

# 2015 SAN FRANCISCO GEOGRAPHIC GREENHOUSE GAS EMISSIONS INVENTORY AT A GLANCE

**By San Francisco Department of Environment, Climate Program**

Published October 2017

For more information contact:

| Wendy Goodfriend, Climate Program Manager, [wendy.goodfriend@sfgov.org](mailto:wendy.goodfriend@sfgov.org)

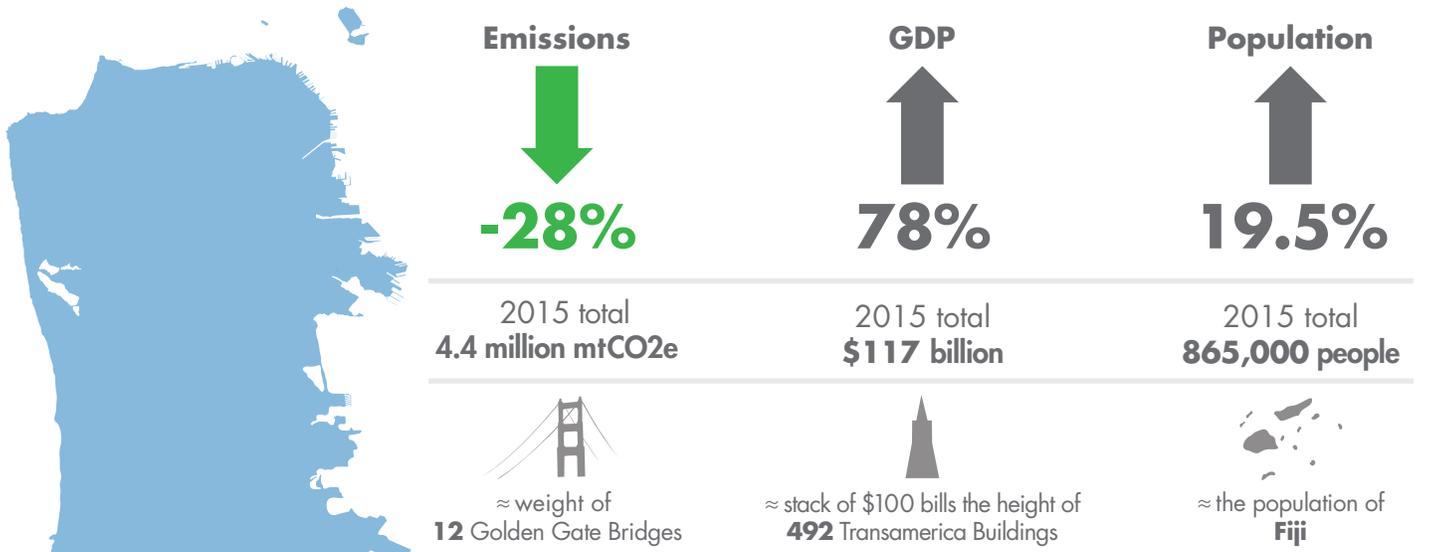
| Brian Reyes, Climate and Sustainability Analyst, [brian.reyes@sfgov.org](mailto:brian.reyes@sfgov.org)

| Silvia Pac, Climate and Sustainability Analyst, [silvia.pacyurrita@sfgov.org](mailto:silvia.pacyurrita@sfgov.org)

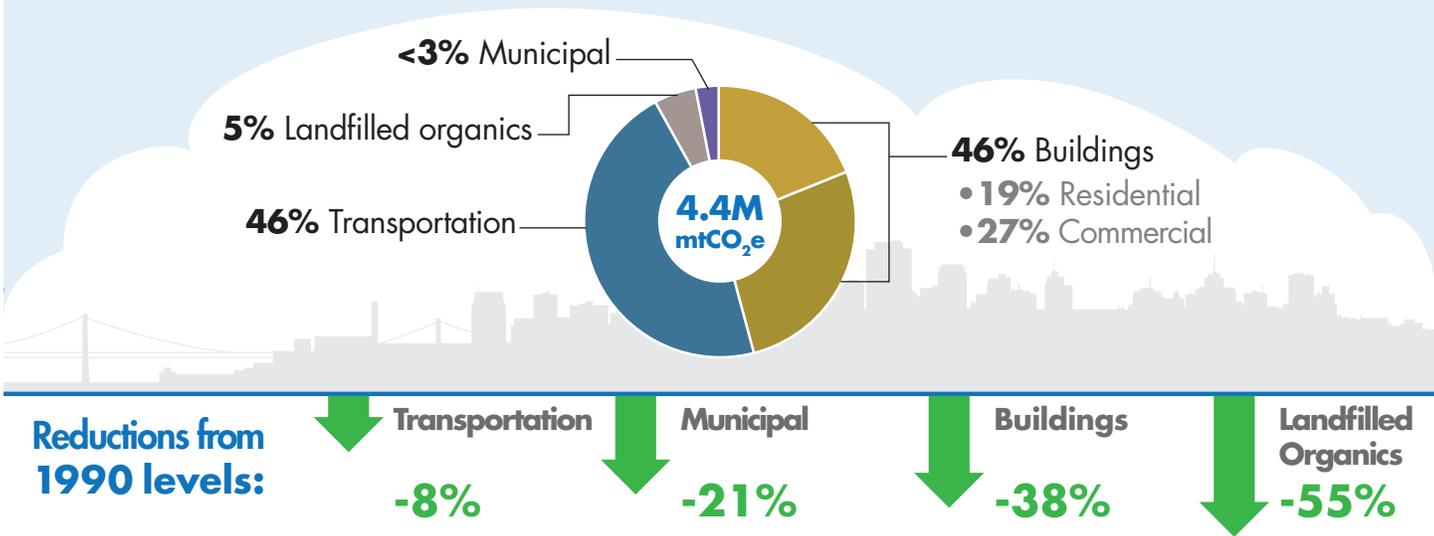
## CONTENTS

Contents.....	2
Emissions Overview .....	5
Emissions Trends .....	5
Emissions Reduction Drivers .....	7
Sector Summary.....	8
Residential.....	8
Commercial.....	10
Transportation .....	12
Landfilled Organics .....	15
Municipal.....	17

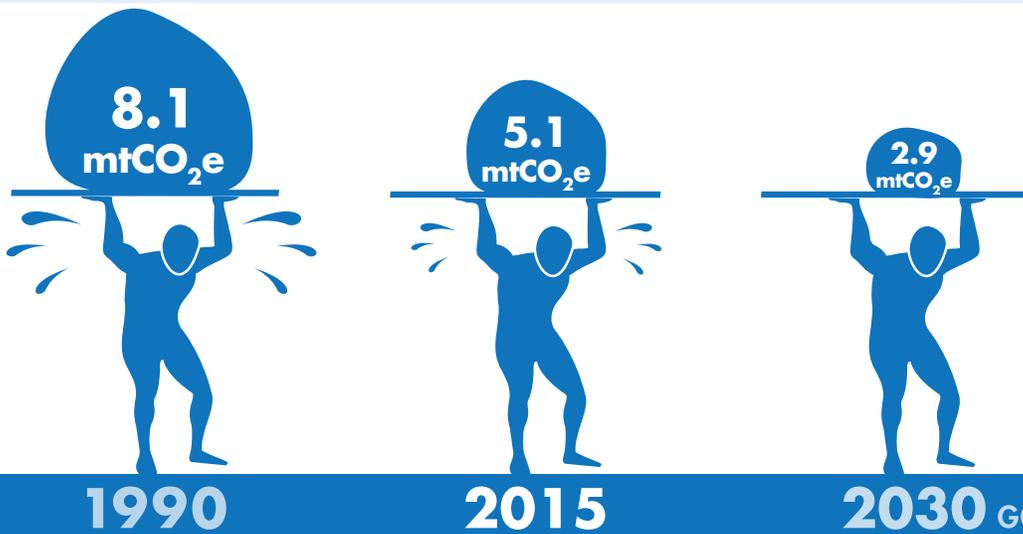
# 1990-2015 San Francisco trends



## 2015 San Francisco emissions by sector



## San Francisco per capita emissions



[Intentionally Left Blank]

## EMISSIONS OVERVIEW

### EMISSIONS TRENDS

In 2015, San Francisco's community-wide greenhouse gas (GHG) emissions, or carbon footprint, totaled 4.4 million mtCO<sub>2</sub>e (Fig. 1). The four sectors tracked in the 2015 inventory include:

- The Residential sector accounted for 19% of the city's carbon footprint, with 72% of emissions from natural gas and 28% from electricity (Fig. 2).
- The Commercial sector accounted for 27 % of the city's carbon footprint, with 45% of emissions from natural gas, 55% from electricity, and 5% from steam
- The Transportation sector accounted for 46% of the city's carbon footprint, with most emissions coming from passenger vehicles (91%) and the remaining from public transportation.
- The Landfilled Organics sector accounted for 5% of the city's carbon footprint<sup>1</sup>.
- The Municipal sector, including facilities and fleet, accounted for a little less than 3% of the city's carbon footprint, with nearly all emissions from natural gas and vehicle fuel use.

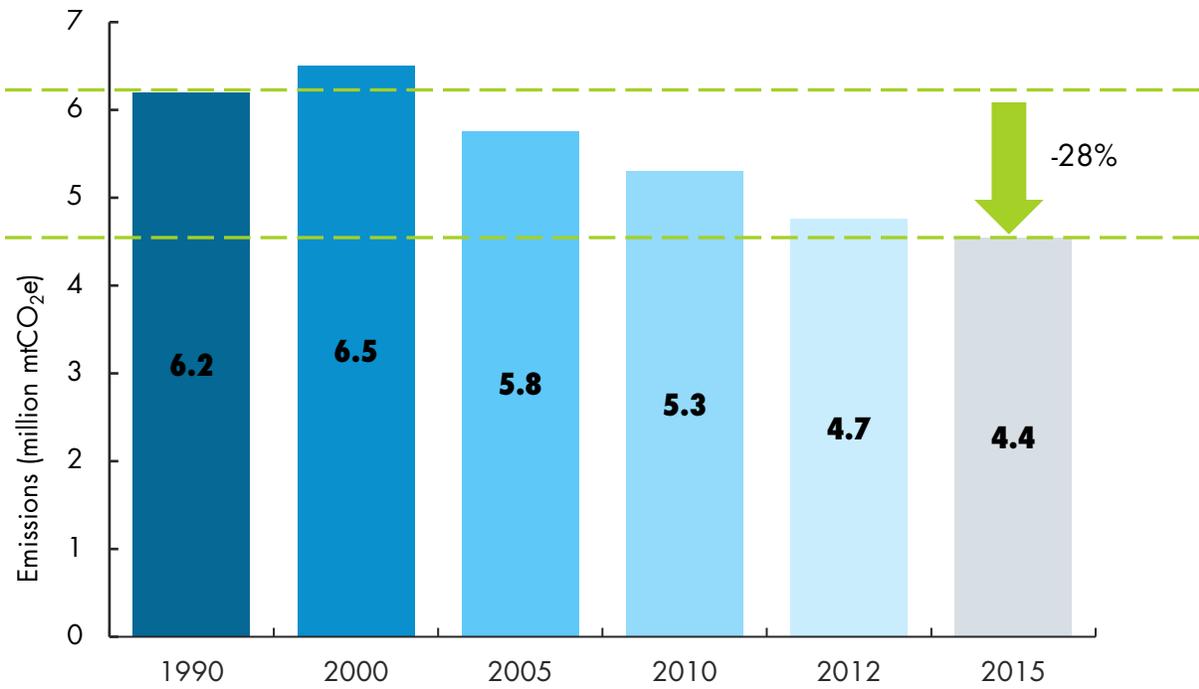
In 2015, San Francisco successfully reduced emissions 28% below 1990 levels from 6.2 million to 4.4 million mtCO<sub>2</sub>e (Fig. 1). Declines occurred across all five sectors tracked:

- The Residential sector declined 41%
- The Commercial sector declined 36%
- The Transportation sector declined 8%
- The Landfilled Organics sector declined 55%
- The Municipal sector declined 21%

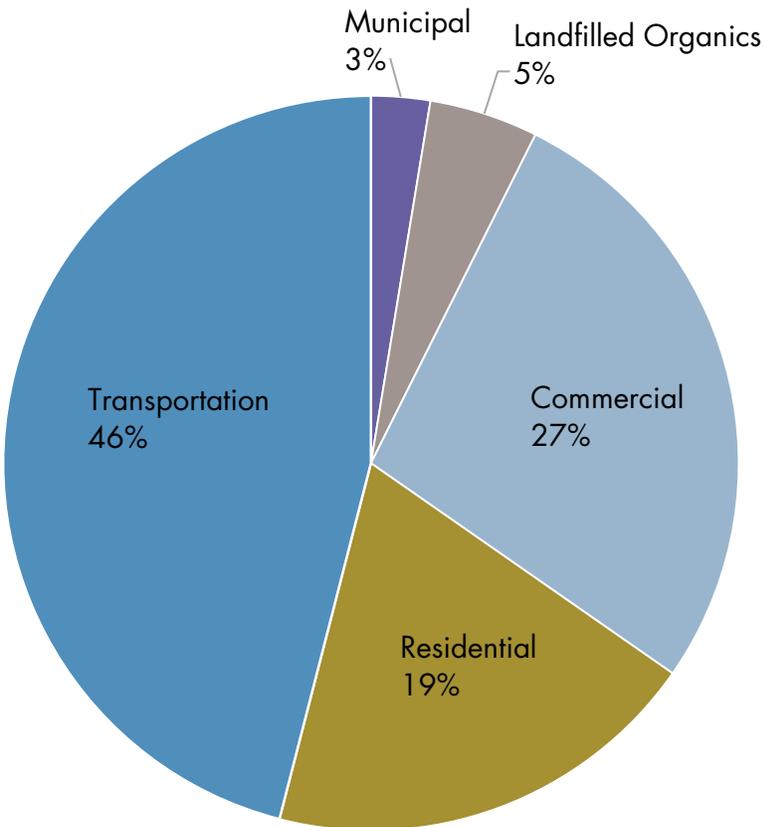
Emission reductions were achieved even though San Francisco's population increased 19% during the same time period. In 2015, San Francisco's emissions per capita was 5.1 mtCO<sub>2</sub>e compared to 8.6 mtCO<sub>2</sub>e in 1990, a 38% decline.

---

<sup>1</sup> Emissions from Landfilled Organics, previously known as the Waste sector, occur when disposed organics break down (decompose) in a landfill and produce methane.



**Figure 1. San Francisco's GHG emissions from inventory year 1990 to 2015.**



**Figure 2. 2015 emissions by sector.**

## EMISSIONS REDUCTION DRIVERS

Reductions in emissions can be attributed to a variety of factors, including changes in the weather and the implementation of innovative technologies, policies and programs. The main drivers of the emission reductions observed between 1990 to 2015 were:

- **Weather was warmer** in San Francisco during the period between 2012 and 2015. The number of days buildings required heat, measured as Heating Degree Days<sup>2</sup>, were fewer in 2015 than previous years, meaning less energy was used to heat buildings.
- **There was an 80% diversion of materials** from landfills through recycling and composting
- **The electric grid has become cleaner for all of San Francisco's buildings over time.** Two dirty inefficient natural gas and diesel power plants within San Francisco's borders were closed (Hunters Point in 2006 and Potrero in 2011), city-owned buildings switched to 100% GHG-free electricity in 2012, and there continues to be annual improvements to PG&E's renewables portfolio<sup>3</sup> mix.
- **A scale-up in energy efficiency programs** helped stem demand for electricity and natural gas. During the period between 2012 and 2016, San Francisco's Energy Watch program saved 3,706 San Francisco commercial and multifamily properties an average of \$3,136 in annual utility bills. The program saved consumers 78 million kWh, reducing carbon emissions by 15,206 mtCO<sub>2e</sub> tons, an equivalent of taking 3,201 automobiles off the road.
- **Progressive green building codes and standards** in San Francisco resulted in more than 452 buildings, totaling over 101.6 million square feet, becoming LEED certified between 2004 and 2017. In addition, the City had 42 city-owned buildings LEED certified between 2004 and 2015, totaling 5.8 million square feet.
- **Improvements in State and Federal appliance and energy standards** reduced electricity and natural gas use in new as well as renovated buildings.

## Impact of Weather on Emissions

It is important to differentiate between long-term emissions reductions driven by new technologies, policies and programs and short-term reductions due to changes in factors such as the weather. Understanding how weather impacts emission levels is important because there are likely to be short-term, year-to-year variations in emissions as San Francisco continues to make progress towards longer-term reduction targets.

---

<sup>2</sup> Heating Degree Days (HDD) is the total number of degrees that a day's average temperature is below 65 Fahrenheit (18 Celsius). Temperatures below 65 Fahrenheit indicate the point at which buildings require heat to condition spaces. Thus, the lower the number of HDDs the more natural gas is required to heat spaces.

<sup>3</sup>California's cleaner grid is driven at the state level through the Renewable Portfolio Standards (RPS), which sets a goal of 33% renewable energy by 2020 and 50% by 2030.

## SECTOR SUMMARY

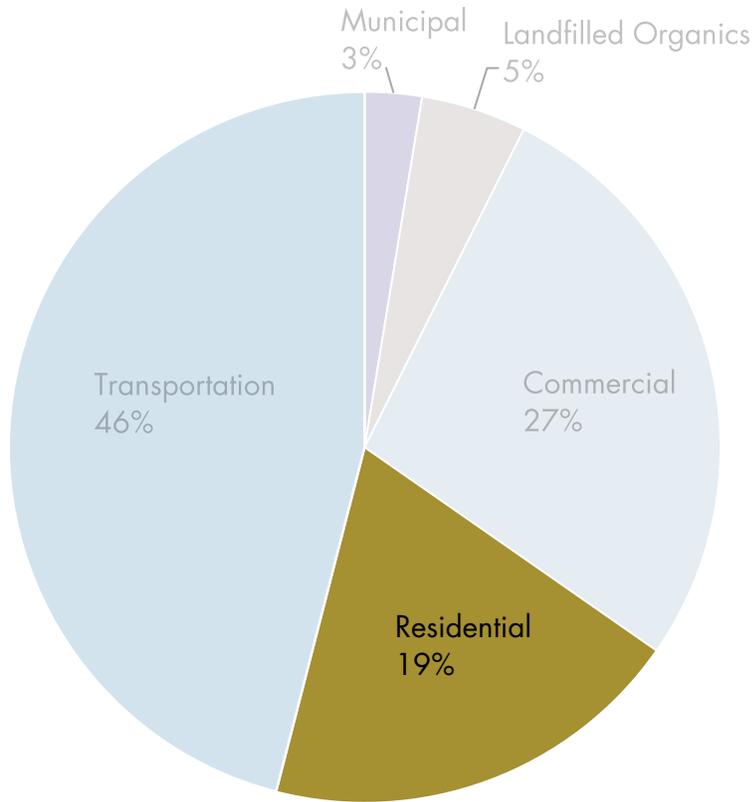
San Francisco inventories are completed in accordance with the ICLEI U.S. Community Protocol (USCP) for Accounting and Reporting of Greenhouse Gas Emissions. The methodology and sectors tracked were third party verified in inventory year 2012. The 2015 inventory was completed according to the guidance of the verifiers. In 2015, the City began reporting its emissions to C40 to improve its GHG emissions inventory by using a newer protocol to estimate emissions referred to as the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC). GPC is a framework unifying emissions inventories globally while incorporating new categories to track. *San Francisco has been tracking its emissions since 1990; hence, it continues to use the ICLEI USCP to report on sectors historically tracked for consistency and trending purposes. San Francisco continues to disclose emissions under the GPC framework for reporting purposes to and compliance with the Global Covenant of Mayors (GCOM).*

Below is an in-depth analysis of 2015 emissions trends since 1990 in the Residential, Commercial, Transportation, Landfilled Organics, and Municipal sectors.

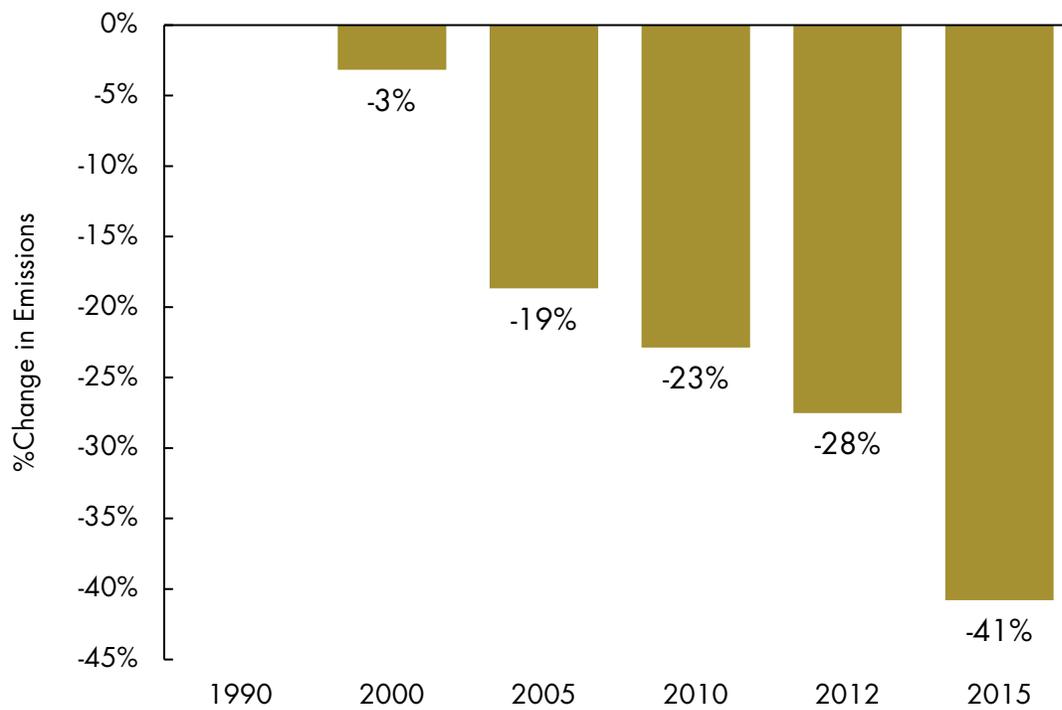
## RESIDENTIAL

In 2015, emissions in the Residential sector totaled 858,142 mtCO<sub>2</sub>e accounting for 19% of San Francisco's GHG emissions (Fig. 3). Emissions from the Residential sector have declined 41% below 1990 levels mainly due to a combination of a cleaner electrical grid and continual implementation of city-wide energy efficiency programs (Fig 4). Residential sector emissions are from energy used by residences to heat household spaces and power appliances including hot water heaters. Emissions from the Residential sector are mostly from natural gas use (72%) compared to electricity (28%) (Fig 5).

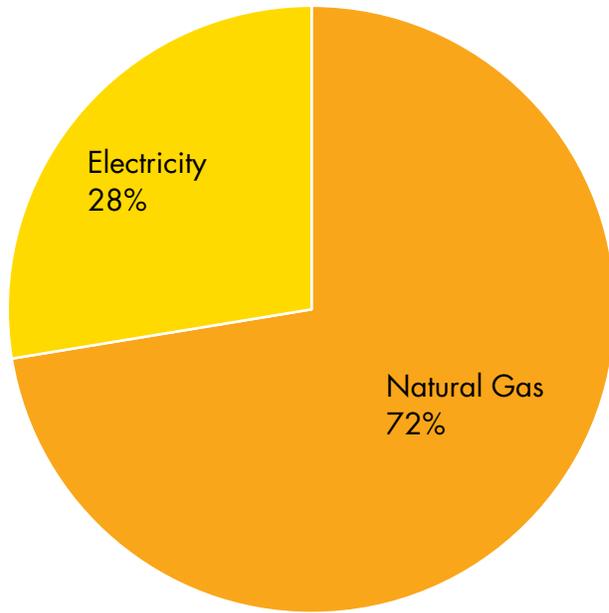
The reduction between 2012 and 2015 was one of the steepest emissions declines since 2005 driven by a combination of a cleaner electrical grid and warmer weather (Fig. 4). Though the relative impact of these two drivers cannot be distinguished, warmer weather was likely the main driver as households were consuming less natural gas to heat spaces.



**Figure 3. 2015 Residential sector emissions.**



**Figure 4. Residential sector emissions changes compared to 1990 levels.**



**Figure 5. 2015 Residential sector emissions by commodity.**

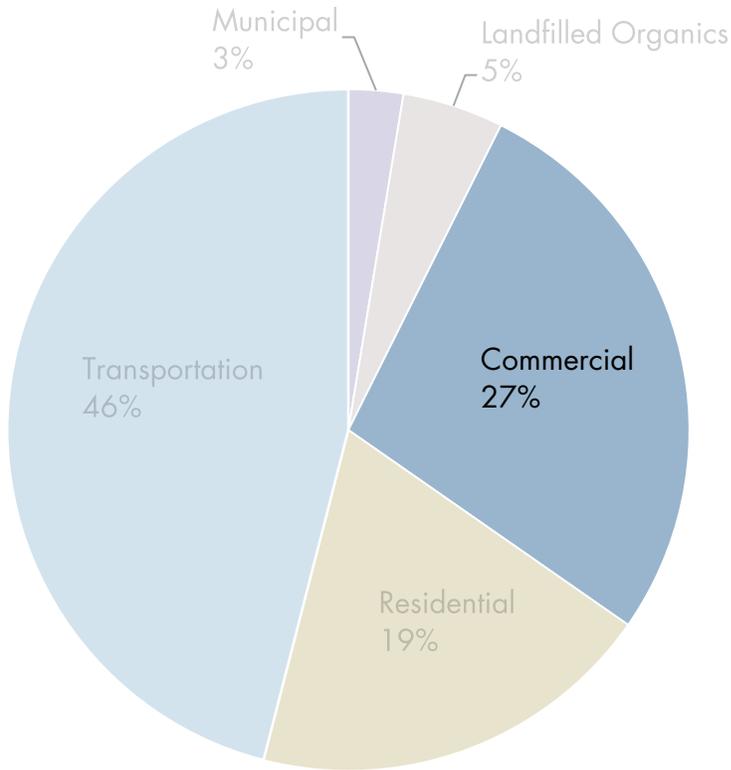
## COMMERCIAL

In 2015, emissions in the Commercial<sup>4</sup> sector (including commercial and industrial, direct access, district, and steam loop customers<sup>5</sup>) totaled 1,213,100 mtCO<sub>2</sub>e accounting for 27% of San Francisco’s GHG emissions (Fig. 6). Emissions from the Commercial sector declined 36% below 1990 levels mainly due to a combination of a cleaner electrical grid, continual implementation of city-wide energy efficiency programs, and the completion of the downtown district steam loop (Fig. 7). Commercial sector electricity use was responsible for the largest share of emissions (55%) compared to natural gas (40%) and steam (5%) (Fig. 8).

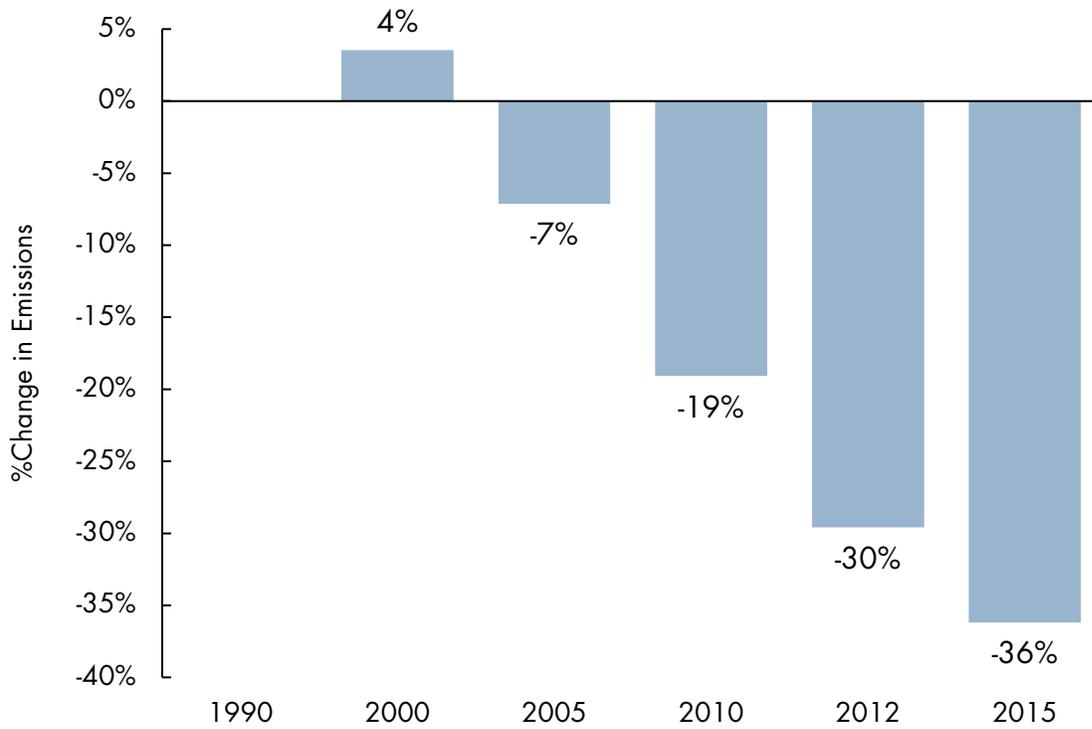
Emissions reductions between 2012 and 2015 were steady, though not as steep as previously observed (Fig 7). Similar to the Residential sector, a combination of a cleaner electrical grid and warm weather drove down emissions in the Commercial sector between inventory year 2012 and 2015.

<sup>4</sup> There are more commercial buildings than industrial buildings in San Francisco. In addition, the commercial sector includes the Industrial sector because of California’s Data Privacy Aggregation rules, which causes the two sectors to be combined.

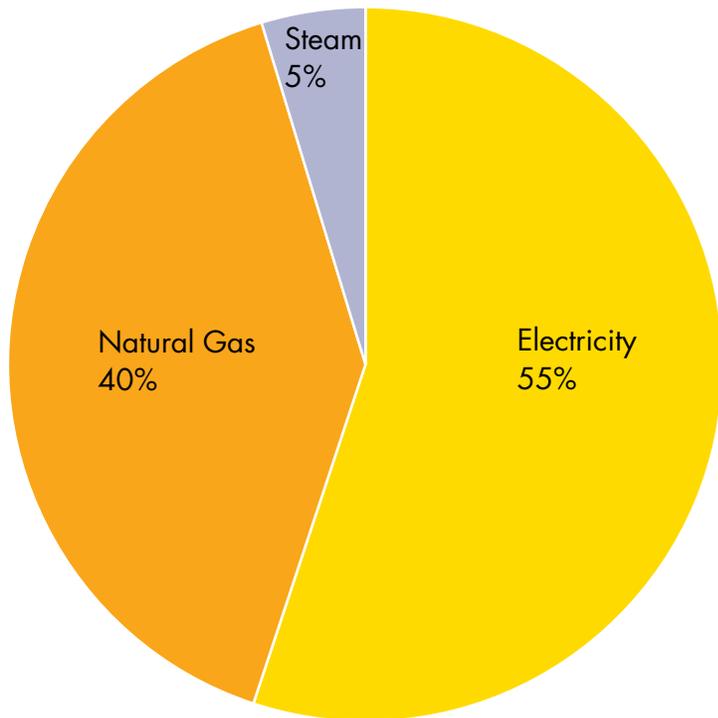
<sup>5</sup> Direct Access is electricity usage for customers for whom PG&E provides transmission and distribution services, but not electricity generation (commercial, Industrial as well as Residential). District electricity includes accounts such as BART, School Districts, Hospital Districts, Water or Sewer Districts, Fire Districts, Junior College Districts, District Fairs, Public Utility Districts, Community Service Districts, Cemetery Districts, Mosquito Abatement Districts and/or Park Districts. The steam loop is powered by natural gas use and serves only commercial and municipal customers in the downtown core.



**Figure 6. 2015 Commercial sector emissions.**



**Figure 7. Commercial sector emissions changes compared to 1990 levels.**



**Figure 8. 2015 Commercial sector emissions by commodity.**

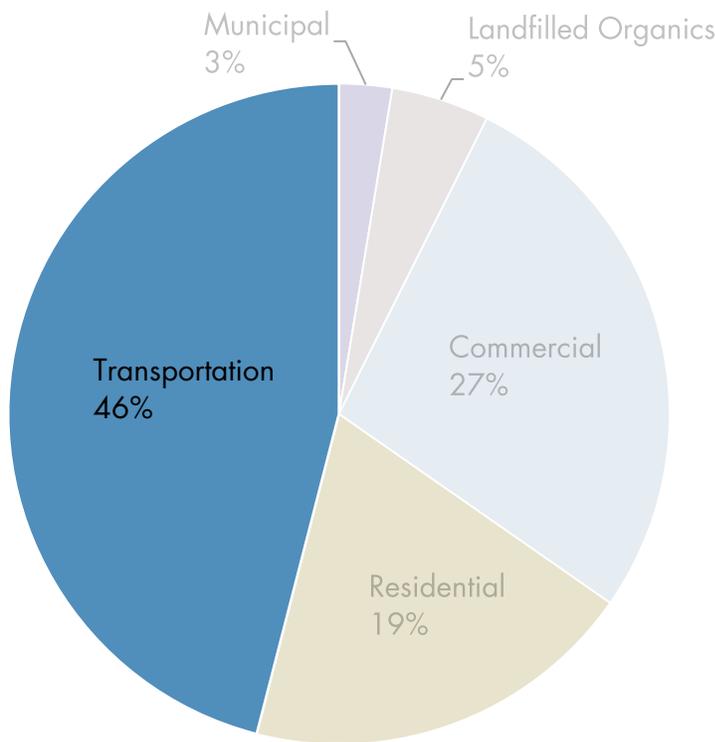
## TRANSPORTATION

In 2015, emissions in the Transportation sector totaled 2,043,617 mtCO<sub>2</sub>e, accounting for 46% of San Francisco’s GHG emissions (Fig. 9). Emissions from the Transportation sector have declined 8% below 1990 levels mainly due to higher fuel efficiency standards and cleaner vehicle fuels mandated by the State of California (Fig. 10). Gasoline used by the Transportation sector was responsible for the largest share of emissions (91%) compared to electricity (5%) and diesel (4%) (Fig. 11). Passenger vehicles (cars and trucks) were responsible for the major share of emissions totaling 1,866,601 mtCO<sub>2</sub>e, accounting for 91%<sup>6</sup> of total Transportation sector emissions (Fig. 11). Public Transportation accounted for the remaining 9% of emissions totaling 177,016 mtCO<sub>2</sub>e (Fig. 12). There were significant reductions realized in San Francisco’s public transit fleet with emissions from MUNI declining largely due to light rail services switching to 100% GHG free electricity and buses to biodiesel.

Transportation sector emissions increased slightly from 2.03 to 2.04 million mtCO<sub>2</sub>e (<1% increase) between inventory year 2012 and 2015. This increase was due to a variety of factors, including an

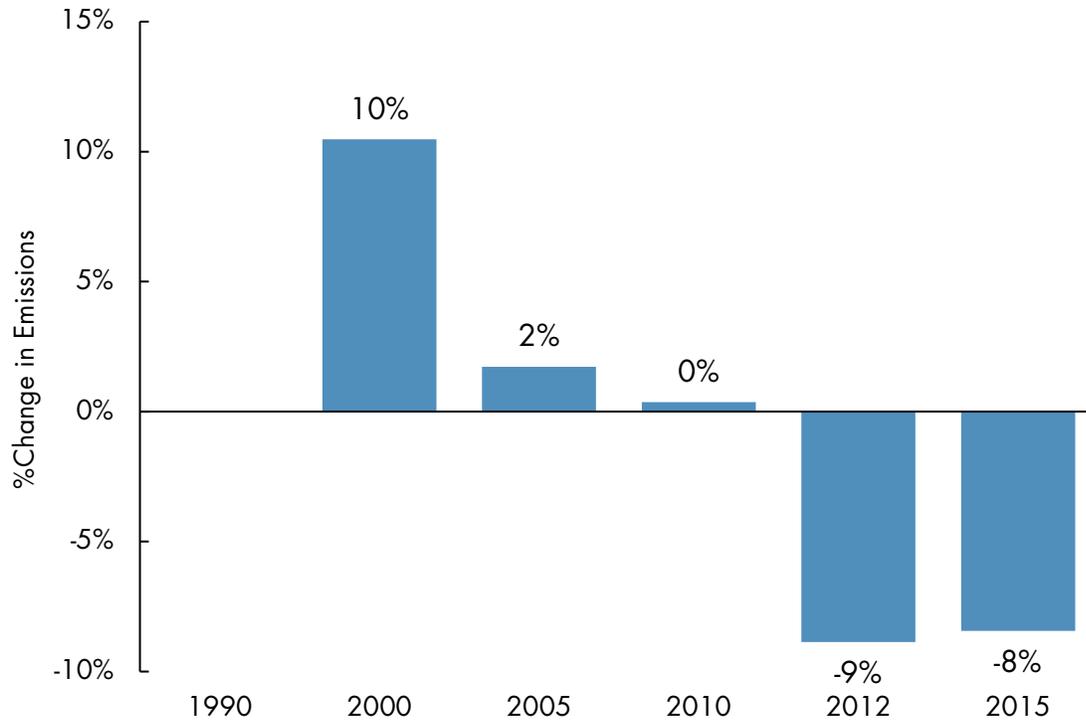
<sup>6</sup> Gasoline consumed makes up the major (~94%) share of passenger vehicle emissions with a small portion from diesel (~4%).

increase in Public Transportation sub-sector emissions. First, BART adopted new electricity emissions factors<sup>7</sup> which resulted in increased 2015 emissions. Second, commuter ferry services to San Francisco expanded, resulting in an increase in diesel consumption between 2012 and 2015 and a 31% increase in emissions, from 17,236 to 22,640 mtCO<sub>2</sub>e. Additionally, a small percentage of Transportation sector emissions generated by city-owned vehicles was re-assigned to the Municipal sector. As discussed in the Municipal section below, city-owned vehicle emissions have been tracked since 2008 but were historically treated as an on-road transportation source, and thus, were included in the Transportation sector. In 2015, emissions from city-owned vehicles were allocated to the Municipal sector, which reduced Transportation sector emissions compared to 2012.

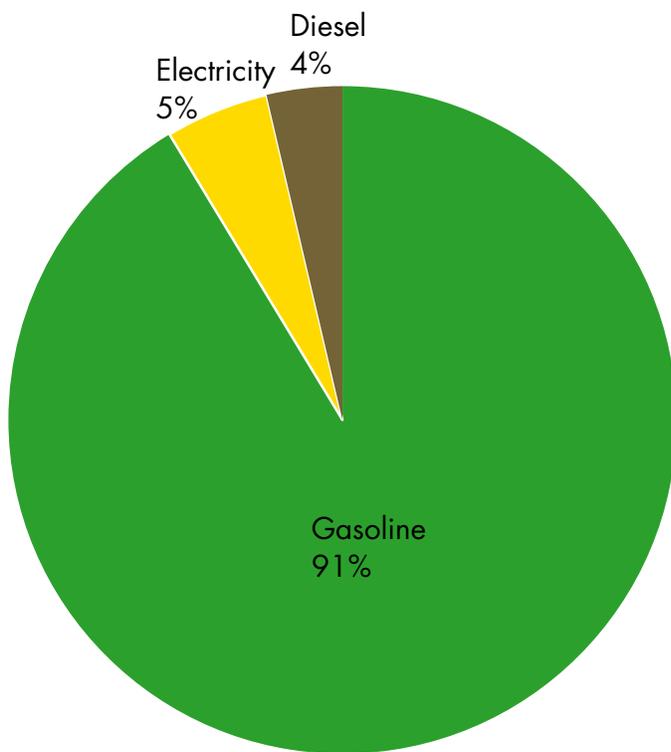


**Figure 9. 2015 Transportation sector emissions.**

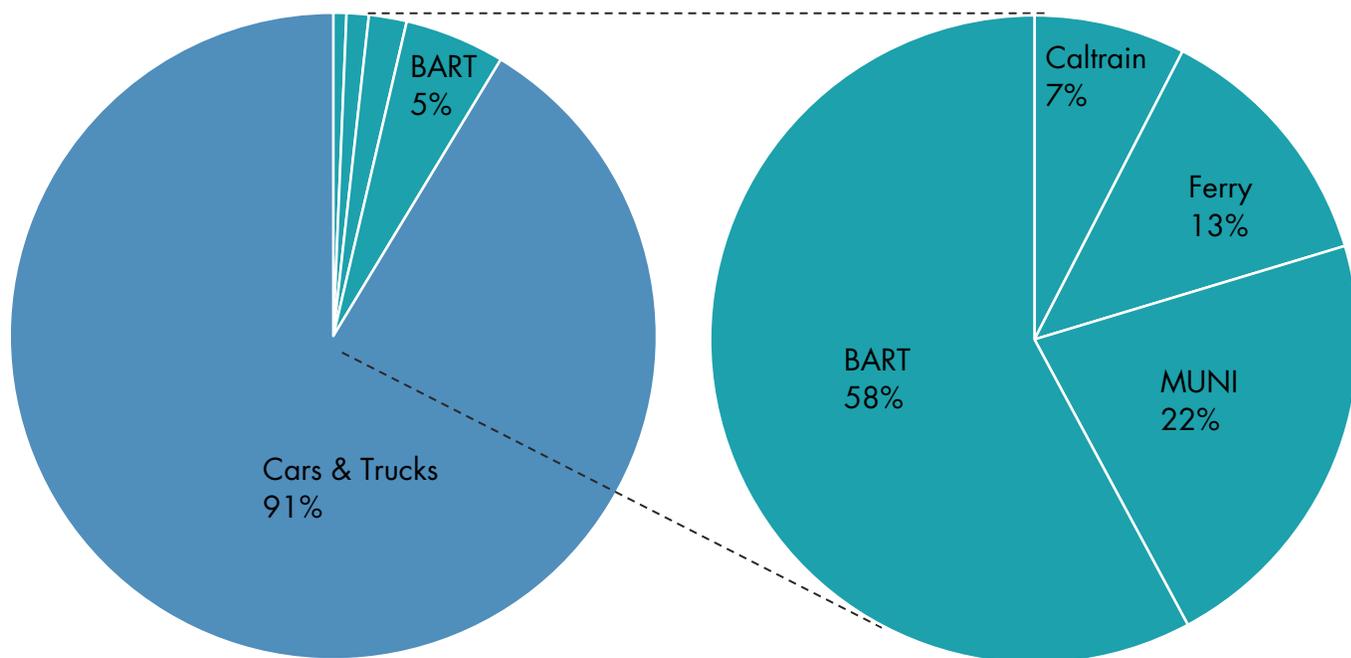
<sup>7</sup> Starting CY2013 moving forward BART began tracking traction power and other non-PG&E power contracts separately, thus, moving away from NCPA power. They began importing unspecified power across the Oregon border which resulted in a higher emissions factor as calculated by BART engineers. This is compliant with CARB’s Mandatory GHG reporting Section 95111.B.1 for unspecified power imports.



**Figure 10. Transportation sector emissions changes compared to 1990 levels.**



**Figure 11. 2015 Transportation sector emissions share by commodity.**



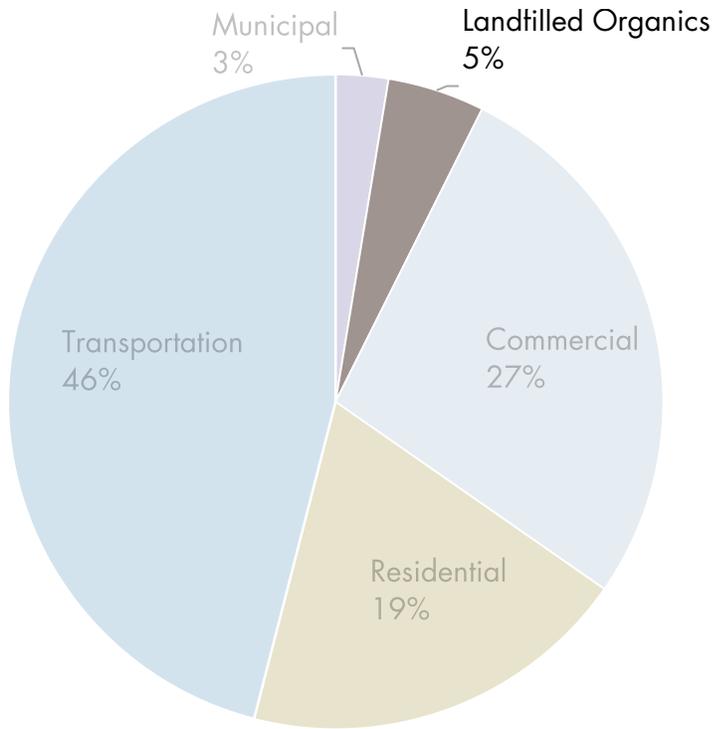
**Figure 12. 2015 Transportation sub-sector emissions.**

## LANDFILLED ORGANICS

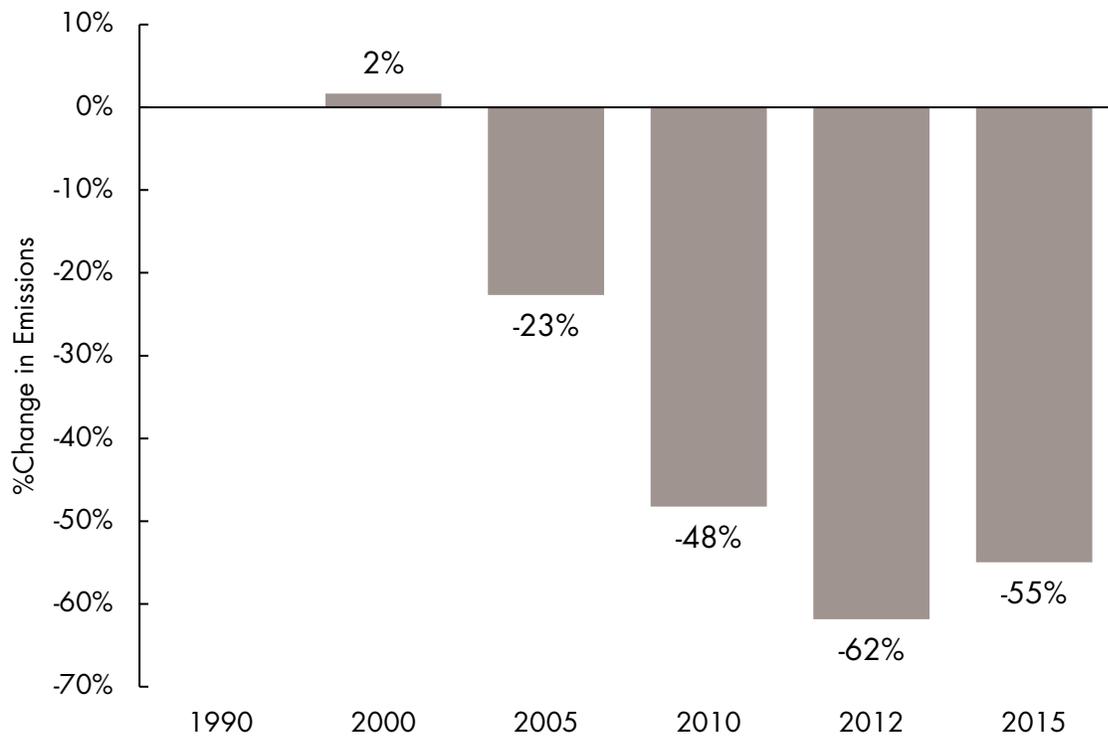
In 2015, emissions in the Landfilled Organics sector<sup>8</sup> totaled 212,941 mtCO<sub>2</sub>e, accounting for 5% of San Francisco's GHG emissions (Fig. 13). Organic materials sent to landfill decomposes and releases methane emissions to the atmosphere. Emissions from the Landfilled Organics sector have declined 55% below 1990 levels due to successful diversion, recycling and composting in the city (Fig. 14).

Landfilled Organics sector emissions increased 18% between inventory year 2012 and 2015. Half of the increase, 9%, was the result of a change in the way waste is characterized. Specifically, the "Other Organic Waste" category, which had previously been excluded, was included as a source of emissions. In addition, there was an increase in Wood and Textiles (5%) as well as Paper (4%) sent to landfill, resulting in approximately a 9% increase in emissions.

<sup>8</sup> Referred to as the Waste sector during previous inventory years.



**Figure 13. 2015 Landfilled Organics sector emissions.**



**Figure 14. Landfilled Organics sector emissions changes compared to 1990 levels.**

## MUNICIPAL

In 2015, GHG emissions in the Municipal sector, comprised of city-owned buildings (76%) and vehicles<sup>9</sup> (24%) was 115,137 mtCO<sub>2e</sub>, accounting for just under 3% of San Francisco's total emissions (Fig. 15). Emissions from San Francisco's Municipal sector declined 22% below 1990 levels with the steepest declines between 2010 to 2012 due in large part to all city-owned buildings fully sourcing GHG-free electricity<sup>10</sup> generated from San Francisco Public Utilities Commission's Hetch-Hetchy hydropower dam (Fig. 16). As a result, natural gas made up the major share (76%) of Municipal sector emissions totaling 87,029 mtCO<sub>2e</sub> (Fig. 17).

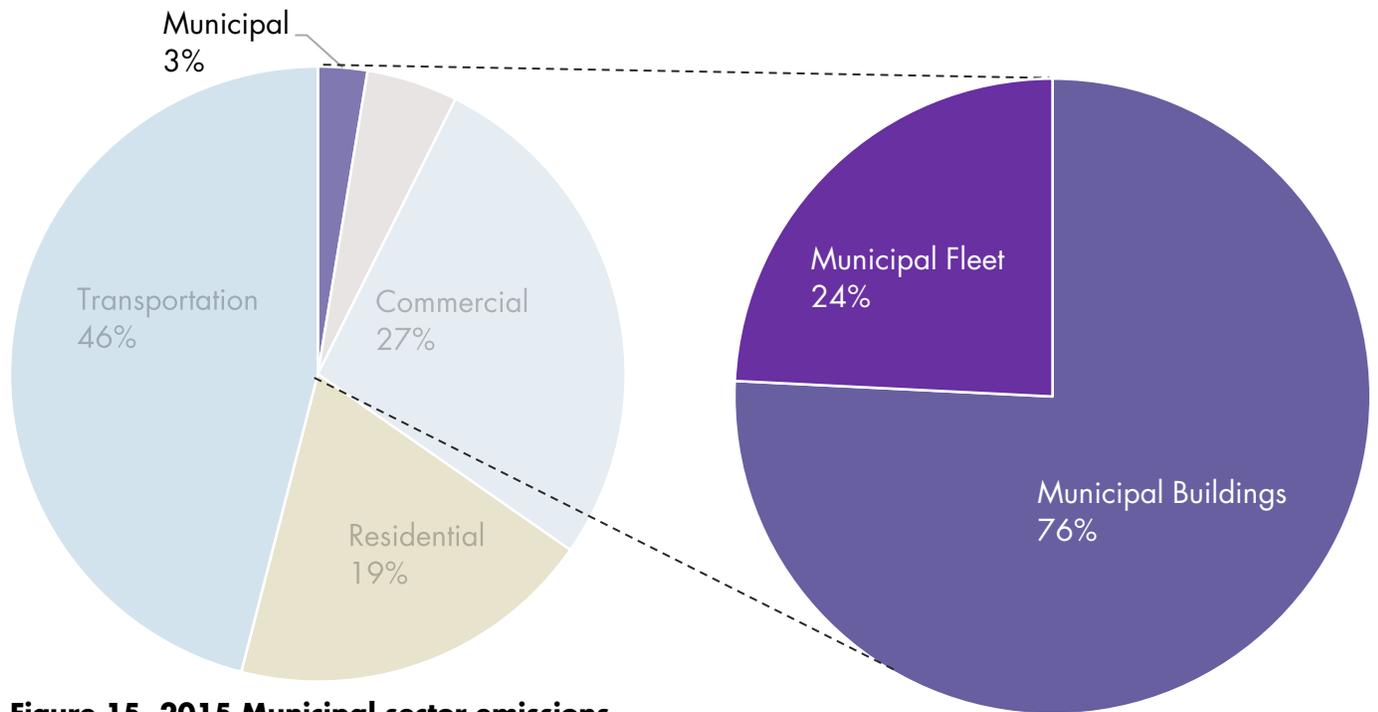
The Municipal sector decreased from 134,404 to 115,137 mtCO<sub>2e</sub> (a 14% decrease) between inventory year 2012 and 2015, with continued steep declines in city-owned building emissions from 111,728 to 87,251 mtCO<sub>2e</sub> (a 22% decrease). As discussed previously, warmer weather in 2015 resulted in a significant reduction in natural gas use. Nonetheless, many municipal energy efficiency projects, programs, and improvements also served to drive down emissions. For example, the City's annual benchmarking report demonstrates that overall city-owned building energy use intensity (EUI)<sup>11</sup> has decreased 18.9 % between 2009 and 2015. In 2014, about 66% of the overall energy use decline was due to natural gas reductions at San Francisco Unified School District locations and 25% was due to reductions at San Francisco General Hospital. In addition, the City continues to improve its efforts to green city-owned buildings with 42 LEED buildings, totaling 5.5 million square feet, certified from 2004 to 2015.

---

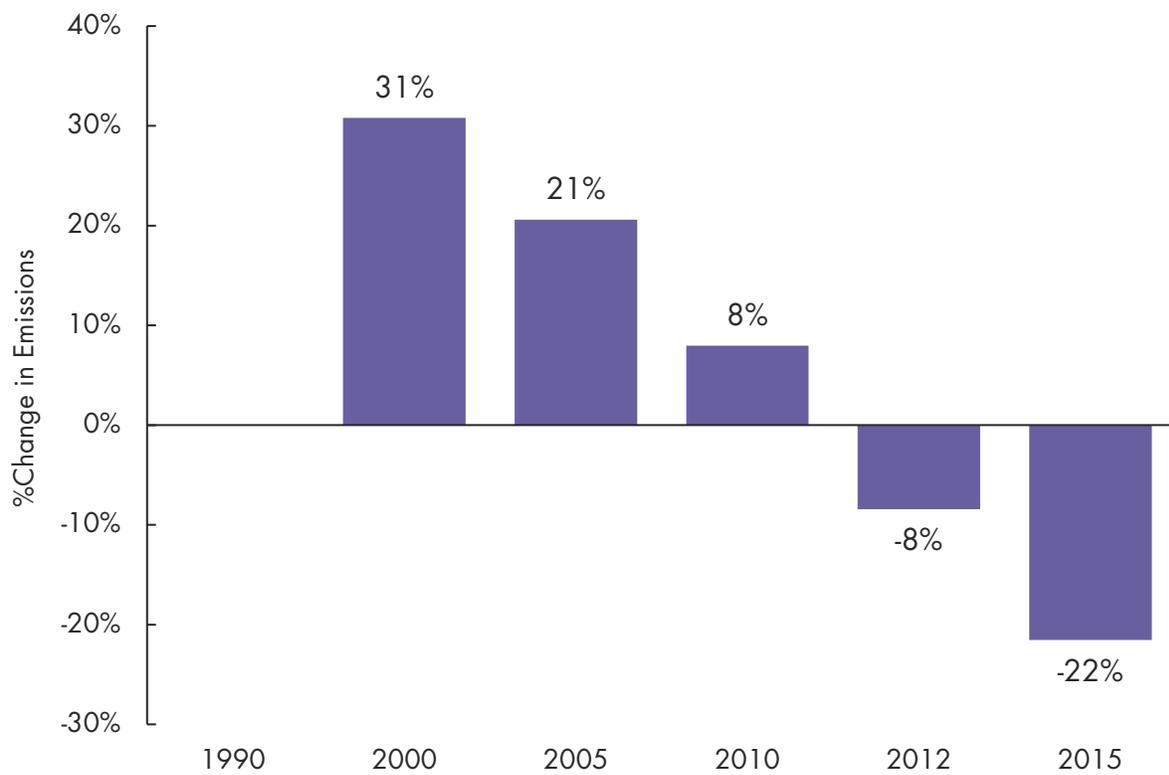
<sup>9</sup> City-owned fleet vehicles have been tracked since 2008 but have historically been treated as an on-road transportation source, and, thus, included as part of the Transportation sector. In 2015, city-owned fleet was allocated to the Municipal sector dating back to inventory year 2010. Moving forward, city-owned fleet emissions will continue to be categorized and tracked within the Municipal sector.

<sup>10</sup> City owned buildings have been sourcing hydro power since the 1970's with very little generation coming from carbon intense sources. Starting fiscal year 2011, the SFPUC began providing power content labels to the CPUC in which all hydro power since has been verified 100% GHG free electric power.

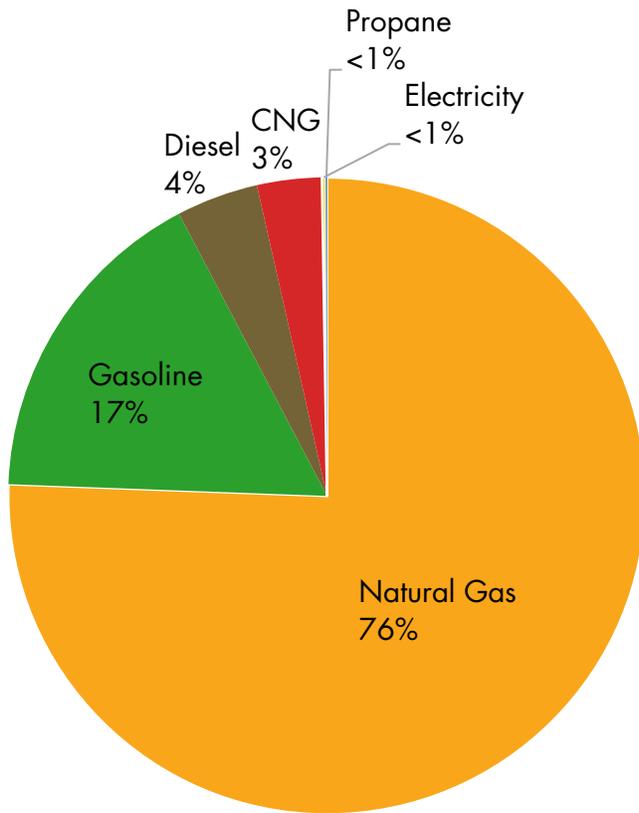
<sup>11</sup> 2015 Energy Benchmarking Report San Francisco Municipal Buildings at <http://sfwater.org/modules/showdocument.aspx?documentid=10201>



**Figure 15. 2015 Municipal sector emissions.**



**Figure 16. Municipal sector emissions changes compared to 1990 levels.**



**Figure 17. 2015 Municipal sector emissions share by commodity.**