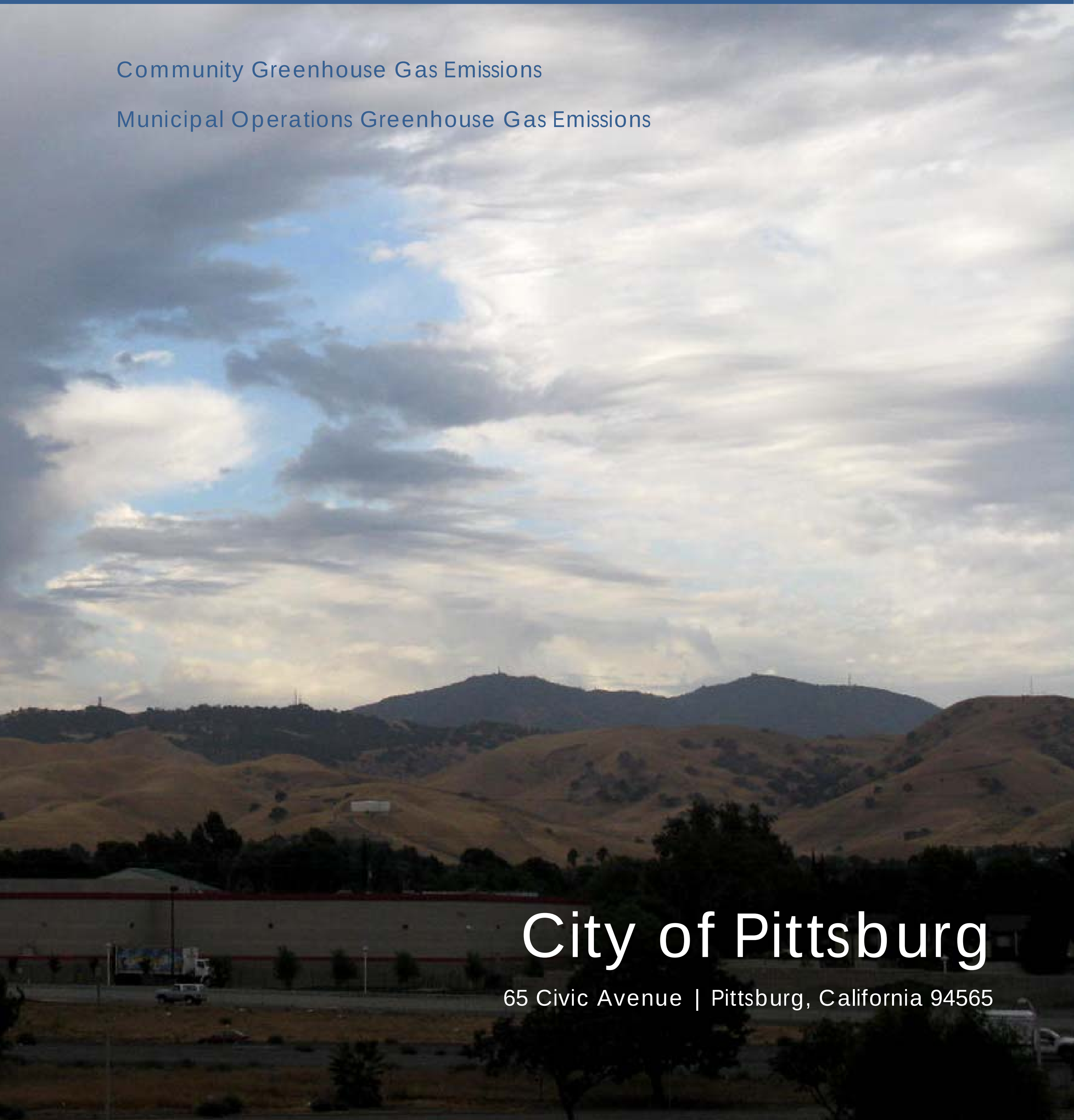
2005 Greenhouse Gas Emissions

Baseline Inventory & Analysis

Community Greenhouse Gas Emissions

Municipal Operations Greenhouse Gas Emissions



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A list of acronyms used in this report can be found in the Acronyms and Glossary at the end of the document.

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1. Introduction

The earth's unique atmosphere and complex ecosystems maintain a balanced state that supports life. Recent human activities threaten to upset this balance by raising the earth's temperature and creating catastrophic changes in the global climate. Measuring greenhouse gases is the first step toward mitigating such climate change.

1.1 Earth and Climate Change

Gases in the earth's atmosphere retain some of the sun's radiant heat energy. This "greenhouse effect" keeps the planet warmer than the open space that surrounds it. Natural systems create some of these "greenhouse gases" (mainly carbon dioxide, methane, and nitrous oxide) and also absorb them, maintaining a constant balance.

In the 1990's, scientific tools began to reveal that the concentration of greenhouse gases in the atmosphere has been steadily increasing since the 18th century.[1] There is scientific consensus that human activities are a major contributor to the increase in greenhouse gases. These human caused greenhouse gases are primarily from the burning of fossil fuels for energy, which began during the Industrial Revolution. As concentrations of greenhouse gases exceed ecosystems' capacity to absorb them, they threaten the balance that has been maintained for millennia. The planet's surface temperatures are rising beyond historic records, and unusual changes in climates have already been observed.[2]

Unbalanced ecosystems create chaotic, unpredictable, and dangerous conditions. Climate change will impact water, food, health, and ecosystems in all geographical regions. [3] Specific impacts to California include:[4]

- Sea level rise and permanent flooding of low-lying areas[5],
- Diminished snow packs in the Sierra mountains, and consequent severe water shortage, reduced water quality,
- Changes in salinity of bodies of water,
- Complications to agriculture and fishing,
- Increased heat waves and wildfires.

Figure 1-1 Pittsburg with 16-55" sea level rise

Source: Bay Conservation and Development Commission

[1] According to the IPCC, "pre-industrial" concentrations of CO_2 were 280 "parts per million" (ppm), and in 2005 were 379 ppm. (Intergovernmental Panel on Climate Change , 2007)

[2] The IPCC AR4 states "Global increases in CO_2 concentrations are due primarily to fossil fuel use… There is *very high confidence* that the net effect of human activities since 1750 has been one of warming." (Intergovernmental Panel on Climate Change , 2007) Summary for Policymakers, p. 5

[3] (Intergovernmental Panel on Climate Change , 2007)

[4] (Snover, 2007)

[5] The San Francisco Bay Conservation and Development Commission predicts that parts of Pittsburg will be flooded with just 1 meter of sea level rise.

Without immediate and extensive action, Earth's environment and its ability to support human societies will change drastically.

1.2 Governments and Climate Change

Governments protect their people from threats that are beyond individual control. Today's governments fend off many complex threats, including disease and toxicity, economic instability and poverty, violence and military conflict. Climate change looms as an amplifier to all of these dangers. An increase in natural disasters (e.g. extreme weather, wildfires, and massive flooding) threatens human safety and infrastructure. Wide-spread scarcity of basic human needs (e.g. food, water, and natural resources) causes social instability. Climate change is not only an environmental threat; its impacts will potentially disrupt all aspects of society.

Although climate change is a global problem, it is the cumulative consequence of local decisions. An effective solution will require all levels of government to respond to the contributions of their jurisdictions. Some mitigating actions will be best executed by larger scales of government, whereas others will require local leadership.

1.2.1 Global Emissions and International Governance

Global annual emissions have been increasing in correspondence with global population and economic growth. In 1990, the global community emitted 39.4 billion metric tons[6] of greenhouse gases (GHGs). In 2004, it emitted 49 billion metric tons, representing a 24% increase since 1990.[7]

Greenhouse Gas Emissions – How much is a metric ton (tonne)?

Since *greenhouse gases* are invisible, and are dispersed in the air all around, it may be difficult to visualize what a "metric ton" of greenhouse gases looks like. According to the California Air Resources Board, a *million* metric tons of carbon dioxide would fill 200,000 hot air balloons, or 500 Empire State Buildings.

Global Emissions in 2004: 9.8 *billion* hot air balloons

U.S. Emissions in 2004: 1.4 *billion* hot air balloons

The Average U.S. Resident in One Year: 1.6 hot air balloons

The Average U.S. Resident over 80 Years: 128 hot air balloons

Data Sources: California Air Resources Board Climate Change conversion of 1MMTCO2 to Familiar Equivalents (www.arb.ca.gov/cc/factsheets/1mmtconversion.pdf)

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[6] Throughout this section, "Metric tons" refers to tons of *carbon dioxide equivalent* (CO_2e). See Appendix C for further explanation. The term CO_2e is first introduced under section *2. Methods*. Throughout this report, "tons" or" tonnes" CO_2e indicate metric tons.

[7] All global emissions inventories from IPCC Fourth Assessment, 2007. (Intergovernmental Panel on Climate Change , 2007)

The Kyoto Protocol is an internationally recognized protocol on GHG emissions. It was introduced in 1997 and became effective in 2005. The signatory countries have agreed to reduce their annual emissions to below 1990 levels by 2012. The Kyoto Protocol calls for greater reduction by industrialized nations, because they contribute a disproportionately large percentage of global emissions.

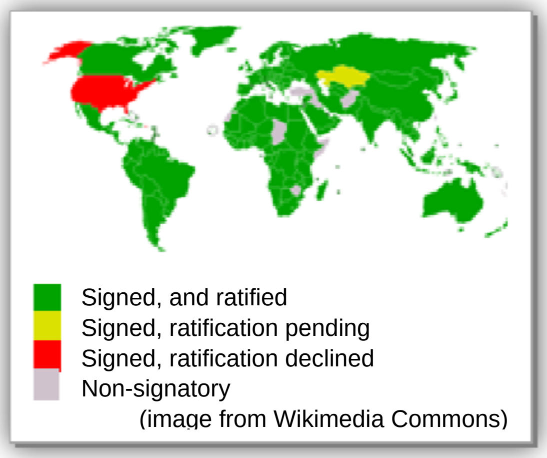

Figure 1-2 Kyoto Protocol signatories

The Intergovernmental Panel on Climate Change (IPCC) is the international scientific authority on climate change. They monitor atmospheric changes and model future conditions under various degrees of climate action. Recent IPCC findings urge for reduction efforts beyond the level of the Kyoto Protocol. They project that a reduction of 50 - 85% below year 2000 levels by 2050 is necessary to avoid the most devastating climate change consequences.[8]

1.2.2. United States Greenhouse Gas Emissions

The U.S. is one of the largest emitters, emitting over 7 billion metric tons of greenhouse gases in 2005.[9] This equals 15% of global emissions, while representing only 5% of the global population.[10] Compared to the global average of 8 tonnes per capita, the U.S. emits almost 24 tonnes per capita.[11]

As of 2008, there were no formal plans at the federal level to reduce GHG emissions. Vice President Al Gore signed the Kyoto Protocol in 1997, but the U.S. government failed to ratify the agreement. President Obama promises more action on energy and climate issues. He has assigned new advisory roles devoted to this field, and has made energy efficiency and renewable energy key components of the American Recovery and Reinvestment Act in February, 2009.[12]

1.2.3. California Greenhouse Gas Emissions and Climate Action

Activities in California emit 469 million metric tons of GHGs annually[13], contributing 6.6% of the U.S. total emissions, while home to 12% of the U.S. population.[14] Per capita emissions are 13 tonnes, which is significantly lower than the national average.[15]

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[8] Examples of consequences at this level include up to 30% of species at risk for extinction, drought in mid-latitudes and semi-arid low latitudes, annual coastal flooding, tendencies for cereal production to decrease in low latitudes. (Intergovernmental Panel on Climate Change , 2007)

[9] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006; (U.S. EPA, 2008)

[10] Greenhouse gas emissions: 7 $GTCO_2e$ / 49 $GTCO_2e$ globally = 15%. Population: 200 million / 6 billion = 5%

[11] Global per capita: 49 $GTCO_2e$ / 6 billion = 8 TCO_2e. U.S. per capita: 7 $GTCO_2e$ / 300 million = 24 TCO_2e.

[12] See Appendix A. Preparer's Note on Context for more about President Obama's statements.

[13] 2002 – 2004 average. (CARB, 2008)

California is leading the U.S. in state-level efforts on climate action. *The Global Warming Solutions Act of 2006* (Assembly Bill 32; AB32) requires the state to reduce its annual GHG emissions to 1990 levels by 2020.[16] State Executive Order S-3-05 sets a further target of 80% below 1990 levels by 2050, which agrees with the IPCC recommendation.[17]

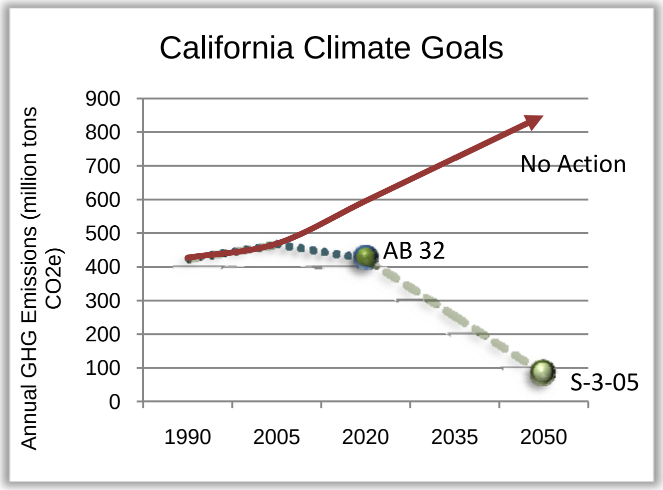

Figure 1-3 California climate goals: 2020 and 2050

In 2008, the state Air Resources Board developed an action plan to achieve AB 32's 2020 reduction target. This document, the *Scoping Plan*, outlines state-wide regulations and initiatives that propose to eliminate 174 million tonnes of annual emissions.[18] Many of these strategies will also reduce local emission levels.

Various state-level plans, including the AB 32 Scoping Plan, assume that local governments will play an important role in reducing state-wide emission levels. The AB 32 Scoping Plan specifically recommends that local governments reduce emissions from their municipal operation to 15% below 2005 levels by 2020, and that they develop strategies for similar GHG reductions in their communities.[19] The State[20] has officially adopted a Local Governments Operations Protocol for reporting emissions from municipal operations, and is preparing a protocol for local governments to report emissions from their communities. Although local inventories and action plans are currently voluntary, the emphasis on local governments in these plans suggests that the state may soon mandate local climate action.

1.3. Local Governments and Climate Change

Local governments are better equipped to respond to some specific needs of their communities than larger scales of government. They will also likely have the responsibility of managing the immediate damages that result from unmitigated climate change. Particularly in the United States, where federal leadership has been lacking, cities and counties have taken initiative by signing mayors' agreements for GHG reduction, and measuring and planning for their local emissions. [21] A recent survey

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[14] Percent of U.S.: 469 $MMTCO_2e$ / 7,000 $MMTCO_2e$ = 6.6%. This calculation assumes that the U.S. and California inventories were prepared with consistent methodologies.
[15] Per capita: 469 $MMTCO_2e$ / 36,500 = 12.8 TCO_2e.
[16] www.arb.ca.gov/cc/docs/ab32text.pdf, accessed November, 2008
[17] http://gov.ca.gov/executive-order/1861/, accessed November, 2008
[18] (CARB, 2008)
[19] (CARB, 2008)
[20] California Air Resources Board
[21] On February 16, 2005 the Kyoto Protocol became law for the 141 countries that have ratified it to date. On that day, Seattle Mayor Greg Nickels launched the US Mayors Climate Protection Agreement to advance the goals of the Kyoto Protocol through leadership

shows that 75% of California local governments have completed, or intend to complete, a GHG inventory and climate action plan.[22]

1.3.1. Contra Costa County Climate Leaders

In 2007, the Contra Costa County Climate Leaders (4CL) program was formed as a network for the County and its nineteen cities to provide support for measuring and reducing greenhouse gas emissions. As part of the 4CL program, Pittsburg and fifteen other local governments in Contra Costa County joined the Cities for Climate Protection program offered by the ICLEI – Local Governments for Sustainability[23].

1.3.2. ICLEI's Cities for Climate Protection Program

ICLEI is an international association of cities and counties initiating climate action and other sustainability efforts. Over five hundred U.S. local governments have joined ICLEI's Cities for Climate Protection (CCP) program. The program consists of five milestones:

1. Conduct an inventory of local GHG emissions
2. Establish a GHG emissions reduction target
3. Develop an action plan for achieving the emissions reduction target
4. Implement the action plan
5. Monitor and report on progress

Figure 1-4 ICLEI's CCP five milestones

This report represents the first milestone – completing a GHG inventory. Inventories provide a "snapshot" of current conditions and include details to guide decision making. They also serve as a benchmark against which future GHG reductions can be measured. ICLEI is a leading authority on local GHG reporting, and contributed to the State's Local Government Reporting Protocol. Conducting an inventory through ICLEI's process helps prepare cities for possible State mandated greenhouse gas reporting.

The CCP program includes measuring and planning for both the local community and municipal operations. The community is defined as activities occurring within a municipality's geographic boundaries. Municipal operations include activities that the local government operates or influences directly. Although emissions from municipal operations constitute a small percentage of overall community emissions, their contribution is large for a single entity. Programs and actions implemented by municipal operations can also provide visible examples as models for the larger community.

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and action. Two years later, The U.S.Conference of Mayors launched the Mayors Climate Protection Center to administer and track the agreement, among its other activities. By November 1, 2007, there were more than 710 signatories to the Agreement. Source: www.seattle.gov/Mayor/Climate (accessed Dec. 30, 2008)

[22] (Public Policy Institute of California)

[23] "ICLEI – Local Governments for Sustainability" is the organization's official name. ICLEI stands for International Council for Local Environmental Initiatives. The name was changed in 2003.

2. Inventory Methodology

ICLEI identifies a list of community and municipal activities that are considered *key* sources of GHG emissions.[24] Data for these key sources were gathered from various agencies for the purpose of this inventory. Greenhouse gas emissions were then calculated from data about the volume and intensity of these activities. See Appendix B for a detailed account of all activity data gathered.

2.1 Community Emission Source Activities

The *community* inventory includes the following activities that *occur within Pittsburg's city limits*:

- **Industrial** emissions (recorded by the Bay Area Air Quality Management District)
- **Transportation** miles driven by cars and trucks within the city limits and their average miles-per-gallon fuel efficiency (mileage data from California Department of Transportation and the Metropolitan Transportation Commission; miles-per-gallon data from the Bay Area Air Quality Management District)
- **Commercial** energy use[25] (electricity and natural gas usage data from PG&E)
- **Residential** energy use (electricity and natural gas usage data from PG&E)
- **Waste** discarded by the community (tonnage from Pittsburg Disposal Service and California Integrated Waste Management Board; composition from CIWMB)

2.2 Municipal Operations Emission Source Activities

The *municipal operations* inventory includes data from the following activities that are recorded for City accounts:

- **Water** treatment and pumping energy use (electricity and natural gas data from PG&E bills)
- **Facility** energy use (electricity and natural gas data from PG&E bills)
- **Vehicle fleet** use of gasoline and diesel and miles driven (data from municipal fueling station reports and annual odometer meter readings from City of Pittsburg Public Works Department)
- **Employee commute** miles driven and vehicle types (data collected through an employee survey)
- **Streetlights** electricity use (data from PG&E bills)
- **Waste** disposed of by municipal accounts (tonnage from Garaventa Enterprise; composition from CIWMB)

[24] Key sources are considered essential components in a GHG inventory. Other emissions occurring within the community and municipal operations that do not fall under *key* sources are called *secondary* emission sources. While measuring secondary sources may provide interesting information, it is often impossible, or prohibitively difficult, to gather accurate data, and there may be nothing the local government can do to influence them. See Appendix F for a discussion of secondary sources in Pittsburg.

[25] The *commercial* sector includes emissions from building energy use of small to medium industrial facilities, but do not include large facilities and industrial process emissions.

Natural gas, gasoline, and diesel emit GHGs when they are consumed in a building or by a vehicle. Electricity use emits GHGs when coal or natural gas is used by a power generation facility.[26] Waste emits GHGs as it decomposes in landfill conditions. Although the electricity generation facilities and landfills may not be within a city's geographical boundary, these emissions are included in the inventory because their ultimate causes – electricity demand and waste generation – occur in Pittsburg.

This inventory classifies emissions sources by sector and energy source (or fuel type). Sector and fuel classification provides the most relevant information for legislation and program creation. Many GHG inventories also classify emission sources by *Scopes*.

2.3 Emissions by Scopes

Scopes express the directness of the relationship between an activity and the emissions it causes. An emission source's Scope is determined by where the emissions occur (at the activity site or in a remote location), and when the emissions occur (during, before, or after the activity). This inventory includes three Scopes:

Scope 1: All direct emissions from sources located within city limits (community inventory) or under municipal control (municipal inventory). This generally includes fuel combustion (e.g. natural gas) in buildings, vehicle emissions, and industrial process emissions.

Scope 2: Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within city limits or municipal control, but that occur at sources located outside of these boundaries.

Scope 3: All other indirect or embodied emissions not covered in Scopes 1 and 2, which occur as a result of activity within the city limit or municipal control. Under current reporting protocols, these sources are optional. This inventory includes the significant and reliably quantifiable Scope 3 emissions of waste (both inventories) and employee commute (municipal inventory).

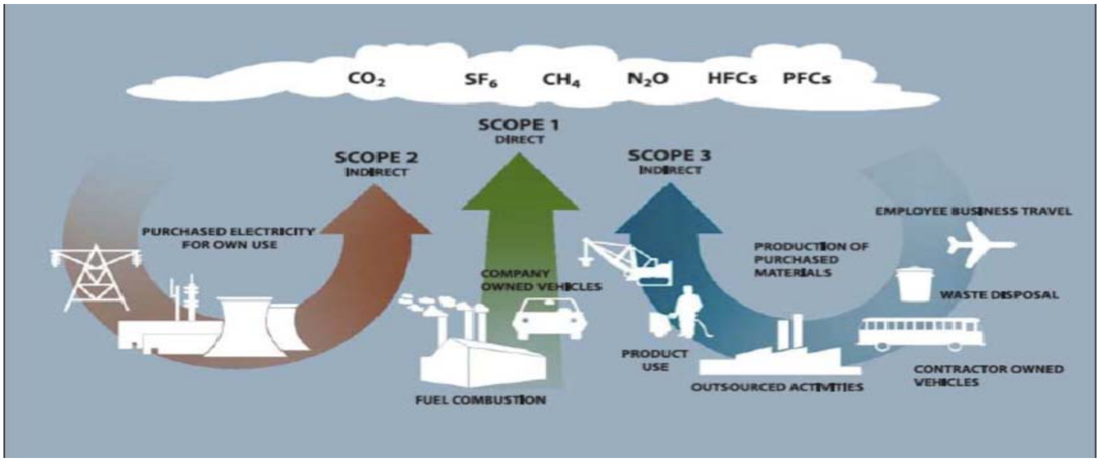
Scopes offer a method to prevent double counting for major categories such as electricity use and waste disposal. This differentiation is critical for a community like Pittsburg, which hosts a major power generation sector. Emissions from the burning of fuel at power plants in Pittsburg are considered a Scope 1 emission source for Pittsburg, but also a Scope 2 emission source for the jurisdictions that use the electricity that is generated.

As most community inventories include at least Scope 1 and Scope 2 emission sources, the same source of emissions from electricity generation will be reported twice – by the

[26] PG&E's "power mix" has much more "clean" sources of electricity than the U.S. Average. See Appendix D for a comparison.

generating jurisdiction and the consuming jurisdiction. Labeling by Scopes allows cross-jurisdictional analyses to avoid double-counting emissions. See Appendix E for a scopes-based classification of the emission sources included in this inventory.

Figure 2-1 Emissions scopes



Source: WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4.

2.4 Baseline Year

Data for both inventories reflect calendar year 2005, which is the baseline year used by most participating cities in the Contra Costa County Climate Leaders group.[27] 2005 is recent enough for data to still be maintained and accessible, and often available in electronic formats. At the same time, 2005 allows trend analyses to show the GHG reduction impacts of conservation actions taken in recent years.

2.5 Clean Air and Climate Protection Software

ICLEI provides its members with the Clean Air and Climate Protection (CACP) software package.[28] This software converts activity data from various sectors into tonnes of *carbon dioxide equivalent* (CO_2e), the common unit used in GHG inventories.[29] It inventories emissions for the three most common greenhouse gases: Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These three gases make up over 98% of global GHG emissions.[30] See Appendix C for an explanation of how the software translates activity data into tonnes of CO_2e.

[27] CIWMB waste composition data were taken from a 2004 report (CIWMB, 2004), and are the most recent data available.
[28] See Appendix C – *Calculating CO_2e* for more information about the CACP software.
[29] "Carbon Dioxide Equivalent" is used to compare different mixes of greenhouse gases based on their impact on global warming, as compared to carbon dioxide. Each greenhouse gas is calculated to express how much global warming impact it will have compared to one ton of carbon dioxide. See Appendix C for a full discussion of this calculation method.
[30] The United Nations Framework Convention on Climate Change recognizes three (groups of) other greenhouse gases: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) that are included in national GHG inventories, and the ozone-depleting substances (CFCs, HCFCs, and halons), which are not included in national GHG inventories because they are already regulated by the Montreal Protocol. These groups of gases are synthetic compounds that are created during industrial processes or are used in refrigeration systems. These gases occur in very small amounts but have a high impact on global warming, earning the name High GWP (global warming potential). (U.S. EPA, 2008)

3. City of Pittsburg Greenhouse Gas Emissions Inventory

Pittsburg has a unique mix of community sectors, with correspondingly unique emission sources. While the purpose of this inventory is to count all GHG emission sources within Pittsburg, it is also intended to provide useful information for the community so that emissions reductions can be accomplished through local actions. Therefore, this inventory is presented in multiple layers. The first layer includes *all* emission sources, including industrial emissions and regional transportation emissions. These emission sources are best addressed by regional and higher levels of government. The second layer limits the scope to include emissions caused by activities of the *local community*, which includes local businesses, residents, and local transportation. The local community and government have greater influence over these emission sources. A third layer shows emissions from municipal operations, which are the activities of the local government.

3.1 2005 Pittsburg GHG Emissions *with* Regional Sources

In the baseline year 2005, activities in Pittsburg caused approximately 4.4 million metric tons CO_2e of greenhouse gases. As Figure 3-1 and Table 3-1 show, 91% of these emissions are attributable to Pittsburg's large industrial sector, and 4% are caused by highway traffic. This section discusses these two regional sources of emissions.

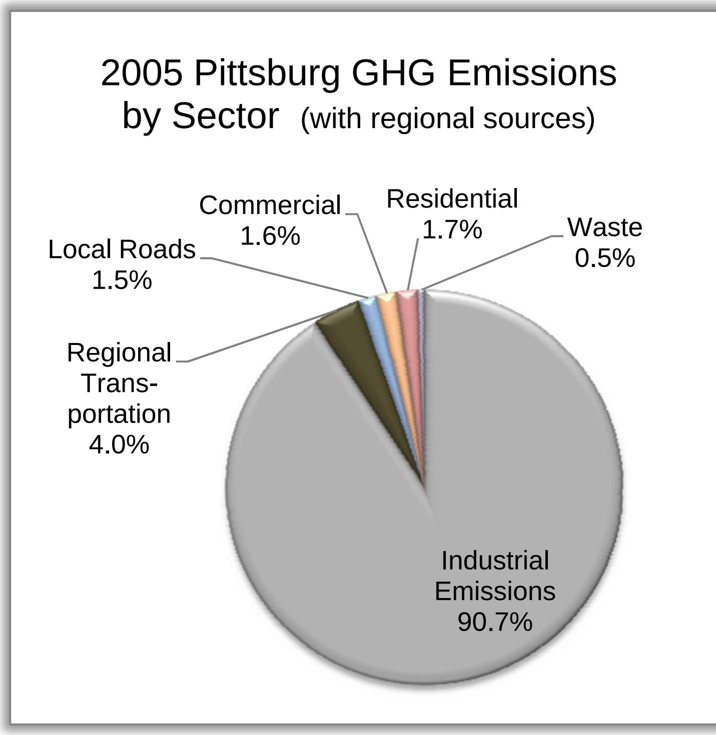


Figure 3-1 2005 Pittsburg community GHG emissions, including regional sources

Table 3-1 Pittsburg community GHG emissions, including industrial sector emissions

Sector	GHG Emissions (Tonnes CO_2e)	Percent of Total Emissions
Industrial	3,984,457	90.7%
Regional Transportation	174,088	4.0%
Local Road Transportation	65,695	1.5%
Commercial	71,775	1.6%
Residential	74,458	1.7%
Waste	23,741	0.5%
Total	**4,394,214**	**100%**

Note: Items may not sum up to total due to independent rounding.

3.1.1. Industrial Emissions

The emissions included in this sector include those resulting from combustion of fuels (such as natural gas, petroleum coke, diesel), and gas-emitting chemical processes. These emissions were reported to BAAQMD as measured by Pittsburg's largest emitters: five power plants and three manufacturing facilities.[31] As Figure 3-2 and Table 3-12 show, natural gas power plants (three plants[32]) account for 88% of Pittsburg's industrial GHG emissions, coke power plants (two plants) account for 10%, and manufacturing sites account for the remaining 2%.[33]

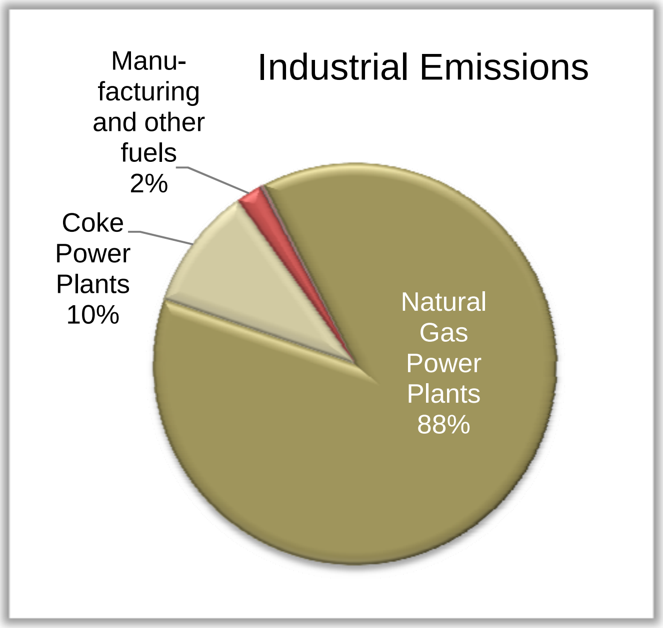


Figure 3-2 Distribution of industrial sector emissions

Table 3-2 Distribution of industrial sector emissions

Industrial Type	GHG Emissions (Tonness CO_2e)	Percent of Industrial Emissions
Gas Power Plants	3,502,755	88%
Coke Power Plants	396,860	10%
Manufacturing/other	84,843	2%
Total	**3,984,457**	**100%**

The electricity generated by the power plants is distributed over the regional power grid, and used by other jurisdictions. As explained in Section 0 *Emissions by Scopes*, this emission source will also be reported by the communities that are the end users of the electricity.

The products of industrial processes (goods or energy) are part of regional or global networks, and respond to market forces and regulations beyond their locality. As such, local governments have limited influence over industrial processes. Federal and state governments can form more appropriately scaled policies, mandates, and incentive programs. The AB 32 plan specifies the creation of a maximum emission threshold from large industrial sources. Industrial facilities can also strive to meet standards set by international organizations.[34] Environmentally and socially responsibility has also become a powerful marketing tool. Competition may drive companies with large industrial facilities to achieve GHG reductions and promote their efforts to reduce their environmental impacts as a strategy to gain market share and increase profits.

[31] Other, smaller industrial facilities reported emissions related to natural gas, which are included in the commercial sector, and non-natural gas emissions that were less than 20 tons CO_2e. See Appendix G for a full explanation of Industrial Emissions data.
[32] This inventory excludes Mirant Power Plant, which was annexed into Pittsburg in 2008. In 2005, it was in unincorporated County, and therefore beyond Pittsburg city limits.
[33] The emissions from marine vessels docked in the ports of the industrial facilities is not included. See Appendix F for a discussion about excluded emission sources.
[34] For example, the International Organization for Standards (ISO) standard for GHG emissions reporting, the ISO 14065:2007.

3.1.2. Regional Transportation

Regional transportation is addressed in this GHG inventory because they occur within the city limits. They do not, however, reflect the activities of only Pittsburg residents or businesses, and are therefore discussed separately from community-based emissions sources. Emissions from regional transportation systems are quantified and presented here if data were available. Although climate action efforts to reduce these emissions are limited at the City level, efforts like advocacy and participation in regional dialogues can contribute to emissions reductions in this sector.

Highway 4 Looking West from Railroad Avenue

There are four regional transportation systems that pass through Pittsburg (Table 3-3). Although rail and BART emissions are not quantified here, it can safely be concluded that highway emissions are the greatest source of regional transportation emissions.

Table 3-3 Regional transportation systems and their emissions

Emissions Source	Metric Tons CO_2e	Percent of Regional Transportation Emissions
Highway	171,952	99%
Marine	2,136	1%
Rail	*Unavailable*	--
BART	*Included in Commercial Electricity*	--
Total	**174,088**	100%

Highway: State Route 4 connects East Contra Costa County and rural areas to the Bay Area's urban centers. Approximately 200 thousand vehicles passed through this four mile segment on an average day in 2005.[35] Emissions from this traffic account for 4% of Pittsburg's total inventoried emissions.

As Table 3-4 shows, gasoline powered passenger vehicles caused 91% of these emissions; diesel trucks transporting goods caused only 9%. Reducing this sector's emissions will require regional strategies for better systems of transporting people, and to a lesser degree for transporting goods.

[35] Total of both East and Westbound traffic. Estimated as 330 million annual vehicle miles traveled ÷ 365 days ÷ 4.04 miles of Hwy 4. AVMT provided by MTC and ICLEI. Length of highway provided by Paul Reinder, City of Pittsburg

Extension of regional public transit and improved regional transportation planning are necessary to alleviate highway emissions. The local government of Pittsburg can urge regional, state, or federal authorities to prioritize these projects. Other than regional advocacy, there are no local government initiatives that will significantly reduce this largest source of community emissions. However, local citizens can reduce these emissions by using the alternative modes of public transit as they are available to demonstrate that there is a demand for public transit.

Table 3-4 Highway emissions by fuel type

Fuel Type	GHG Emissions (Tonness CO2e)	Percent of Highway Emissions
Gasoline	151,867	91%
Diesel	20,085	9%
Total	**174,646**	**100%**

Local citizen support is also effective in regional advocacy. Individuals in the region can also reduce or nearly eliminate these emissions by choosing alternative fuel vehicles like plug-in electric vehicles as they become available. Even incremental increases in fuel efficiency of vehicles results in significant emissions reductions.

Marine: There are about two nautical miles of vessel lanes that pass through Pittsburg's waterways, and two commercial ports where large marine vessels enter and dock.

Emissions from marine vessels contribute about 1% of regional transportation emissions. The majority of these emissions are caused at the ports, when vessels idle their engines for energy while they are docked (hotelling). One of the two commercial ports in Pittsburg has been providing electricity to the ships that dock there (shore power) since the 1990's, thereby eliminating this emission source. The emissions caused by the electricity use by the ships are included in the electricity data for the commercial sector.[36]

Table 3-5 Marine emissions sources

Fuel Type	GHG Emissions (Tonness CO2e)	Percent of Marine Emissions
Hotelling	1,863	87%
Manuevering	98	5%
Transit	175	8%
Total	**2,136**	**100%**

Rail: 4-5 miles of railway passes through Pittsburg. Approximately four cargo trains pass through this segment daily. Data sources for rail emissions are unavailable.[37]

BART: 2 miles of BART tracks run within or along Pittsburg's city limit. The emissions related to BART travel are caused mainly by electricity use, which is included in the commercial energy use sector.

[36] See Appendix F for a discussion on marine emissions.
[37] See Appendix F for a discussion on rail emissions.

3.2 2005 Pittsburg Community GHG Emissions without Regional Sources

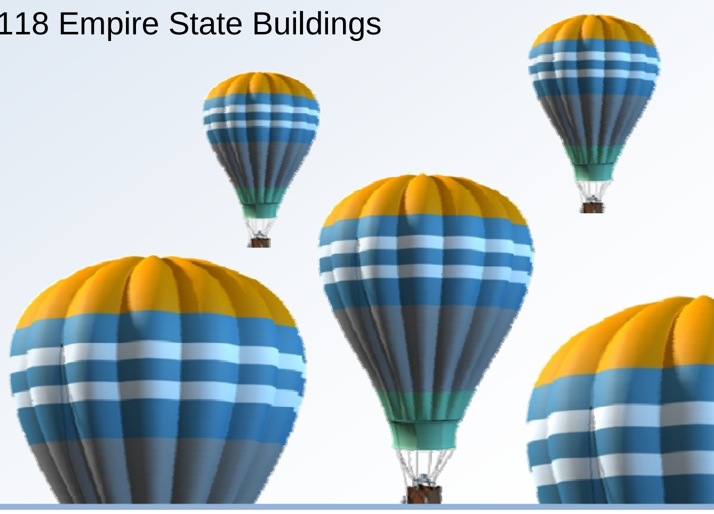
Local governments are best suited to engage with localized sectors of the community – residents, local businesses, and traffic on local roads. Recognizing the need to focus on community-based emissions, the discussion from this point forward excludes emissions from industrial sources and regional transportation.

The local community activities in Pittsburg emitted approximately 236 thousand metric tons CO_2e. As Figure 3-3 and Table 3-6 show, emissions were distributed almost equally among energy types (natural gas, electricity, and transportation fuels), each contributing about 30% of total emissions. The remaining 10% of community emissions resulted from waste decomposition.

By sector, the residential sector emitted the most, followed by the commercial sector, transportation, and finally the waste from the whole community. Each sector and energy source reflects a distinct need of the community. Some emission sources can be addressed by various levels of government, but emissions caused by individual residences, businesses, and vehicles can ultimately only be changed by individuals.

Pittsburg GHG Emissions in Hot Air Balloons

The amount of greenhouse gases emitted by Pittsburg in 2005, if quantified as carbon dioxide, could have filled 47 thousand hot air balloons, or 118 Empire State Buildings



2005 Pittsburg Local Community GHG Emissions by Sector

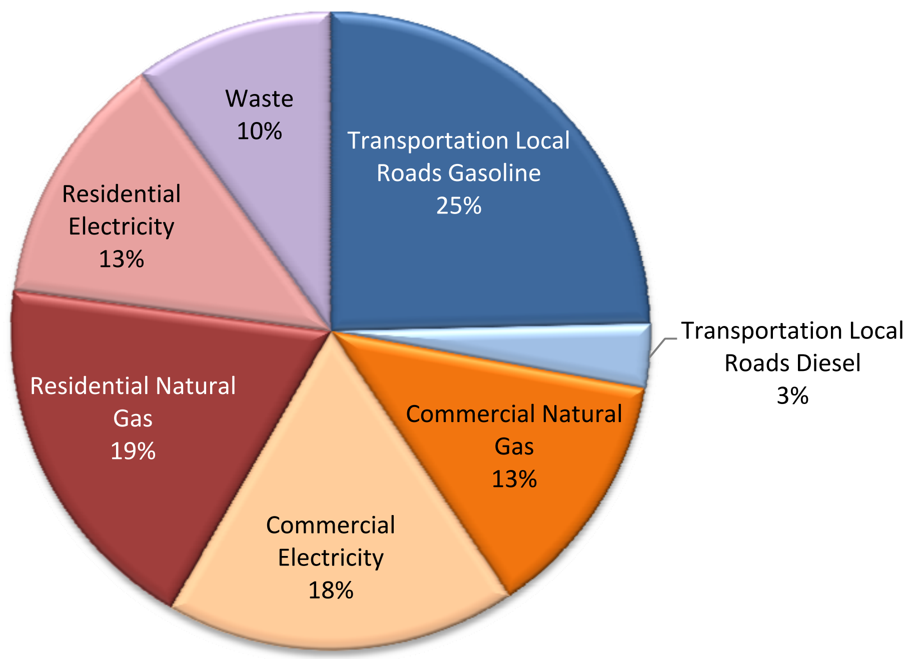


Figure 3-3 2005 community GHG emissions, by sector and energy source.

Table 3-6 2005 community GHG emissions by sector and energy source

Sector	Energy Type	Percent of Community GHG Emissions	Greenhouse Gases (Metric Tons CO_2e)	Energy (million Btu)
Transportation	**Local Roads Gasoline**	25%	58,021	805,112
	Local Roads Diesel	3%	7,674	92,518
Transportation Total		***28%***	***65,695***	***897,631***
Commercial	**Natural Gas**	13%	29,873	395,409
	Electricity	18%	41,901	639,698
Commercial Total		***30%***	***71,775***	***1,035,107***
Residential	**Natural Gas**	19%	44,110	824,736
	Electricity	13%	30,348	463,315
Residential Total		***32%***	***74,458***	***1,288,051***
Waste		10%	23,741	-
Total		**100%**	**235,668**	**3,383,929**

Note: Items may not sum up to total due to independent rounding.

3.2.1 Local Transportation

Transportation on local roads emitted 66 thousand tonnes CO_2e of GHGs, equal to 28% of total community GHG emissions. The majority of these emissions were generated by passenger vehicles.

Railroad Avenue Near Bliss Avenue

City planning that supports walkable communities and improved pedestrian and bicycle plans offer a viable and convenient alternative to automobile travel for local and routine trips. In addition to greenhouse gases, local transportation emissions contain smog-causing gases and particulate matter that cause asthma and other health problems. Reducing cars and traffic will also improve public health.

Stronger fuel economy standards and cleaner fuels will reduce the emissions per mile driven, even if the volume of traffic does not decrease. These standards can be set by the federal government or the state. Locally, behavioral changes toward carpooling, vehicle maintenance, and driving speeds can significantly increase fuel efficiency and reduce transportation emissions.[38]

3.2.2. Commercial Energy Use

The commercial emissions included in this inventory refer to emissions related to energy consumption by non-residential buildings, including retail, office, food service, schools and other institutions, and small to medium industrial facilities. This sector emitted 72 thousand tonnes CO_2e, equal to 30% of total community GHG emissions. Electricity use accounts for 58% of commercial emissions; natural gas combustion accounts for the other 42%.

Shopping Plaza on Railroad Avenue

[38] The GHG reduction benefits from these measures will be difficult to measure, however, because fuel efficiency data is recorded at a county-wide scale, and will not reflect adjustments made solely in Pittsburg.

Commercial buildings use natural gas for space heating, water heating, and cooking in commercial kitchens. They use electricity for lighting, cooling, and computer and electronic equipment. Figure 3-4 shows the sources of GHG emissions from a typical commercial building in California.[39]

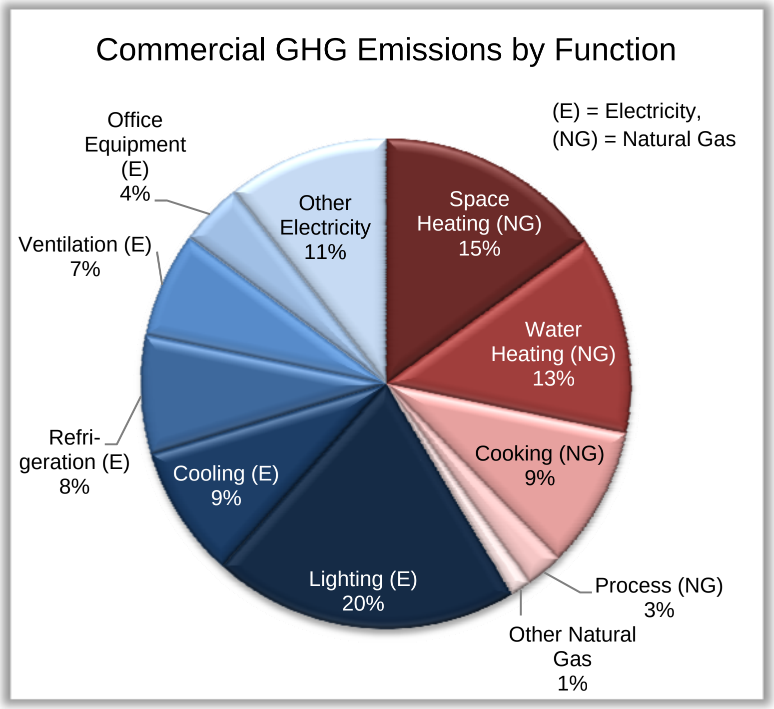


Figure 3-4 GHG emissions by commercial energy use

Businesses can reduce their emissions by conserving energy. Typically, energy efficiency upgrades to lighting, equipment, and heating and cooling system offer the most energy and cost savings for commercial buildings. PG&E and other agencies provide audits and rebates to facilitate such upgrades. New web tools are also emerging that allow businesses to monitor and track their energy usage, and make energy-saving decisions.[40]

PG&E or other large-scale electricity providers can host large-scale renewable energy projects, while individual commercial and residential sites can host small-scale generation equipment on-site, such as rooftop solar photovoltaic panels or wind turbines. Introducing more renewable, non-emitting sources of electricity generation reduces electricity-related emissions. Clean energy supplies reduce the amount of electricity generated by burning natural gas or other petroleum based fuels, such as coal or petroleum coke.

[39] This distribution is based on data in the CPUC's California Long Term Energy Efficiency Strategic Plan, September 2008, which states that commercial buildings consume 38% of the state's total "power" use and 25% of the state's total natural gas use. State totals were tallied from by-county use data for 2006 on the CEC's Energy Consumption Data Management System (accessed Dec. 18, 2008). Emissions factors used for Pittsburg's inventories were applied to commercial energy use – 0.000224 tons CO_2e per kWh and 0.005348 tons CO_2e per Therm.
[40] Energy Star rates energy efficiency of appliances and commercial facilities. Their online portfolio manager tracks businesses' energy usage (businesses enter their utility bill information) and GHG emissions, and ranks them compared to other similar businesses. This tool helps businesses make decisions that will save energy and money. Other tools are discussed as part of the California Air Resources Board small business toolkit.

3.2.3. Residential Energy Use

The residential sector emitted 74 thousand tonnes CO_2e, equal to 32% of total community GHG emissions. Natural gas use accounts for almost two thirds of residential emissions; electricity use accounts for the other third. In 2005, the average residence in Pittsburg used 36 Therms of natural gas and 579 kWh of electricity per month, emitting 3.9 tonnes CO_2e.

Parkside Neighborhood

Homes in California use natural gas for space heating, water heating, cooking, and dryers. They use electricity for lighting, refrigeration, TVs and computers, air conditioning, and other appliances. Figure 3-5 shows how a typical home's electricity and natural gas use translates into GHG emission.[41]

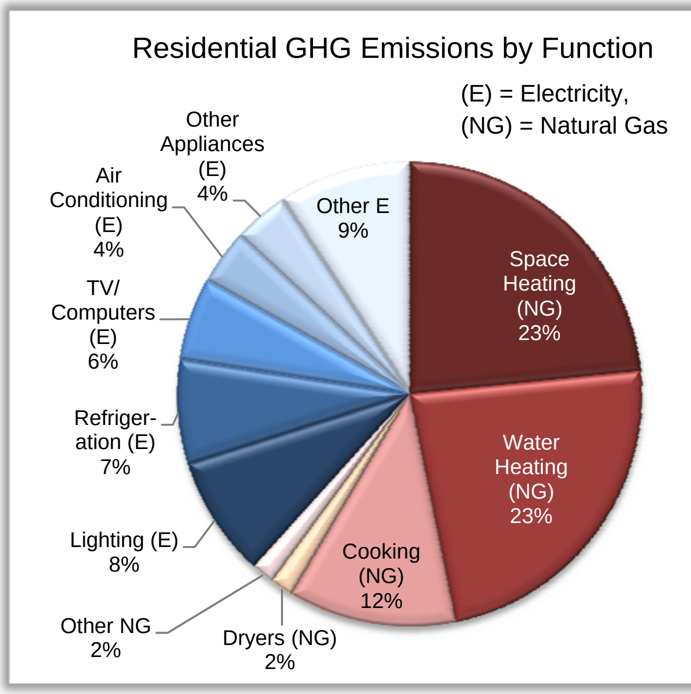


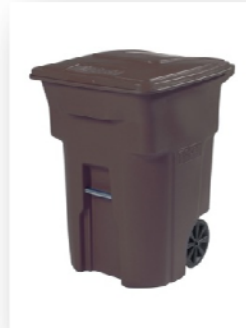
Figure 3-5 GHG emissions by residential energy use

Local government can encourage and assist residences with energy efficiency upgrades and renewable energy options. Energy efficient appliances and home improvements that improve insulation can reduce home energy use (and thereby GHG emissions) by over 30%. Local utilities, such as PG&E, offer rebates for purchases of appliances that are energy efficient (e.g. certified by ENERGY STAR).

[41] Total residential energy use in Pittsburg was multiplied by the CA average percentages by function from the CPUC plan. (CPUC, 2008). Emissions factors used for Pittsburg's inventories were applied to residential energy use – 0.000224 tons CO_2e per kWh and 0.005348 tons CO_2e per Therm.

3.2.4. Waste

Community waste emitted 24 thousand tonnes CO_2e, equal to 10% of total community GHG emissions.



After recycling and source separation efforts, the community sent 77 thousand tons of waste to landfills. Of the 77 thousand tons, 50 thousand tons are estimated to be organic matter (paper, food, plants). Organic matter sent to landfills slowly decomposes and emits methane over many years. Paper products account for over half of these emissions (56%). Food waste, construction lumber/textiles, and plant debris account for the rest (22%, 16%, and 6% respectively).[42]

Waste emissions occur beyond the city limits, and over a long period of time. These emissions are included in the inventory of the community that generates the waste, however, because waste generation is the ultimate cause of the emissions.[43]

[42] The percentage in waste stream of each type of organic matter was derived from a state-wide waste characterization study (CIWMB, 2004).

[43] The emissions from hauling and processing the waste are not counted in this sector, but in the transportation and industrial sectors of the communities in which the hauling and processing occur.

3.3 2005 Pittsburg Municipal Operations Greenhouse Gas Emissions Inventory

In the baseline year 2005, City of Pittsburg municipal operations emitted 5.5 thousand metric tons CO_2e of greenhouse gases. The municipal operations inventory is a subset of the community inventory, and represents 2% of emissions from the local community in 2005. For municipal operations, cost data are presented when available, and total over $2 million. Many GHG reduction measures will provide savings to the City's operating expenses.

Figure 3-6 and Table 3-7 show that electricity use – by the Water Treatment Plant, City facilities, and streetlights – accounted for half of municipal operations emissions. Gasoline combustion – by vehicle fleet and employee commute – emitted an additional third of municipal operations emissions. Natural gas, diesel, and waste decomposition emitted the rest.

By sector, energy used for water management and City facilities contributed the most emissions. Vehicle fleet and employee commute emissions were also significant sectors. Waste from all municipal operations was a minimal source of emissions, constituting 1% of municipal operations emissions.

Municipal Operations GHG Emissions = 2% of Community Emissions

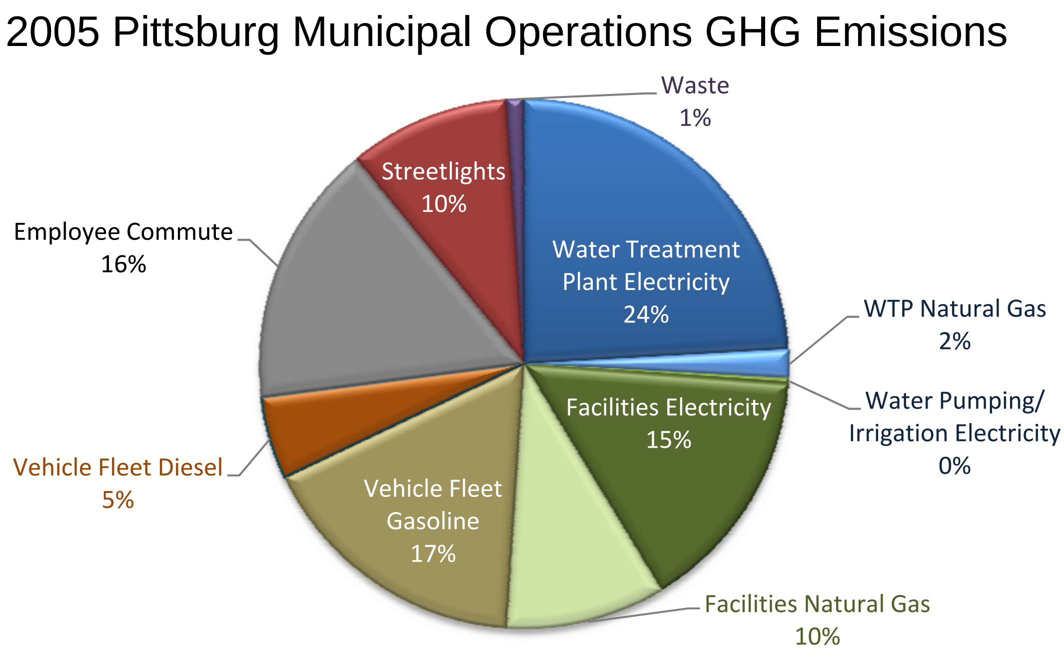


Figure 3-6 2005 municipal operations GHG emissions by sector and energy source.

Table 3-7 2005 municipal operations GHG emissions by sector and energy source.

Sector	Energy Type	% of Total GHG Emissions	Greenhouse Gases (Metric Tons CO_2e)	Energy (million Btu)	Cost (1,000 Dollars)[44]
Water Management	**WTP Electricity**	24%	1,328	20,271	**747**
	WTP Natural Gas	2%	96	1,789	**19**
	Irrigation Electricity	0.30%	19	291	**15**
Water Management Total		***26.3%***	***1,442***	***22351***	***782***
Facilities	**Electricity**	15%	832	12,704	**506**
	Natural Gas	10%	538	10,050	**115**
Facilities Total		***25%***	***1,370***	***22,754***	***621***
Vehicle Fleet	**Gasoline**	17%	932	13,132	**261**
	Diesel	5%	274	3,312	**67**
Vehicle Fleet Total		***22%***	***1,207***	***16,444***	***329***
Employee Commute	**Gasoline / Diesel**	16%	887	12,084	**-**
Street Lighting	**Electricity**	10%	545	8,318	**461**
Waste		1%	58	-	-
Total		**100%**	**5,508**	**81,950**	**2,195**

Note: Items may not sum up to total due to independent rounding.

[44] Cost of electricity and natural gas from PG&E bills, gasoline and diesel assumed to be $2.50 per gallon in 2005.

3.3.1. Water Management

Water management operations emitted 1,442 tonnes CO_2e, equal to 26% of emissions from municipal operations. Water management by the City of Pittsburg includes the treatment and distribution of water to residences and businesses in the community, as well as operating the City's irrigation system.

The Pittsburg Water Treatment Plant accounts for 99% of the energy used for water management; the rest was used for pumping and irrigation. Energy costs for water management operations totaled $782 thousand. In 2009, the Water Treatment Plant is installing a new energy system to reduce these costs and emissions.

Table 3-8 Emissions from water management

Emission Source	Metric Tons CO2e	Percent of Water Emissions
WTP - Electricity	1,328	92%
WTP - Natural Gas	96	7%
Pumps, Irrigation, etc.	19	1%
Total	**1,442**	**100%**

Water conservation by both the community and City irrigation systems will reduce the amount of energy used for water treatment. The City is currently installing a central irrigation system that will minimize excessive water use. Energy efficiency infrastructure upgrades may also reduce the Water Treatment Plant's energy use and emissions. In 2006, a pipeline carrying reclaimed water for irrigation was installed. Starting in 2008, half of the City's irrigation needs will be supplied with reclaimed water, which significantly reduces the need to treat fresh water. The pipeline provides the infrastructure for future irrigation projects to use reclaimed water.

3.3.2. Municipal Facilities

Pittsburg City Hall

Energy used by municipal facilities emitted 1,370 tonnes CO_2e, equal to 25% of total emissions from municipal operations. Municipal facilities used 3.7 GWh of electricity and 100 thousand Therms of natural gas, costing $620 thousand in 2005.

As Figure 3-7 shows, City Hall used the most energy among municipal facilities. Buchanan Pool and "other", which includes rental buildings, also used significant amounts of natural gas. The Marina, which supplies shore power to boats that dock there, and the parks, which include park-specific lighting (not counted under the streetlights sector), used significant amounts of electricity.

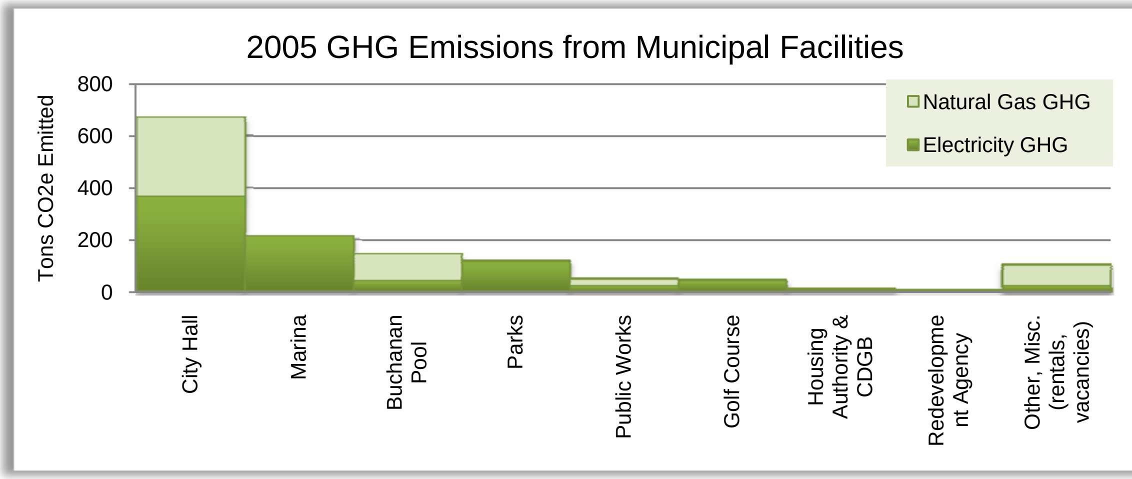


Figure 3-7 Municipal facilities sources of emission

In 2006, City Hall underwent an extensive heating and cooling system retrofit. The retrofit reduced electricity consumption by 20%, natural gas consumption by 77%, and GHG emissions by 341 tonnes, a 46% reduction. The investment was paid back within a year and continues to save the City over $85 thousand per year.

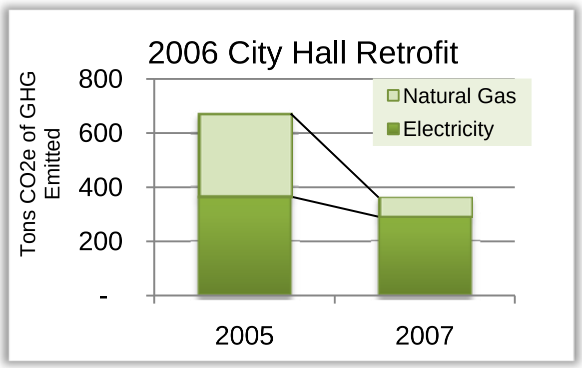


Figure 3-8 Pittsburg City Hall emissions

Table 3-9. Pittsburg City Hall retrofit project: Energy, GHG, and cost savings

	2005	2007	Savings	
Electricity (kWh)	1,562,880	1,244,640	318,240	20%
Electricity Cost ($)	$210,026	$169,540	$40,486	19%
Natural Gas (Therms)	57,293	13,342	43,951	77%
Natural Gas Cost ($)	$65,639	$19,735	$45,904	70%
GHG Emiss. (Tonnes CO_2e)	**741**	**400**	**341**	**46%**

Similar energy audits and upgrades in other facilities can further reduce municipal operations costs and emissions. Renewable electricity generation systems (such as solar photovoltaic panels and wind turbines) would also yield significant emissions reductions, particularly since 60% of facility related emissions result from electricity use.

3.3.3. Vehicle Fleet

The municipal vehicle fleet emitted 1,207 tonnes CO_2e, equal to 22% of municipal operations emissions. The fleet consumed a total of 105 thousand gallons of gasoline and 27 thousand gallons of diesel in 2005. Assuming an average of $2.50 per gallon of vehicle fuel in 2005, powering the fleet cost approximately $329 thousand.

Police and public works vehicles consumed the most gasoline. The diesel vehicles in the Public Works Department include heavy equipment used for City maintenance.

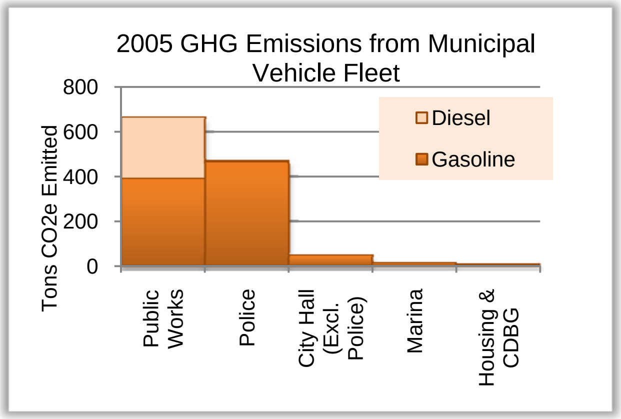


Figure 3-9 Municipal vehicle fleet emissions by department

Purchasing policies that prioritize fuel efficient vehicles lower fuel consumption over time as older, inefficient vehicles are replaced by newer models. Use policies that minimize unnecessary idling also reduce fuel consumption.

3.3.4. Employee Commute

Employee commutes emitted 887 tonnes CO_2e, equal to 16% of emissions from municipal operations. Although commutes are not under the City's direct control, they are included in some municipal operations inventories because the City can address this emission source by implementing programs like carpools or incentives for public transit.

Commute patterns for 2005 were assessed through an employee survey. Most respondents commuted five days a week, and drove alone. About five percent of respondents reported routinely carpooling, walking, or taking public transit. The average round-trip daily commute was 22 miles.

The City can offer incentives like discounted public transit tickets or passes, or tax-related savings (e.g. Commuter Check). It can set up an employee carpool matching program. Work arrangements that reduce the number of commute days also reduce commute emissions. Such work arrangements include offering telecommuting options or flexible hours that allow some staff positions (where appropriate) to work longer hours per day, for less days in a month.

3.3.5. Streetlights

Municipal street lighting operations in 2005 emitted 545 tonnes CO_2e, equal to 10% of municipal emissions, and cost $461 thousand. Streetlights used 90% of this electricity; traffic signals used the other 10%.

Street light energy use can be reduce by replacing energy inefficient streetlights with more efficient models, assessing and adjusting excessive street light intensity without compromising safety, and installing sensors that detect available light and turn on as appropriate, or manually modifying streetlight hours to minimize excessive usage. All traffic signals have been retrofitted with LED (light emitting diodes), which use half as much energy as older style light fixtures.

3.3.6. Waste

Waste from municipal operations emitted 58 tonnes CO_2e, equal to 1% of emissions from municipal operations. Municipal operations disposed of 198 tons of waste in landfills in 2005. The organic matter in this amount of waste will release methane as it decomposes in landfills.

Approximately half of the municipal waste stream was generated by direct municipal operations, from City Hall and the community centers. The other half was generated by the public or non-municipal operations and collected through the City's waste services. This includes the contents of public waste receptacles at parks and Delta View Golf Course, waste from Marina tenants, and a significant amount of illegally dumped waste.

4. 2020 Projections

If no action is taken to reduce GHG emissions, Pittsburg's community and municipal operations emissions are expected to increase with population and economic growth. This section projects how many tonnes of GHG will be emitted in the year 2020 under a "business-as-usual" scenario.

Projected emissions levels are important to consider when establishing a target for reduction. In addition to eliminating a percentage of 2005's annual emission level, climate action plans must also address the additional emissions associated with growth.

4.1 2020 Community Greenhouse Gas Emissions Projections

Growth in population and number of jobs means new buildings will be constructed to house residences and workplaces, more transportation activity, and more waste generation. Between 2005 and 2020, Pittsburg's residential population is projected to increase by 22%. The number of commercial jobs are expected to grow 53%.[45] The number of miles traveled by automobiles is expected to grow by 31% on SR 4 and 38% on local roads.[46] Based on these projections, Figure 4-1 and Table 4-1 show that community emissions will increase by 36% from 236 thousand tonnes CO_2e to 325 tonnes CO_2e. See Appendix G for details on the growth indicators used.

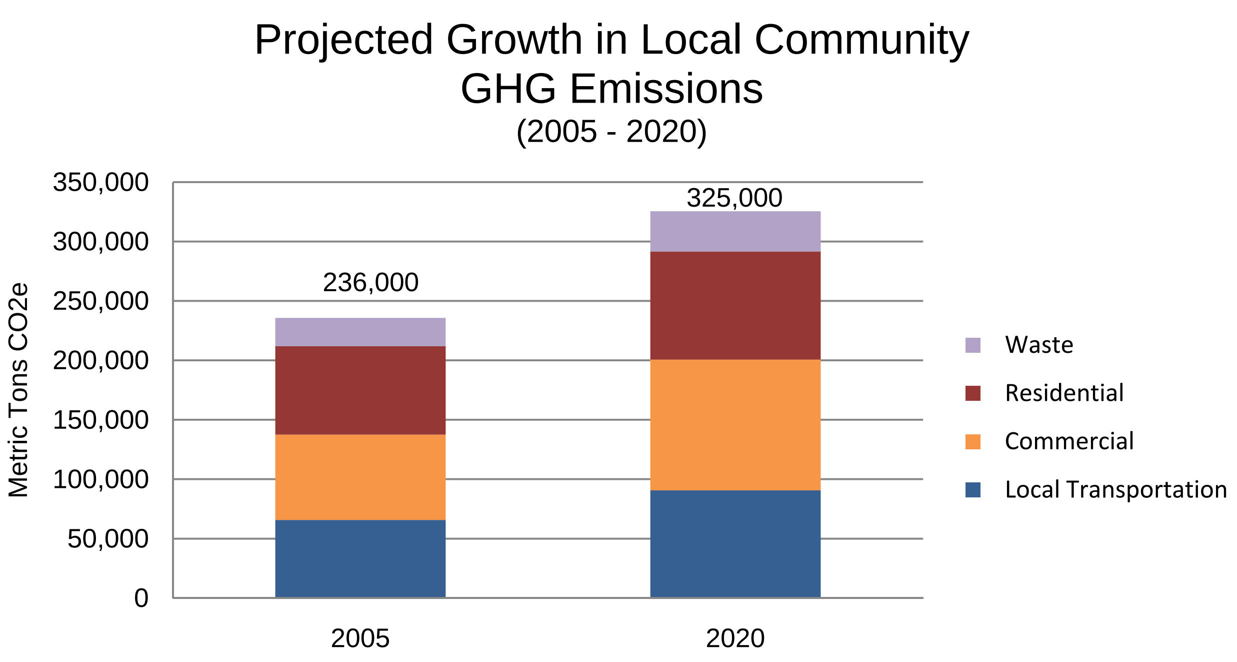


Figure 4-1 Projected increase in community GHG emissions

[45] Association of Bay Area Governments, 2009, see Appendix H.
[46] Contra Costa Transportation Authority

Table 4-1 Projected community GHG emissions by sector

Local Community Emissions	**2005 Emissions (tonnes CO_2e)**	**2020 Emissions (tonnes CO_2e)**	**Percent Growth**
Local Transportation	65,695	90,693	38%
Commercial	71,775	110,020	53%
Residential	74,458	90,925	22%
Waste	23,741	33,801	42%
Total Local Community	**235,668**	**325,438**	**38%**
Regional Emission Sources	**2005 Emissions**	**2020 Emissions**	**Growth**
Industrial	3,984,457	4,749,138	19%
Regional Transportation	174,088	227,849	31%

As Table 4.1 shows, this projected growth will increase GHG emission levels from each sector. The various sectors will grow at different rates. The commercial sector is projected to grow most quickly, followed by the waste, transportation, and finally residential sectors. The different growth rates will alter the proportion of emissions by sector. Compared to the distribution in 2005, commercial emissions will account for a larger portion of community emissions, while transportation and residential emissions will account for a smaller proportion of emissions than they did in 2005.

The industrial sector's emissions are projected to grow in relation to industrial jobs, which are expected to grow 19% between 2005 and 2020. If new industrial uses are the same as existing uses, and the same technologies are utilized, the industrial emissions in Pittsburg could grow from 3.9 to 4.7 million tonnes CO_2e (Figure 4-2). Changes in the types of industrial use, as well as the application of updated technological systems will affect, and likely reduce, future emissions levels.

Regional transportation on SR 4 is expected to grow significantly. The expansion in number of lanes, as well as the population growth in communities east of Pittsburg will cause the volume of traffic to grow 31% by 2020 (Figure 4-3). However, eBART through Pittsburg will improve access to the BART systems, allowing people from Pittsburg and communities to the east to drive shorter distances to access the BART system.

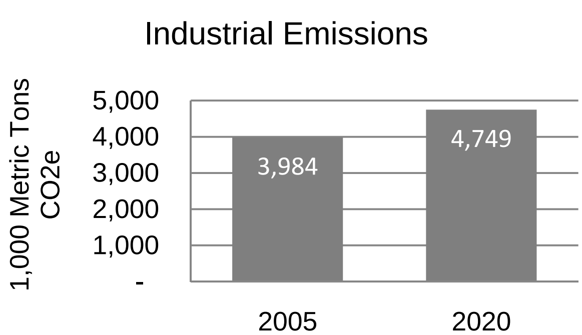


Figure 4-2 Projected increase in industrial emissions

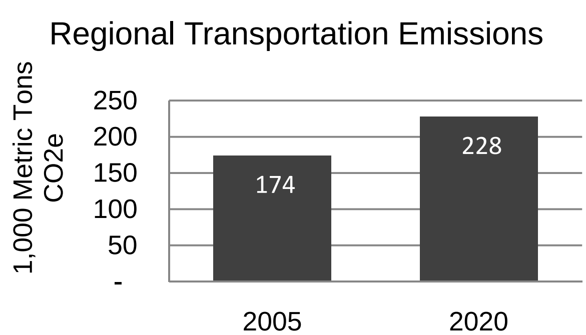


Figure 4-3 Projected increase in regional transportation

4.2 2020 Municipal Operations Greenhouse Gas Emissions Projections

Between 2003 and 2008, Pittsburg City staff grew an average of 0.85% per year. This growth rate will result in 13.3% increase in number of employees between 2005 and 2020. The employee growth rate was applied as a growth indicator for GHG emissions from the municipal operations areas of facility energy use, employee commute, vehicle fleet, and waste. The residential population growth rate was used as the indicator for the streetlight and water sectors, because needs for these services grow with the community. Figure 4.4 and Table 4.2 show an overall increase of 13.5% from 5,508 tonnes CO_2e to 6,418 tonnes CO_2e. Each sector's emissions as a percentage of total municipal operations emissions remains about the same.

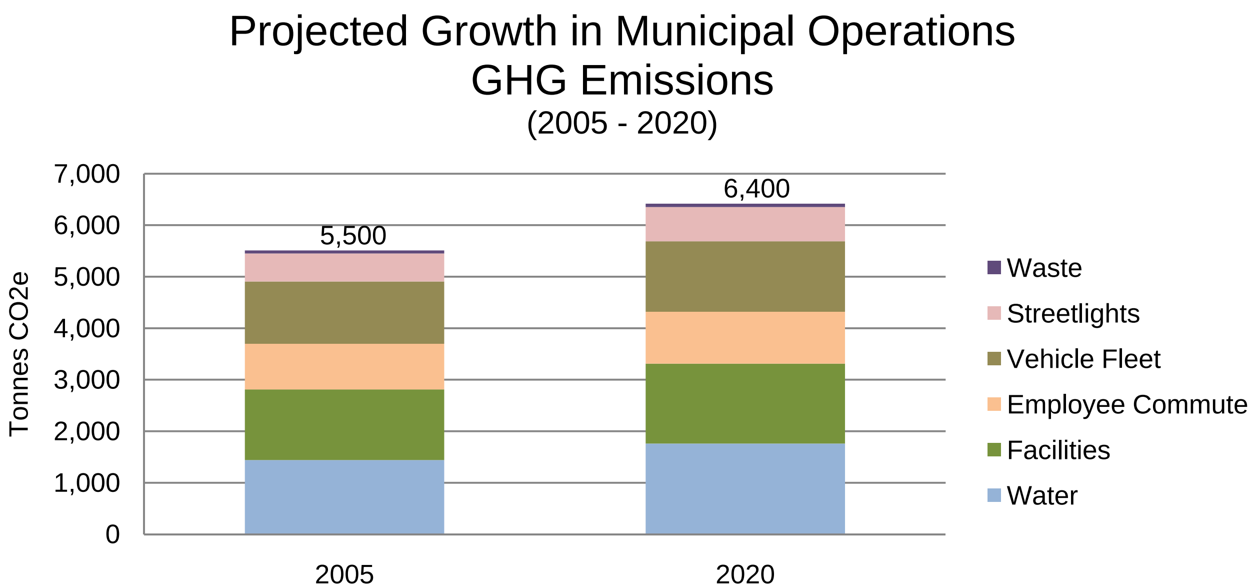


Figure 4-4 Projected increase in GHG emissions from municipal operations

Table 4-2 Projected municipal operations GHG emissions by sector

Sector	2005 Emissions (tonnes CO_2e)	2020 Emissions (tonnes CO_2e)	Percent Growth
Water	1,442	1,761	22%
Facilities	1,370	1,553	13%
Employee Commute	887	1,005	13%
Vehicle Fleet	1,207	1,368	13%
Streetlights	545	666	22%
Waste	58	66	13%
Total	5,508	6,418	16.5%

Note: Totals may not sum up due to independent rounding.

5. Next Steps

In accordance with ICLEI's Cities for Climate Protection program's second and third milestones, the City of Pittsburg will next establish a reduction target and develop a Climate Action Plan. The two milestones will likely be completed concurrently. As key climate action strategies are assessed during the development of the Action Plan, they will suggest what degree of reduction is an appropriate target. Setting a target that is challenging while still feasible is important to motivate action.

5.1 Community Climate Action Plan and Target

Local government has varying degrees of influence over community emission sources. Processes that require community interaction with the City, such as for building permits and recycling services, create an opportunity for influence. In other areas where no such protocol exists, the City may need to initiate new programs or educate the community about existing programs offered by other agencies. The Community Climate Action Plan will include a spectrum of strategies that the City may use to target community emissions, as well as actions that residents and businesses can take. Community leaders' support of implementing these strategies will be key to successfully reducing GHG emissions in Pittsburg.

In sectors where local government has little or no influence, the plan may suggest regional or state-level advocacy. The two largest sources of emissions in the community inventory are electricity generation and regional passenger vehicle transportation (highway gasoline emissions). As discussed throughout this inventory, much of these two emission sources will only be reduced through actions and regulations from state and regional levels. While the Climate Action Plan may include reductions from state and regional measures, it will emphasize the importance of the local action and advocacy by the City and the community.

5.2 Municipal Operations Climate Action Plan and Target

Local government has greater control over its municipal operations. The actions in the municipal operations Climate Action Plan will be very specific, and also show each action's financial benefits. The City Hall retrofit described in Section 3.3.2 provides an excellent example of cost saving measures that also reduce GHG emissions.

Some municipal operations reduction targets coincide with the local community targets, whereas others specify a different target. The State's AB 32 Scoping Plan recommends a 15% reduction below 2005 by 2020. Aiming for this target will prepare Pittsburg's municipal operations for possible state mandates.

5.3 Looking Ahead

In many ways, today's world is accelerating. Due to technological advances and economic expansion, GHG-emitting activities in today's societies are faster and more intense than in previous eras, and are increasing exponentially.

As the world realizes the reality and magnitude of climate change, leaders in all sectors are rapidly initating efforts to mitigate the impacts as much as possible. Governmental initiatives, new business models, and committed personal actions are emerging and spreading. This means that in addition to unprecedented changes in the ecological climate, economic and political climates may shift in response. Pittsburg is preparing itself to weather unpredicability in the future by being watchful of upcoming changes and planning in advance. This inventory identifies and examines the problem. The next steps are to develop solutions.