

GREENHOUSE GAS EMISSIONS INVENTORY

The first step in developing a plan to reduce greenhouse gases was to identify sources and quantities of greenhouse gases emitted in Fort Collins. An emissions inventory was conducted for the baseline year of 1990. This inventory included only carbon dioxide and methane (together represented as a CO₂ equivalent, or CO₂e). The inventory did not cover a small subset of emissions that are not readily controlled by local government actions including large engine sources (locomotive and aircraft) and agricultural sources (fertilizer and livestock). This section presents a “baseline” greenhouse gas emissions analysis for 1990, an interim year emissions analyses (1995 and 1997), and a projection of greenhouse gas emissions for 2004 and 2010.

CO₂e = Carbon Dioxide Equivalent; Global Warming Potential

To make relative comparisons between carbon dioxide and methane possible, the Global Warming Potential for both has been calculated. Since methane is 21 times more potent a greenhouse gas than carbon dioxide, the relative global warming potential of carbon dioxide = 1, and methane = 21. When methane and carbon dioxide emissions are summed, they are referred to as CO₂(e), indicating the methane has been converted to CO₂ equivalent.

City-wide Baseline Emissions Inventory (1990)

The emissions inventory covers residential, commercial, industrial and transportation sector emissions of CO₂ that result from the combustion of fossil fuel. It also covers methane that is emitted from solid waste decay from Fort Collins' contribution to the Larimer County Landfill. Details of the emissions inventory, including data sources and assumptions, are discussed in “Fort Collins Greenhouse Gas Emissions Analysis” in Appendix B.

In 1990, Fort Collins generated approximately 1,360,000 tons of CO₂e. Figure 3 shows CO₂ emissions by source. The largest source (42%) of local CO₂ emissions is electricity generation. Approximately 60% of Fort Collins' electricity is provided by the Rawhide Energy Station (the cleanest coal-fired power plant in Colorado), and approximately 35% of the city's power is hydroelectric. A small fraction of Fort Collins electricity is from wind energy purchased by voluntary subscription.

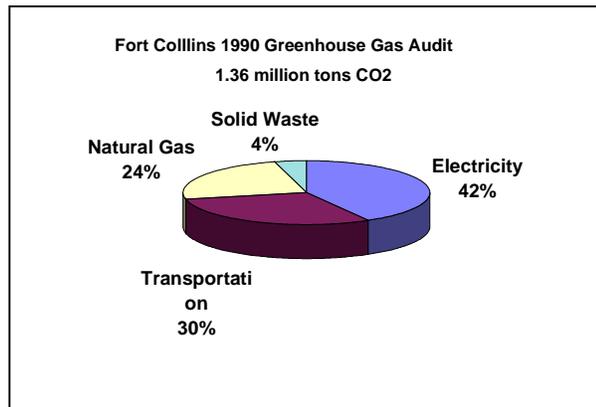


Figure 3. Fort Collins 1990 Greenhouse Gas Emissions, by Source

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Over a quarter (30%) of 1990 CO₂ emissions came from fuel burned for transportation. Another quarter came from natural gas combustion, used primarily for residential and commercial heating. Methane released from solid waste decay in the landfill was responsible for approximately 4% of the 1990 CO₂ emissions.

Figure 4 shows that CO₂ emissions by major end use were relatively evenly distributed across residential, commercial, industrial, and transportation sectors, with a smaller portion resulting from landfill waste decay.

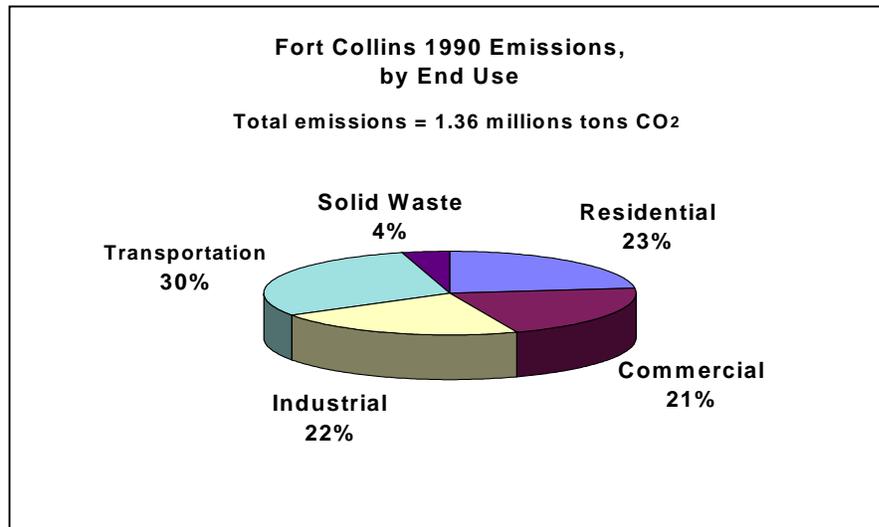


Figure 4. Fort Collins 1990 Greenhouse Gas Emissions by End Use Sector

In 1990, Fort Collins' population had reached 87,758. Each citizen generated an average 15.5 tons CO₂ e. Figure 5 shows Fort Collins' per capita emissions relative to select Cities for Climate

Protection cities. Generally, CO₂ emissions are lower in temperate climates and areas of high urban density having lower VMT per area. CO₂ emissions are higher in areas of temperature extremes where more energy is spent on heating or cooling.

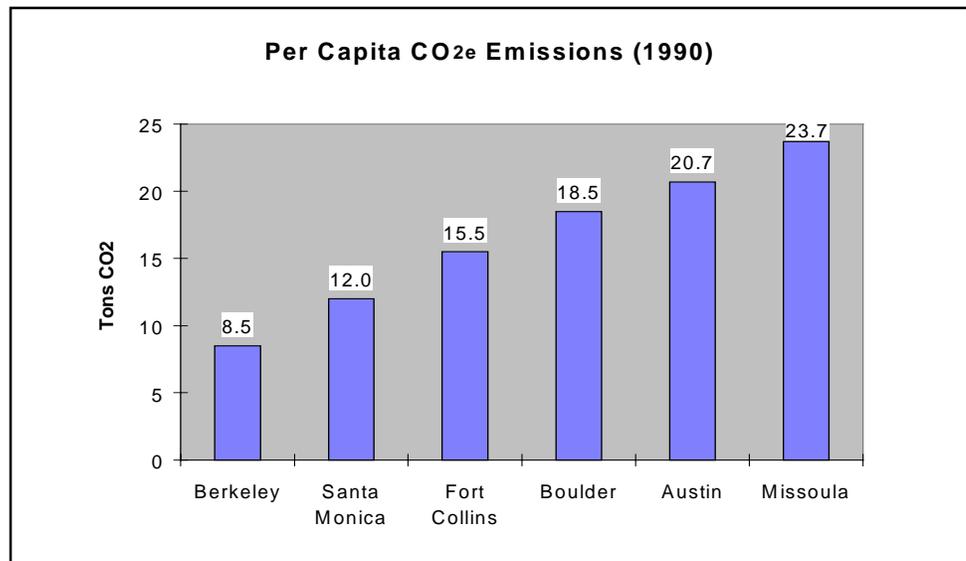


Figure 5. Select U.S. Cities 1990 Per Capita Emissions

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Interim Year Emissions Inventory (1995)

A greenhouse gas emissions inventory was also conducted for 1995. In 1995, Fort Collins total CO₂ emissions were 1,621,000 tons, a 19% increase over 1990 levels. Per capita CO₂ emissions increased by 5% from 15.5 tons per person in 1990 to 16.3 tons per person in '95.

Interim Year Emissions Inventory (1997)

A greenhouse gas emissions inventory was also conducted for 1997. In 1997, Fort Collins total CO₂ emissions were 1,861,000 tons, a 37% increase over 1990 levels. Per capita CO₂ emissions increased from 15.5 tons per person in 1990 to 17.5 tons per person in 1997.

Figures 6 and 7 show how Fort Collins' CO₂ emissions increased by source and end-use sector between 1990 and 1997.

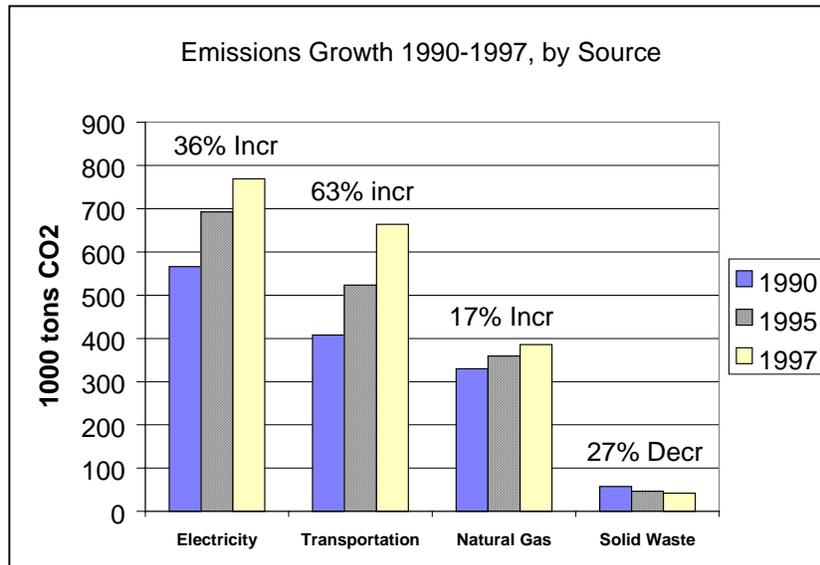


Figure 6. 1990 – 1997 Increase in Greenhouse Gas Emissions by Source

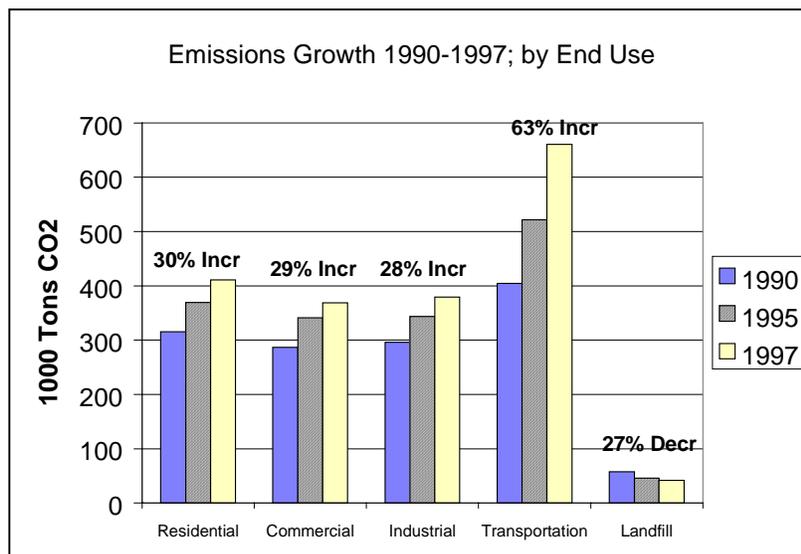


Figure 7. 1990 – 1997 Increase in Greenhouse Gas Emissions by End Use Sector

City-wide Greenhouse Gas Emissions Forecast (2010)

The CO₂e emissions forecast for 2010 is intended to reflect CO₂ emissions in the absence of any conservation measures implemented since 1990. Under this scenario, Fort Collins CO₂ emissions are predicted to increase to 3.523 million tons, an increase more than one and a half times (159%) the 1990 level.

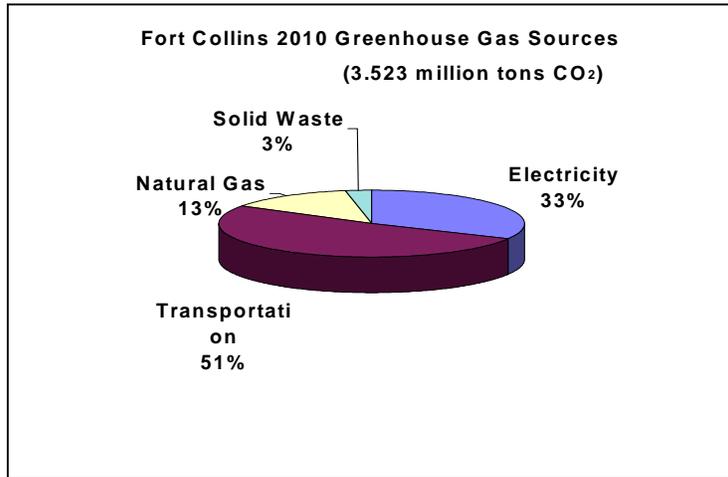


Figure 8. Forecast 2010 Greenhouse Gas Emissions by Source

Fort Collins’ population is predicted to increase to 143,450 by 2010, based on a predicted 2.2% yearly growth rate from 1999 through 2010. This yields a per capita emission rate of 24.6 tons CO₂ e in 2010. The net emissions increase between 1990 and 2010 is 159%, with a per capita increase of 58%.

The growth assumptions used to create this forecast and resulting emissions growth rates are outlined in Table 2. Propane, which accounts for less than 1% of the inventory, was excluded from the table. The assumptions are discussed in greater detail in Appendix B, “Fort Collins Greenhouse Gas Emissions Analysis”.

Table 2. Fort Collins 2010 Emissions Forecast Assumptions

Emissions Category	1990 Tons CO ₂	Avg. Yrly Growth Tons CO ₂	Net growth 1990-2010 Tons CO ₂	2010 Tons CO ₂	Data Source
Electricity	565,668	3.6 %	103 %	1,146,257	Fort Collins Utilities
Natural Gas	239,737	1.8 %	44 %	475,105	Public Service Company of Colorado
Transportation (based on 7% VMT growth/yr from '95-2010.	404,752	7.8 %	346 %	1,803,860	City of Fort Collins Transportation Department
Solid Waste (1990 per capita waste = 1.066 tons, and 2.2% population growth/yr from 1999 to 2010)	57,308	2.5 %	63 %	93,675	Population growth rate – City of Fort Collins Advance Planning Department

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City-wide Greenhouse Gas Emissions Forecast (2004)

The same forecast assumptions are used to create a nearer-term forecast for the year 2004. Fort Collins is predicted to emit 2.536 million tons of CO₂ in 2004, or an estimated 23.9 tons per person. Figure 9 shows predicted emissions by source categories for 2004.

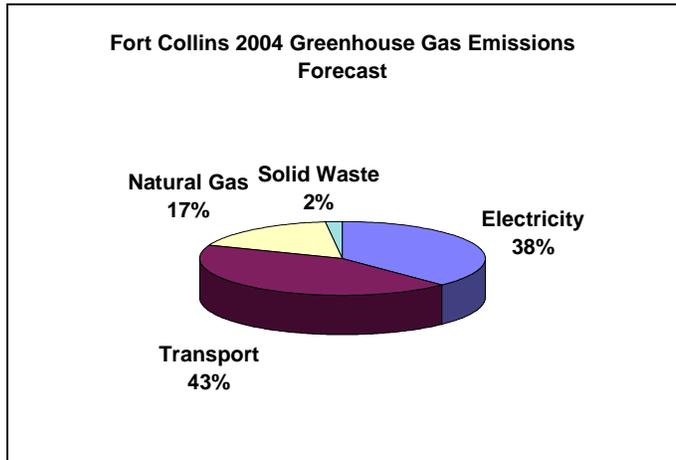


Figure 9. Forecast 2004 Greenhouse Gas Emissions by Source

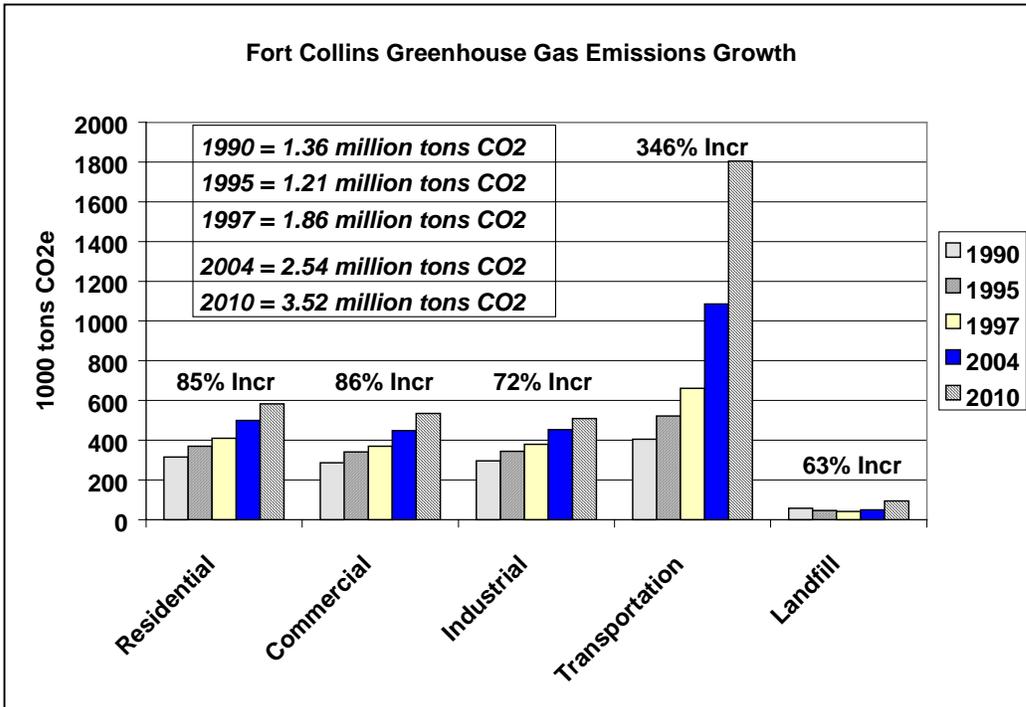


Figure 10. Greenhouse Gas Emissions Increase from 1990 - 2010

Figure 10 illustrates the growth in CO₂ emissions by end use sector between 1990 and 2010. Based on the above assumptions, Fort Collins' CO₂ emissions are predicted to increase 159 % by 2010. This increase is higher than most other U.S. cities participating in the CCP campaign, and is attributed to the expected continuation of rapid growth rates experienced in the recent past. The largest jump by far is predicted for the transportation sector, which is forecast to increase nearly 350% above 1990 levels. This prediction is based on results of the 1998 Mobility Report Card for Fort Collins, which indicated that vehicle miles traveled (VMT) rose 25% between 1995 and 1998.

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The 2010 electricity and natural gas usage forecasts were based on estimates provide by the Fort Collins Utilities and Public Service Company of Colorado. Although residential electrical appliances are becoming more energy efficient, the square footage of new homes is increasing, as is the number of appliances per household, accounting for the predicted 3% per year increase in electricity consumption in the residential sector. Additionally, residential air conditioning has been identified as one of the most rapidly growing energy demands.

The 2010 emissions from the landfill have been estimated by applying the 1990 per capita municipal solid waste generation rate (1.06 tons of waste to landfills per person) to the projected 2010 population of 143,450 people.

The 2010 population estimate was based on a growth rate of 2.2% per year from 1999 until 2010. The City's Advance Planning Department estimates the Fort Collins' population to reach 112,912 in 1999.

City Government Emissions Inventory

City Council Resolution 97-97, which authorizes work on this campaign, expresses the intent for the City government to set a good example:

“The Council intends for the City to take a leadership role in increasing energy efficiency and reducing greenhouse gas emissions from municipal operations.”

In order to gain an understanding of greenhouse gas emissions resulting from municipal operations, a 1990 emissions inventory for the City government was prepared. Because the city government does not track all the information needed to prepare the audit, a number of assumptions were made to arrive at a CO₂ emissions estimate for 1990. These are discussed in greater detail in Appendix B.

City Government 1990 Baseline Greenhouse Gas Emissions

The emissions inventory for Fort Collins City government covers buildings, streetlights, water treatment processes, fleet fuel consumption, and waste generation. In 1990, City government operations were responsible for the consumption of 212,337 million BTU's, disposal of 1,942 tons of waste, and 39,736 tons CO₂e. This represents 2.9% of Fort Collins' total citywide CO₂ emissions.

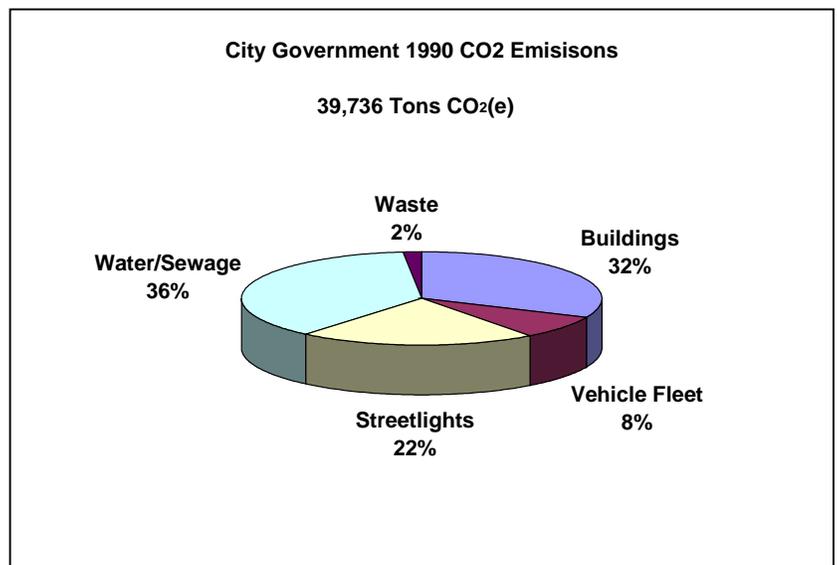


Figure 11. 1990 City Government CO₂ Emissions

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Figure 11 and Table 3 list City operations' share of CO₂ emissions.

Table 3. 1990 Fort Collins City Government CO₂ Emissions

	Tons CO2 (e)	Percent CO2(e)	Energy Million BTU's
Buildings	12,577	31.7 %	86,852
Vehicle Fleet	3,167	8 %	39,880
Streetlights	8,545	21.5 %	25,584
Water Treatment and Reclamation	14,743	37.1 %	60,021
Waste	703	1.8 %	
TOTAL	39,736	100 %	212,337