's population has grown 21% since 1990



873,965 people  
21% increase since 1990

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



4,080,203 mtCO<sub>2</sub>e  
48% reduction since 1990

This equates to per-capita emissions reduction of 57%



4.67 mtCO<sub>2</sub>e per capita  
57% reduction since 1990



# Emissions Overview

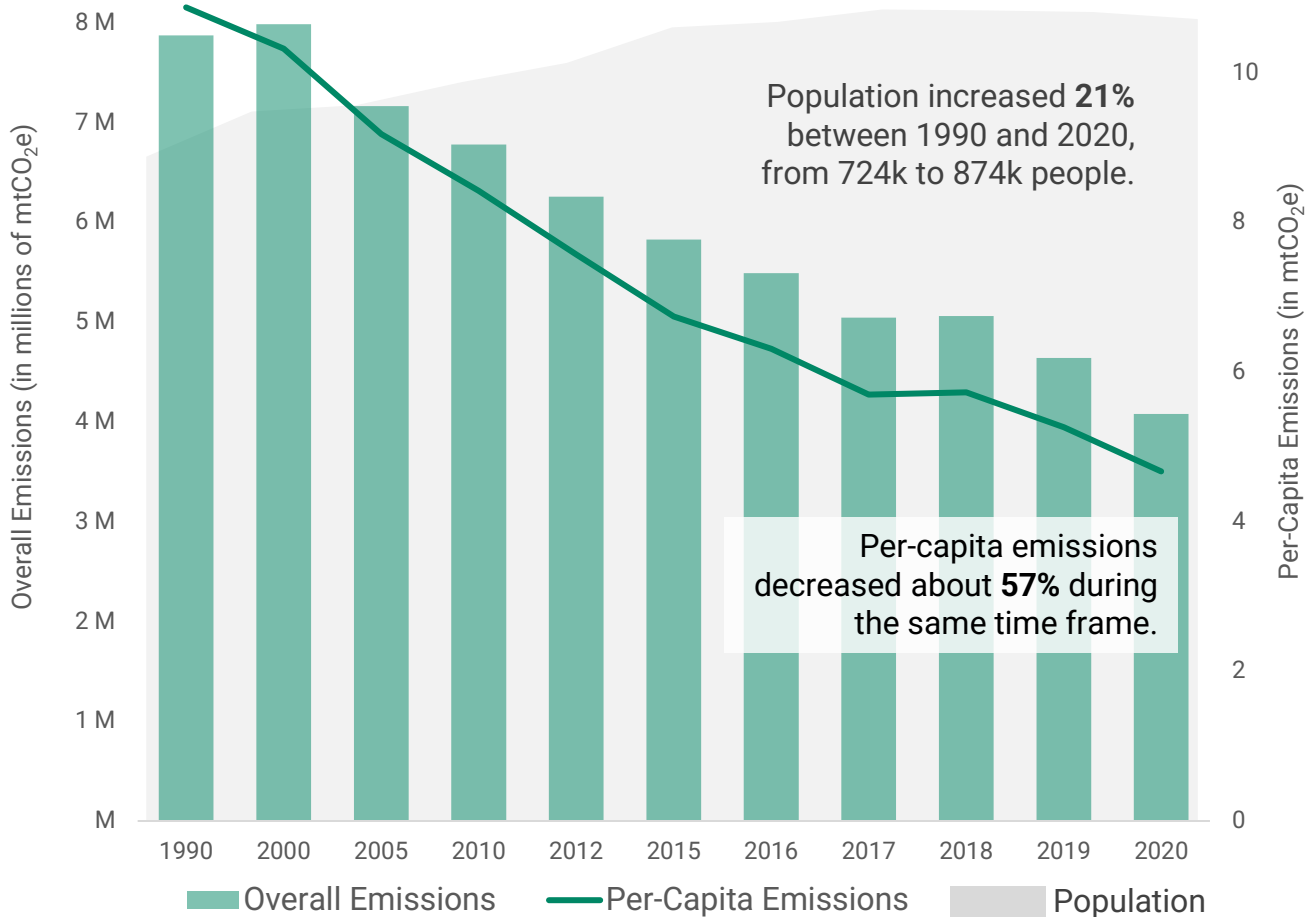
## Emissions Trends

In 2020, San Francisco's emissions were 48% below 1990 levels, from 7.9 million mtCO<sub>2</sub>e to 4.1 million mtCO<sub>2</sub>e. These reductions came despite a 21% increase in population and during the beginning of the COVID-19 pandemic.

As a result, San Francisco's emissions per capita was 4.67 mtCO<sub>2</sub>e/person in 2020, less than half of the 11 mtCO<sub>2</sub>e/person seen in 1990.

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

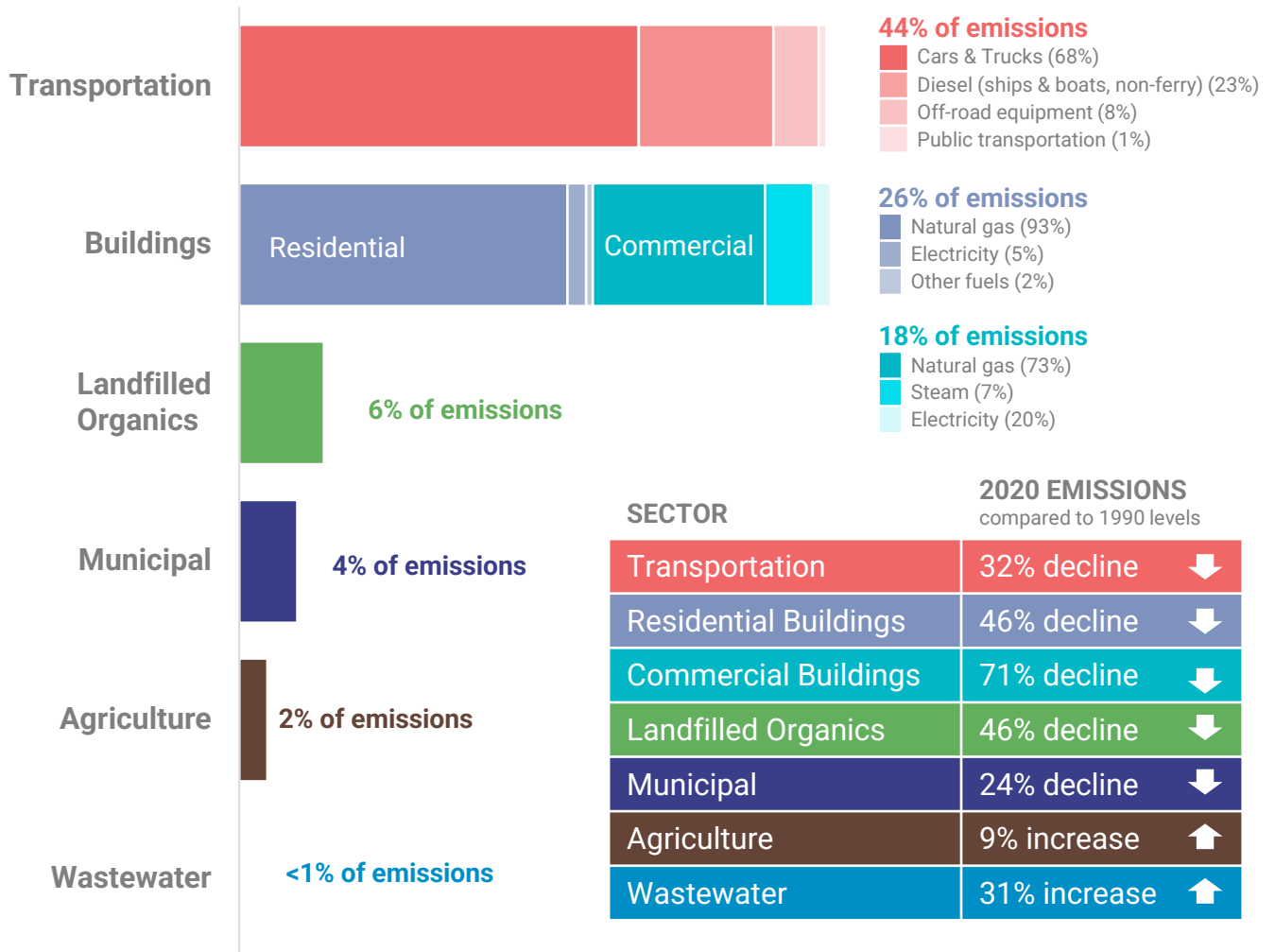
- A cleaner electric grid for all of San Francisco
- A scaleup in energy efficiency programs
- Progressive green building codes
- Cleaner vehicle fuels and fuel efficiency standards



# Emissions Overview

## Emissions Trends (continued)

Emissions are categorized into seven sectors in the 2020 inventory.



2020 emissions were 12% lower than in 2019. Transportation emissions fell 19% between 2019 and 2020, primarily driven by the Covid-19 pandemic; this was the largest contributor to drop in community-wide emissions. Overall building sector emissions decreased by 5%, led by reductions in natural gas use in residential and commercial buildings.

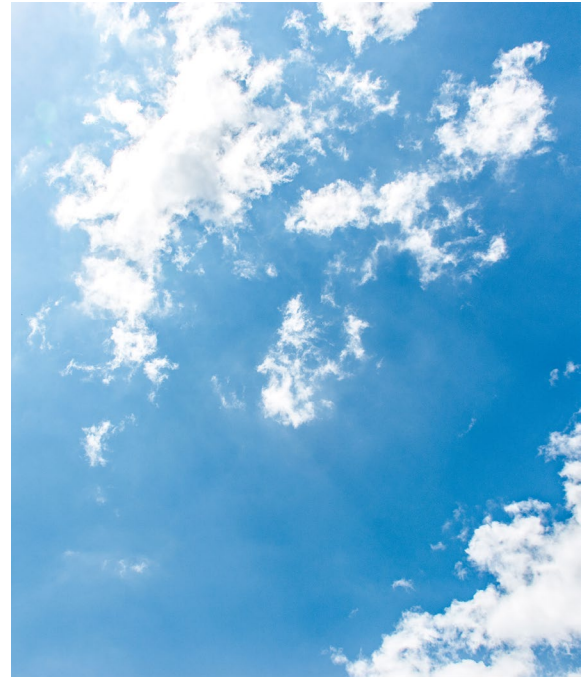


# Emissions Overview

## 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 2020, the global COVID-19 pandemic. Key drivers of emission reductions observed between 1990 and 2020 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. 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.** Over the years, the City has continued to scale up energy efficiency services by promoting and implementing BayREN residential and commercial programs in addition to offerings from the SFPUC for city buildings. 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 are becoming cheaper and more accessible. Since January 2020, all new construction is required to be all-electric with no on-site fossil fuel use. Moving forward, it will be important to accurately quantify the impacts of existing building electrification programs and policies on building sector emissions reductions over time.

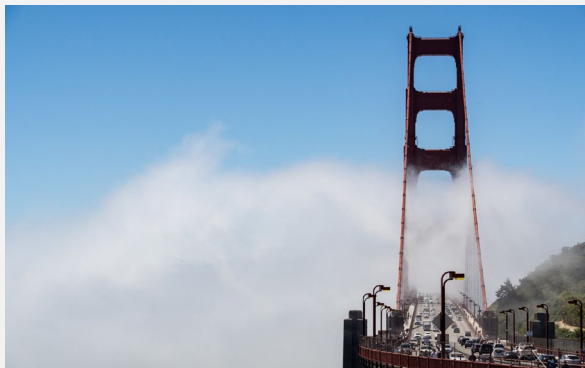


# Emissions Overview

## Emissions Reduction Drivers (continued)

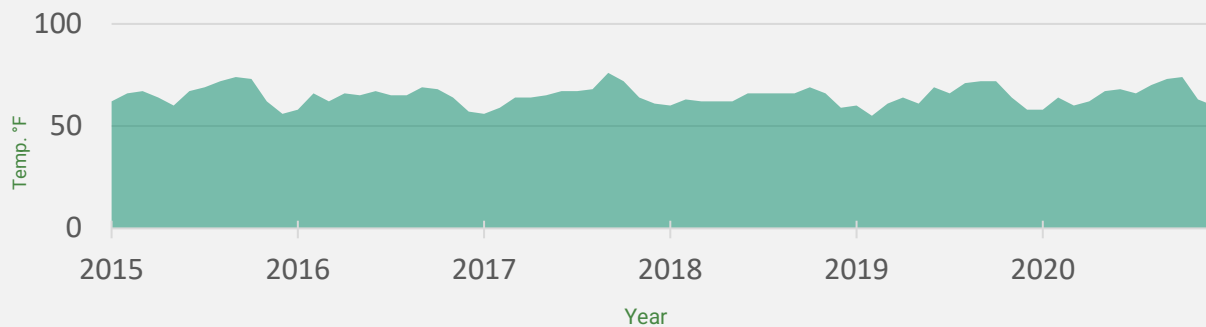
**San Francisco, long known for its pioneering zero waste efforts,** has increasingly focused on diverting organic waste from landfills, which end up releasing methane to the atmosphere. This has been done by implementing aggressive collection policies (mandatory recycling and composting requirements), 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, and facilitating greater material recovery and reuse in high-impact areas such as construction.

**Increasing low-carbon trips and vehicle electrification.** In 2020, 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) has 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. One key goal is that by 2030, at least 80% of local trips should be low-carbon—meaning mainly trips by transit, walking or biking instead of driving. As the city works with communities to increase low-carbon travel, most cars and trucks will switch from gas to electric, so departments are working together to make it easier to install car chargers while equitably expanding access to public charging stations.



### Impact of Weather on Emissions

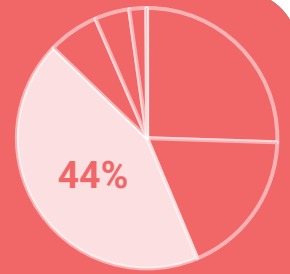
Weather can impact emissions levels and lead to short-term, year-to-year variations as San Francisco continues to make progress toward longer-term reduction targets. For example, warmer temperatures compared to a previous year can drive down energy consumption needed to heat buildings, while colder seasonal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



Source: [www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/](http://www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/)

# Transportation

2020 Emissions = 1.8 million MTCO<sub>2</sub>e

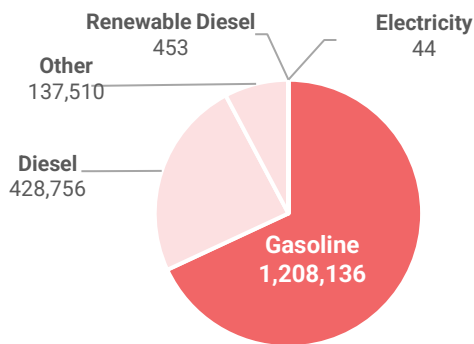
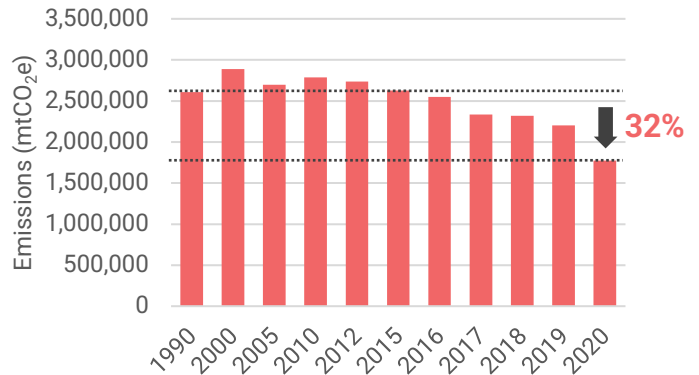


Emissions from fossil-fuels used to operate on-and off-road vehicles and equipment, ships, and boats.

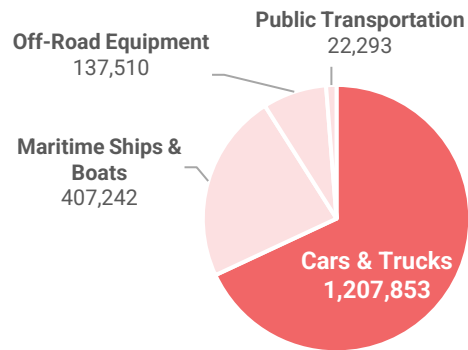
Transportation emissions have declined **32%** since 1990.

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: 68% of transportation emissions (tons CO<sub>2</sub>e) are from gasoline consumption in road vehicles.**



**BY MODE: 68% of transportation emissions (tons CO<sub>2</sub>e) 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.

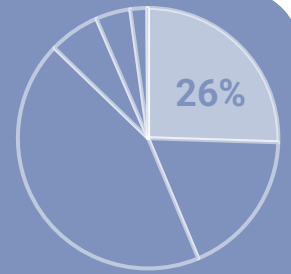
## Key Data Sources

- 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

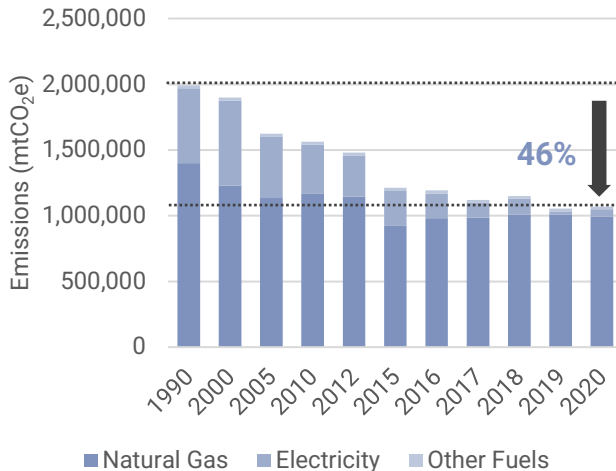
\* SFCTA now provides vehicle miles travelled (VMT) data via an improved methodology ("Covid Congestion Tracker")

# Residential Buildings

2020 Emissions = 1.1 million MTCO<sub>2</sub>e



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



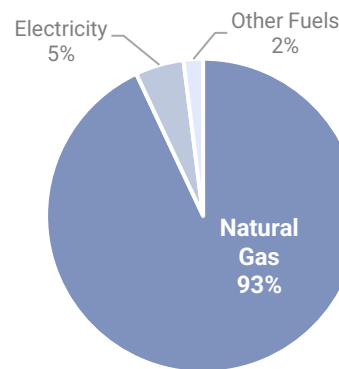
Residential emissions have declined **46%** since 1990.

Key Drivers:

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

**93%** 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.



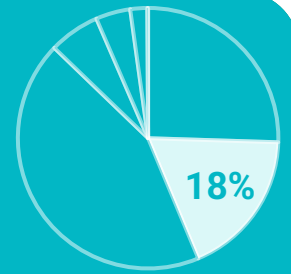
## Key Data Sources

- 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

2020 Emissions = 715,000 MTCO<sub>2</sub>e

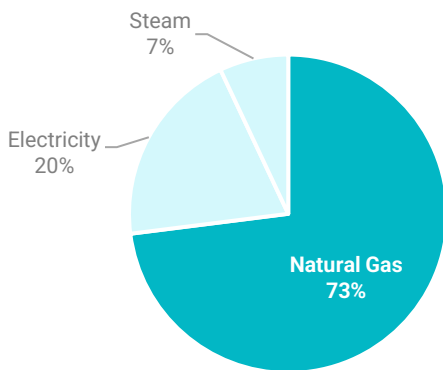
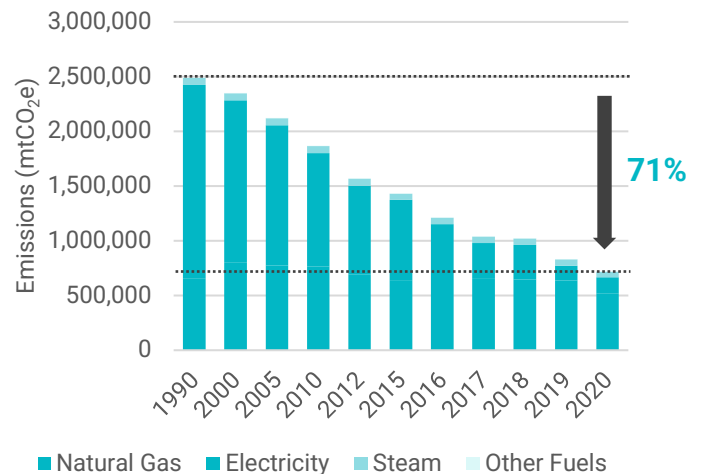


Emissions from fossil-fuels resulting from electricity and natural gas consumption by commercial and industrial utility, direct access, district, and steam loop customers.

Commercial emissions have declined **71%** since 1990.

Key Drivers:

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



**73%** 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.

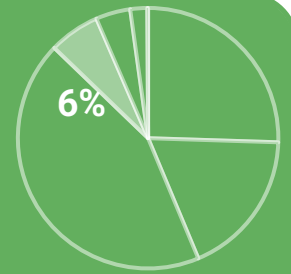
## Key Data Sources

- PG&E "Community Wide GHG Inventory Report for San Francisco"
- SFPUC
- CleanPowerSF

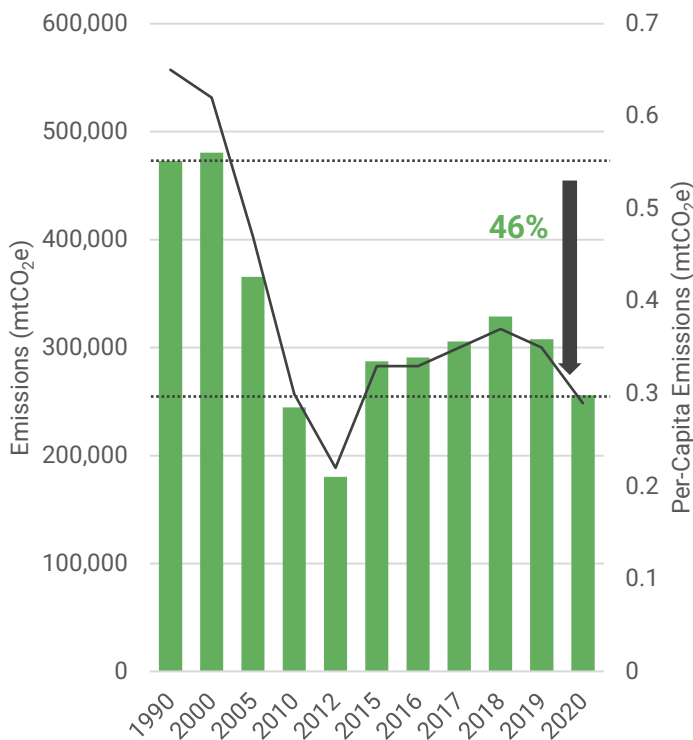
70% of commercial electricity was sourced from CleanPowerSF, resulting in lower emissions. This percentage will increase with the implementation of Env. Code Chapter 30, which phases in a requirement for commercial buildings to obtain all electricity from 100% renewable sources.

# Landfilled Organics

2020 Emissions = 256,000  $\text{MTCO}_2\text{e}$



**Methane emissions** from decomposition of organic materials sent to landfill.



Landfilled organics emissions have declined **46%** since 1990.

Key Drivers:

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

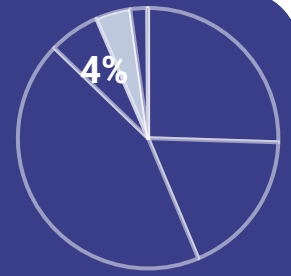
## Key Data Sources

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

Per capita emissions from landfilled organics has gone from 0.65  $\text{mtCO}_2\text{e}$  per person in 1990 to 0.29  $\text{mtCO}_2\text{e}$  per person, a decrease of 55%.

# Municipal

2020 Emissions = 175,000 MTCO<sub>2</sub>e



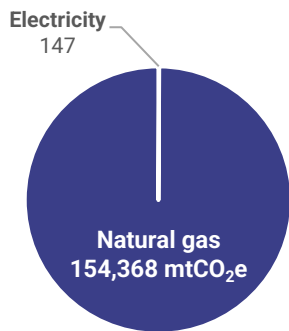
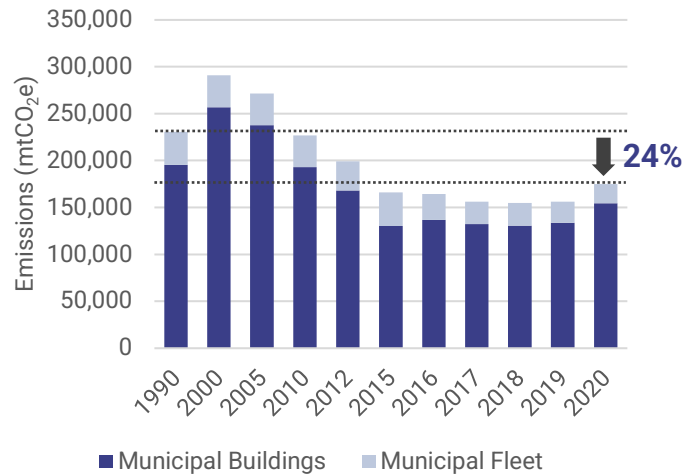
Emissions from fossil-fuels used to provide heating, hot water, lighting, and power appliances for municipal buildings and facilities, and to operate municipal fleets and equipment.

Municipal emissions have declined **24%** since 1990.

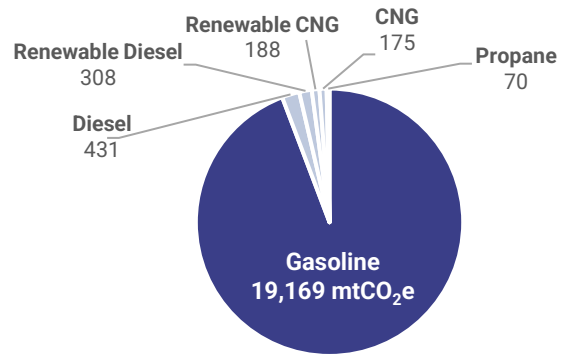
88% of emissions are from city-owned buildings. 12% are from city fleet.

Key Drivers:

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



**99.9% of our city building emissions come from use of natural gas.** Continuing to use renewable electricity, increase energy efficiency and move away from natural gas will help decrease municipal emissions.



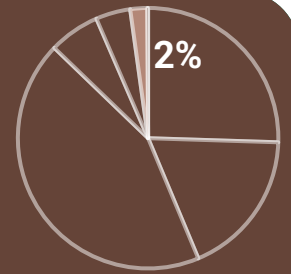
**94% of our city fleet emissions come from use of gasoline.** Continuing to electrify the fleet and using renewable diesel will help further decrease municipal emissions.

## Key Data Sources

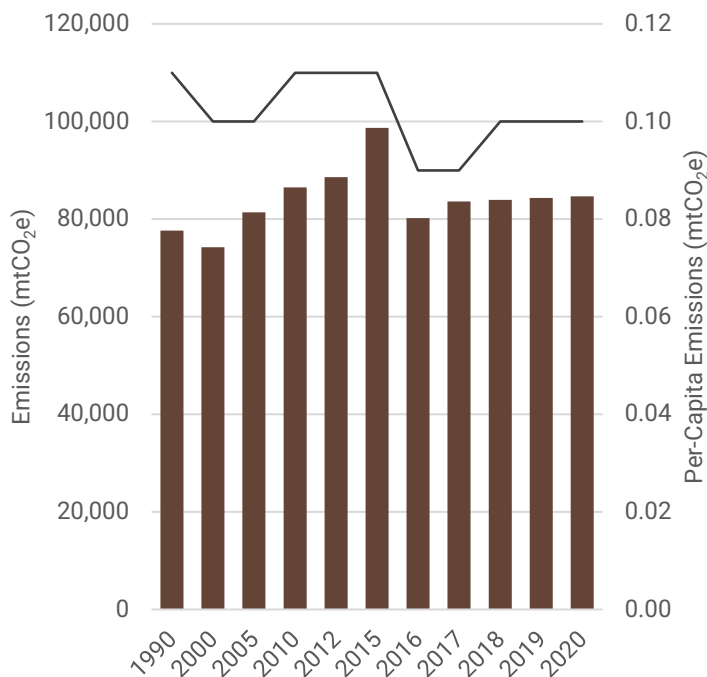
- PG&E "Community Wide GHG Inventory Report for San Francisco"
- SFPUC
- City and County of San Francisco, multiple departments

# Agriculture

2020 Emissions = 85,000 MTCO<sub>2</sub>e



Emissions released from animal waste and urban soil management.



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

Since 1990, agriculture emissions have increased **9%** overall, but decreased **10%** per-capita (even with significant population growth), and is stabilizing at about 0.10 mtCO<sub>2</sub>e 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, deer, etc.)
- Biomass burning (namely the accidental burning of vegetation in city boundaries)
- Soil management



# Wastewater

2020 Emissions = 5,600 MTCO<sub>2</sub>e

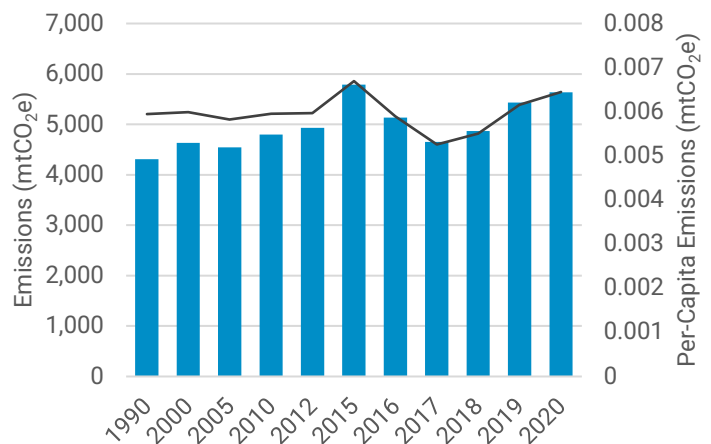


Emissions released from liquid waste discharge, treatment process, and gases released during digestion from the Southeast, Oceanside and North Point Wastewater Treatment Plants.

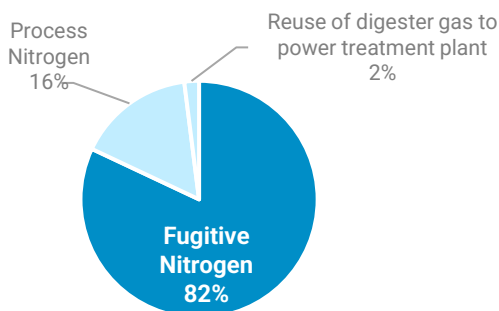
Wastewater emissions have increased **31%** since 1990.

**Drivers:**

- Emissions have increased due to a concurrent 21% 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 31%, **per capita emissions** have increased only 8%



**Emissions Breakdown:**

- Fugitive Nitrogen: 82%
- Process Nitrogen: 16%
- Reuse of digester gas to power treatment plant: 2%

**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.