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City of Duluth
Cities for Climate Protection Campaign

Greenhouse Gas Inventory & Forecast Report

With Recommendations for the Development of Duluth's Local Action Plan

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Duluth Greenhouse Gas Emissions Inventory and Forecast Report

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Executive Summary

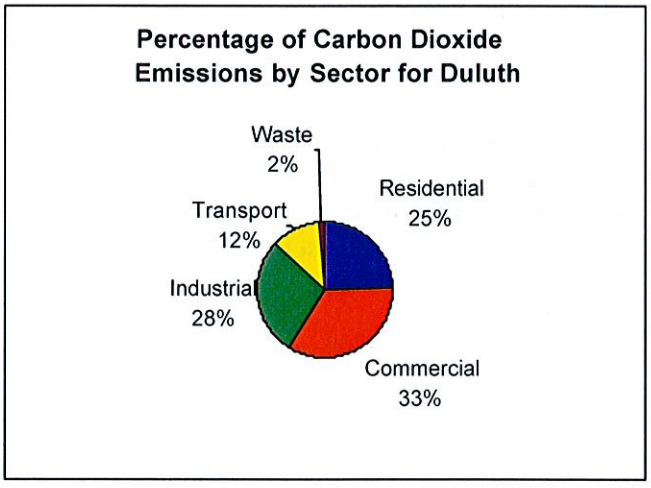
Introduction

Despite debate over the last decade, there is an overwhelming scientific consensus that human contribution of greenhouse gases (GHG), primarily carbon dioxide and methane, are having a profound effect on our global climate. Although concrete predictions have not been made, international scientific and political communities recognize that elevated temperatures, loss of habitat and species, and economic hardships due to damage from severe weather patterns and changes in natural resources are just some of the substantial changes we may experience in the coming years if action is not taken to reverse the current climate change trend.

The City of Duluth has joined with over 110 cities in the United States, and more than 500 worldwide, to make a commitment to addressing global climate change at the local level. In May of 2001, the Duluth City Council passed a resolution to participate in the Cities for Climate Protection Campaign (CCP) sponsored by the International Council for Local Environmental Initiatives (ICLEI). This greenhouse gas emissions inventory is the first step in a 5 Milestone process through which the City of Duluth will take a leadership role to inform and motivate the rest of the community into action. Quantifying the amount of greenhouse gas emissions Duluth is currently producing through energy consumption, transportation, and waste generation will allow the community to more effectively evaluate the impact different energy-saving measures will have on reducing emissions. The political and fiscal costs required to reduce greenhouse gas emissions today are less severe than the costs and efforts that would be required to adapt to climate change in the near future.

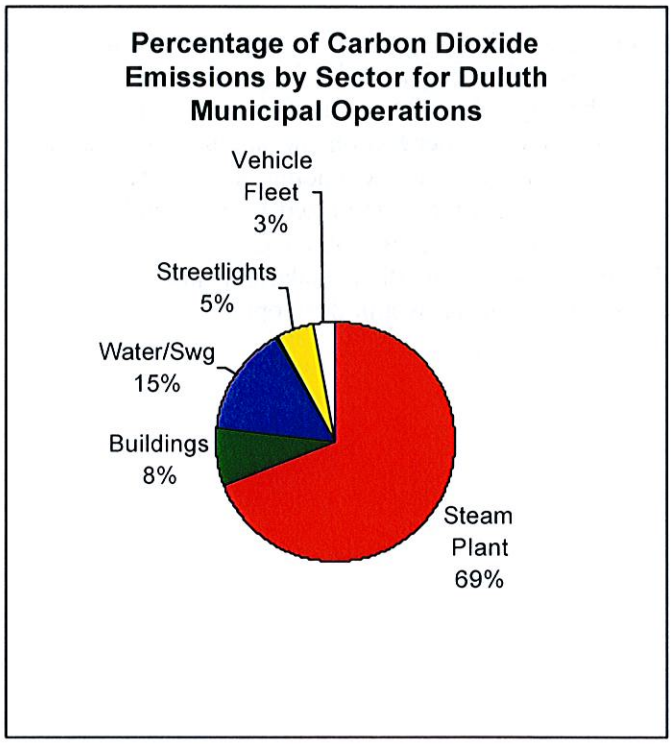
Inventory Results

The greenhouse gas (GHG) emissions inventory measures emissions in two separate categories. The first is a measure of major energy-source emissions from Duluth residential, commercial, and industrial sectors referred to herein as the 'Community' inventory. The second is a study of the emissions produced from municipal facilities and operations as a sub-set of the larger community, referred to as the 'Corporate' inventory. The emissions are determined by electricity and fuel coefficients that calculate the amount of carbon dioxide (or methane in equivalent carbon dioxide - eCO2 - units) that is released per unit of energy burned. The baseline year for the Community inventory is 1999 while the Corporate baseline is set at 1996. Forecasts are made for the year 2020.



In 1999, Duluth's greenhouse gas emissions totaled 2,322,834 tons. Commercial establishments account for the largest percentage of emissions at 33 percent, followed by the industrial sector (28 percent), residential sector (25 percent), and transportation sector (12 percent). Electricity is the largest overall source of eCO2 in Duluth, primarily due to the elevated emissions coefficient for over 90 percent coal burning during power generation.

The City of Duluth municipal operations generated 126,370 tons of eCO2 in 1996, accounting for 5.4 percent of the community total. The Duluth Steam Co-op produces over 69 percent of all municipal emissions through coal burning to generate steam for approximately 227 buildings downtown. Water and Sewage pumping and treatment stations account for 15 percent of emissions through energy consumption for the City of Duluth, followed by Buildings (8 percent), Streetlights/Traffic signals (5 percent) and Vehicle Fleet (3 percent). The energy costs for local government operations alone totaled more than $4 million in 1996, so the potential for saving both money and greenhouse gas emissions is great.



According to this inventory, Duluth has a per capita GHG emissions rate of 26.7 tons of eCO2. Duluth's emissions are higher, relative to many other communities in the United States. The Minnesota state average electricity CO2 coefficient is considerably less than the regional coefficient for the Duluth area, again due to a higher percentage of coal burned in power generation. Using forecasting predictions provided by the U.S. Department of Energy, it can be assumed that if no action is taken to address emissions, the Duluth community will be responsible for producing over 3,162,471 tons of eCO2 emissions in 2020. This is an increase of 36 percent within two decades.

Emissions Reduction Action Plan

The next steps for Duluth are to determine what existing energy-saving measures are working for the city, to formally adopt a greenhouse gas emissions reduction target, and to draft a Local Action Plan to commit resources and leadership to the proposed measures for emissions reduction. The Plan will be written with the input of multiple departments within municipal operations, and with strong representation from various sectors throughout the community. A task force will be formed to ensure good communication, organization, and a strong foundation for the Local Action Plan.

Municipal operations, although only a small percentage of Duluth's total emissions, will be important as far as setting an example for the rest of the community. Measures initiated over the past five years to increase efficiency in City buildings and facilities have already had a measurable impact on energy consumption and a clear cost savings benefit. At the same time, the City of Duluth can also promote community-wide programs to reduce energy consumption and emissions through not only serving as a role model, but also helping to provide appropriate technology, education, policy, and encouragement to local businesses and private citizens.

The Cities for Climate Protection Campaign will help guide Duluth through the 5 Milestones towards its ultimate greenhouse gas emissions reduction goal, but the success of the campaign is completely determined by the city. The timeframe for establishing a target reduction goal and developing the Local Action Plan will depend on the amount of time the task force is able to commit to planning and implementation, and the amount of resources available to the community. Incorporating CCP planning strategies into established projects and other proposed initiatives is often the best way to ensure continued success. A Cities for Climate Protection chapter will be included in Duluth's Comprehensive City Plan, making Duluth the first city in the nation to incorporate CCP into its master vision for overall development.

Introduction to the Campaign

Overall Goal:
To reduce the emissions of gases and air pollutants that contribute to global climate change and local air quality degradation.

Duluth Specific Objectives:
1. Improve and protect Duluth's quality of life in the future.
2. Raise awareness of global climate change and the sources of climate change gases.
3. Implement public programs to increase energy and transportation efficiency as well as solid waste reduction in order to locally reduce Duluth's contribution to the global problem of climate change.
4. To develop practices to reduce the emission of greenhouse gases and increase operational cost efficiency in municipal operations.

International Council for Local Environmental Initiatives' Cities for Climate Protection Campaign

The International Council for Local Environmental Initiatives (ICLEI) is an association of local governments around the world dedicated to the prevention and solution of global environmental problems through local actions. Over 500 municipalities from around the world belong to this association; more than 110 in the United States alone. ICLEI was launched in 1990 as the international environmental agency for local governments under the sponsorship of the United Nations Environment Program, the International Union of Local Authorities (IULA), and the Center for Innovative Diplomacy. ICLEI maintains a formal association with IULA and has official consultative status with the United Nations through which it advocates the interests of local governments before international bodies. ICLEI's mission is to build and support a world-wide movement of local governments to achieve tangible improvements in global environmental conditions through the cumulative impact of local actions.

In 1993, ICLEI began the Cities for Climate Protection Campaign (CCP) to assist local governments that have committed to addressing the issues surrounding increased greenhouse gas (GHG) emissions and the pressing threat of global climate change. As such, the CCP is a global campaign to slow the earth's warming trend and to improve local air quality and urban livability. CCP enlists cities to prepare and enact plans to reduce energy consumption and associated GHG emissions. The target is to recruit cities that together account for more than 10 percent of global human-induced GHG emissions. Eight percent of that target is already being met by the 500 cities currently participating in CCP. The City of Duluth was the 101st city in the United States to join in this campaign.

CCP operates a variety of technical assistance projects that focus on innovative approaches to implementing energy-efficiency measures in municipal and commercial buildings, reducing GHG emissions through land-use planning, and developing strategies to reduce emissions in the transportation sector. Some specific suggestions include procurement policies that specify energy efficiency standards in all purchasing city-wide, implementation and participation in district energy programs, financial incentives for installation of photovoltaics, policy shifts from roads and highways to alternative transit, and impact, facility, mitigation, and permit fees that discourage sprawl.

The Cities for Climate Protection Campaign involves a five-milestone process to achieve GHG emissions reductions. The five milestones are as follows:

- **Milestone One:** Conduct a baseline emissions inventory for both municipal operations and the entire community as a whole. From the baseline data, emissions growth or decline is forecasted for the year 2020 assuming no actions are taken to reduce GHG emissions. The primary sources of emissions examined in the inventory come from energy use (electricity and other heating fuels for residential, commercial, and industrial facilities) and transportation (emissions from the combustion of fossil fuels by personal, commercial, and transit vehicles). ICLEI provides a software program designed by Torrie Smith Associates that calculates equivalent carbon dioxide emissions from these sources.

- **Milestone Two:** Set an emissions reduction target. Most local and international targets have been set at 20 percent reduction of base year emissions levels, and use their forecast year as the target year for obtaining these emissions reductions.

- **Milestone Three:** Develop a Local Action Plan or a collection of initiatives to reach the target reductions. These initiatives will include finding conservation, efficiency, and technological improvements available to the city.

- **Milestone Four:** Implement actions. This milestone encourages municipal governments to formally adopt emission reduction initiatives. Further, various municipal departments may be called upon to coordinate and implement the adopted initiatives.

- **Milestone Five:** Monitor emissions reductions. Monitoring and verifying progress of the implementation of actions to reduce emissions is an ongoing process that begins once measures are implemented. ICLEI's software tool assists in the quantification of emissions reductions and allows for convenient reporting of results.

At the present, the City of Duluth has completed Milestone One and will proceed by setting an emissions reduction target and developing a Local Action Plan in the coming months.

Greenhouse Gas Emissions Inventory

Overall Emissions Inventory Methodology

The baseline years for Duluth's Community and Corporate greenhouse gas (GHG) emissions inventories are 1999 and 1996, respectively. 1999 was the earliest year for which reliable community-wide fuel and electricity consumption data could be gathered. 1996 was chosen for the Corporate inventory in order to rightly attribute energy-saving measures the city has recently initiated into the upcoming Local Action Plan. However, data from throughout the 1990s was collected for various areas and occasionally used to supplement the analysis where needed. The forecast year chosen for this analysis is 2020.

The emissions inventory and forecast are separated into two distinct parts. The first is a community-wide assessment of all major energy consumption that produces GHG emissions in the City of Duluth. This portion of the analysis examines emissions from electricity, natural gas, and fuel oil (where available) consumed by the residential, commercial, and industrial sectors of the city. Coal burned by the Duluth Steam Co-op to steam-heat 227 buildings downtown has also been included in this sector. In addition, emissions produced by personal and commercial vehicles are included. Total tons of waste sent to the landfill is the final assessment area. The methane emissions from decaying waste have been translated into equivalent carbon dioxide emissions (eCO2) for the purpose of reporting. However, it is important to note that one ton of methane emissions is equal to twenty-one tons of carbon dioxide.

The second section of the inventory is an examination of the emissions created solely by municipal operations of the City of Duluth (referred to herein as the Corporate inventory). This portion of the analysis is a sub-set of the larger Community inventory and includes the electricity, natural gas, gasoline, diesel, fuel oil, and coal consumed by all municipal facilities and properties (including buildings, lighting, water pumps, vehicles, etc.) for 1996. Waste from municipal facilities was not calculated, as records provided insufficient data and it is estimated to be a small part of total emissions. However, the City of Duluth has recently become a member of Minnesota Waste Wise and will be undergoing a waste audit in order to better determine how the city can reduce waste. Oil used by the city was also estimated to be a small percentage of the total energy consumed and was not included in this study.

Duluth Emissions Inventory Results

Community Emissions Profile

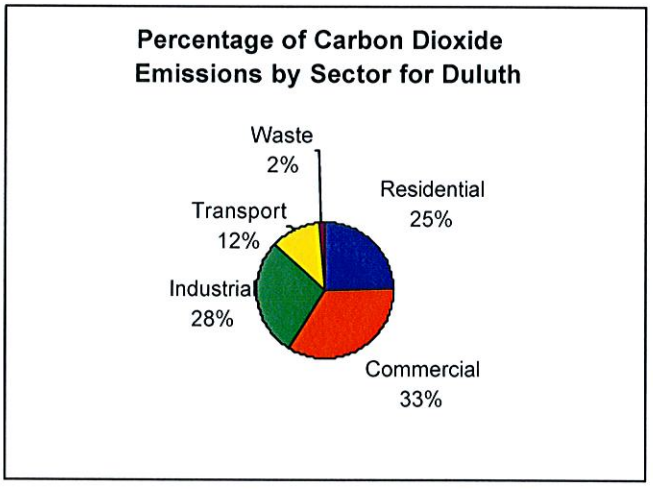
The Duluth community produced more than 2,322,834 tons of equivalent carbon dioxide (eCO2) in 1999; 26.7 tons per capita. The national average is approximately 22 tons per capita. It is predicted that without undertaking any actions to reduce greenhouse gas (GHG) emissions, Duluth's energy consumption will be responsible for emitting over 3,162,471 tons of eCO2 by the year 2020. This is an increase of 839,637 tons, or 36 percent, within two decades. Attached in Appendix C is a report titled "Duluth Community Greenhouse Gas Emissions – Time Series Report." This provides the calculated anticipated increases in eCO2 emissions by sector from 1999 to 2020 within the City of Duluth. **Table 1** provides a brief synopsis of the Time Series Report. Emissions are growing across all sectors with the largest increase coming in the commercial sector. Forecasts are based on U.S. Department of Energy projections. The forecast for waste production was provided by Kurt Soderberg, Executive Director of the Western Lake Superior Sanitary District.

Table 1
Carbon Dioxide Emissions Increases from 1999 to 2020 by Sector for the City of Duluth

Year	Residential	Commercial	Industrial	Transport	Waste
1999	568,336.8	789,552.2	652,838.5	277,231.0	34,905.3
2020	749,910.4	1,069,010.3	911,090.8	359,856.1	72,603.1

Further, **Table 2** provides a breakdown by percentage of eCO2 emissions by sector. The commercial sector is the largest source of carbon dioxide emissions accounting for approximately 33 percent of total Duluth emissions released into the atmosphere. Following the commercial sector is the industrial sector (28 percent), residential sector (25 percent), transportation sector (12 percent), and waste sector (2 percent). See "Duluth Community Greenhouse Gas Emissions in 1999 – Sector Summary" in Appendix D for more details.

Table 2



Additionally, electricity appears to be the main energy source contributing to carbon dioxide emissions. For Duluth, it is likely a higher regional CO2 coefficient for electricity generation that has added to the greater percentage. As previously mentioned, Minnesota Power's CO2 coefficient for electricity is nearly twice the state average due to heavy coal usage in power generation. **Table 3** provides a breakdown of the percentage each fuel type contributes to eCO2 emissions in Duluth. Again, a more detailed breakdown including all fuel information compiled is included in Appendix D titled "Duluth Community Greenhouse Gas Emissions in 1999 – Base Year Report by Source."

Table 3

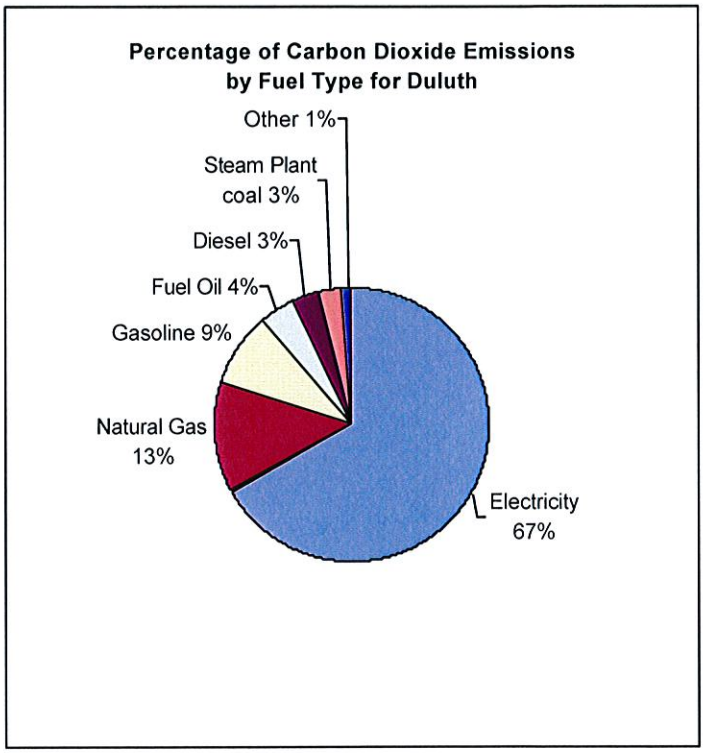


Table 3a provides a detailed percentage breakdown for each major energy source in the various sectors. Due to incomplete oil consumption information, it is represented as a much smaller percentage for commercial and industrial sectors than actual. Electricity consumption is still the largest source of carbon dioxide emissions in all sectors, while natural gas is the second largest. "Community Greenhouse Gas Emissions in 1999 – Base Year Report by Sector and Source" in Appendix D lists every fuel type and corresponding levels of carbon dioxide emitted for each sector.

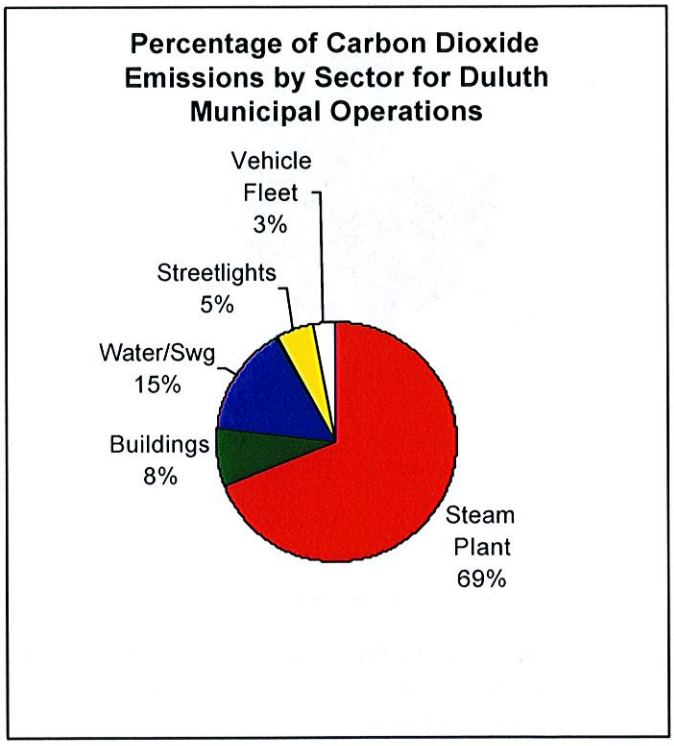
Table 3a
Percentage Each Fuel Type Contributes to Carbon Dioxide Emissions by Sector

Sector	Electricity	Natural Gas	Light Fuel Oil	Coal
Residential	14.8	6.5	3.2	-
Commercial	25.1	5	1 (limited data)	3
Industrial	26.7	1.4	N/A	N/A

A detailed report documenting the contributions of each entry and type of energy source to eCO2 emissions within each sector is provided in Appendix D of this report. See "Community Greenhouse Gas Emissions in 1999 – Base Year Detailed Report" for further information.

The municipal operations of the City of Duluth generated 126,370 tons of eCO2 in 1996. This represents approximately 5.4 percent of the community's net carbon dioxide emissions based on the 1999 Community emissions inventory. **Table 4** provides a breakdown of the percentage each sector (Buildings, Vehicle Fleet, Streetlights, Water/Sewage, and Steam Plant) contributes to municipal emissions. From **Table 4**, the Duluth Steam Co-op accounts for 69 percent of total municipal emissions, contributing 87,329 tons of carbon dioxide in its steam generation. Buildings account for 7.8 percent of carbon dioxide emissions generated, or 9,849 tons. Water/Sewage operations account for 14.7 percent, or 18,612 tons of carbon dioxide. Streetlights and traffic signals account for 5.1 percent, or 6,485 tons of carbon dioxide, and Vehicle Fleet accounts for 3.2 percent, or 4,097 tons of carbon dioxide emissions. Two different breakdowns of all municipal properties are included in Appendix E titled "Corporate Greenhouse Gas Emissions in 1996 – Base Year Detailed Report" and "Duluth Corporate Greenhouse Gas Emissions in 1996 – Base Year Report by Subsector."

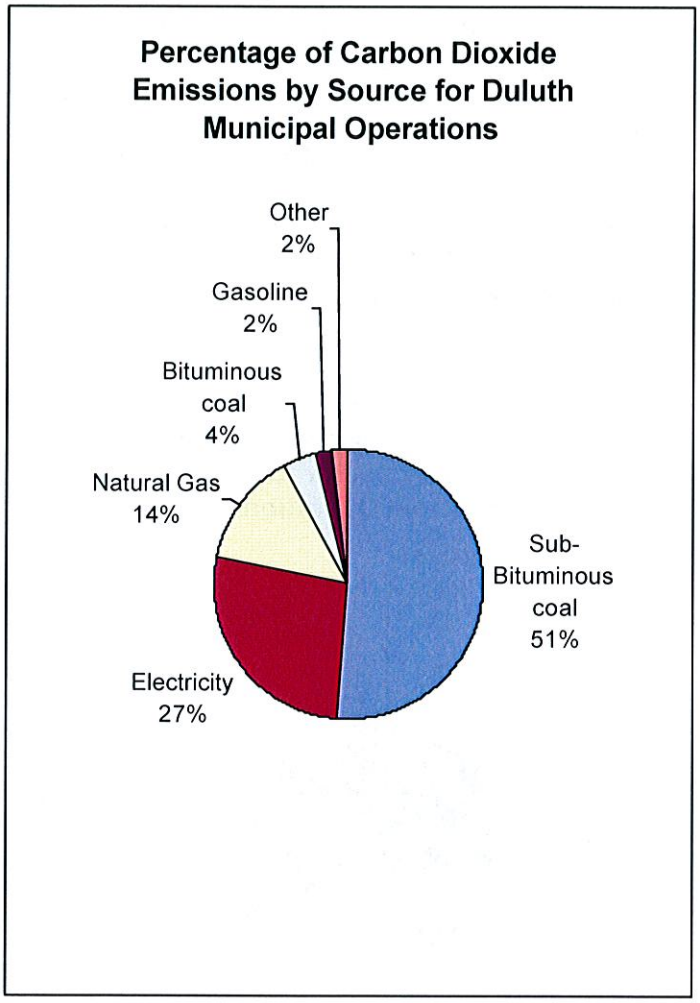
Table 4



Similar to the Community analysis, electricity is responsible for a large percentage of emissions within the Corporate sector (27.4 percent). However, the main source accounting for 52 percent of total emissions is Sub-Bituminous coal burned at the Duluth Steam Co-op creating district steam-heat for 227 buildings downtown. Natural gas (14 percent) is the third largest contributor to Corporate GHG emissions, followed by Bituminous coal (4 percent) and Gasoline (2 percent) used by the vehicle fleet. Appendix E contains a detailed account of each fuel's contribution in

the report "Duluth Corporate Greenhouse Gas Emissions in 1996 – Base Year Report by Source." The following **Table 5** provides a graph for this breakdown.

Table 5



Schools are heavy energy consumers, but in this case have not been specified as a percentage because they are not under the jurisdiction of municipal operations. Rather, the Duluth schools' energy consumption is automatically included in the commercial sector of the Community inventory. A more detailed breakdown by school and fuel source can be found in the Appendix titled "Energy Report – Independent School District #709, 1999-2000."

Finally, the City of Duluth's vehicle fleet produced a total of 4,097 tons of eCO2 in 1996. Of all the City departments, the vehicles operated by the Department of Public Works and Utilities - Utility Operations were responsible for producing the most carbon dioxide (1,222 tons). The Pubic Works and Utilities – Maintenance Operations division's vehicles produced 1,045 tons of carbon dioxide, followed by the Police Department (947 tons). **Table 6** provides a graphic representation of carbon dioxide emissions produced by vehicles in each department, including fuel costs, for 1996.

Table 6
Carbon Dioxide Emissions and Fuel Costs for Department Vehicles in 1996

Department	CO2 Emissions (tons)	Fuel Costs ($)
Admin. Services-Fleet	41	3,682
Admin. Services-Prop. Mgt.	63	6,024
DECC	1	86
Duluth Public Library	9	860
FAVR program-2001	171	182,136
Finance-Assessors	5	484
Fire Department	168	14,870
Job Training-special grant	6	535
Parks/Rec-Golf	0	8
Parks/Rec-Parks/Rec Division	46	4,130
Parks/Rec-Zoo	9	860
Planning-Business Dev.	6	557
Police Department	947	85,689
PW&U-Engineering	82	7,430
PW&U-Park Maintenance	106	9,392
PW&U-Street Maintenance	1,045	88,653
PW&U-Traffic Engineering	69	6,532
PW&U-Utility Operations	1,222	110,037
Steam Plant	24	2,211
W&G CNG vehicles	77	N/A

Although the FAVR program in which City employees drive their own vehicles for business is not nearly the largest vehicle group contributing to GHG emissions, it is the most costly at $182,136. Public Works and Utilities – Utility Operations is the second most costly at $110,037, and is in fact the largest vehicle department contributing to GHG emissions.

Moving CCP into the future: Where do we go next?

Timeline

Due to the individualized nature of the Cities for Climate Protection Campaign, the timeframe for which Duluth develops its proposed task force and Local Action Plan is completely determined by the city. This process will be influenced by the amount of time the task force is able to commit to planning, the amount of resources needed and available for the planning process, and the priority this campaign ranks with other proposed projects and activities of the city. Some cities are able to develop their Local Action Plan within a few months; others take up to, and sometimes more than, one year. The City of Duluth will need to evaluate the factors effecting the planning process in this city, and keep in mind that this is a dynamic process that will change with other changes in city operations. *The most important element to remember is that incorporating CCP initiatives and planning strategies into established projects and other proposed initiatives is usually the best way to ensure its continuation and success.* A Cities for Climate Protection chapter will be included in the Comprehensive Plan, making Duluth the first city in the nation to incorporate CCP into its master vision for overall development.

Duluth's progress through the CCP Milestones

- **Milestone 1 – Conduct a Greenhouse Gas Emissions Analysis: Baseline Inventory and Forecast of Emissions Growth**

  The emissions inventory for the City of Duluth began in early July 2001 and was completed in October 2001. A detailed analysis of fuel and electricity consumption for both Community (residential, commercial, industrial) and Corporate (municipal) sectors has been calculated and entered into the CCP Greenhouse Gas Emissions software program developed by Torrie Smith Associates. Forecasting data provided by the U.S. Department of Energy has been used to estimate business-as-usual growth projections for energy usage and carbon dioxide production into the year 2020.

- **Milestone 2 – Set a Reduction Target**

  This milestone gives the CCP new direction in Duluth, in that the city will not only be continuing to evaluate its current situation, but also look to the future and plan for sustainability. Strong task force development is key in this process, as is good, working communication between city departments and different sectors of the community to establish priorities and set goals.

  The reduction target is the specific greenhouse gas (GHG) emissions reduction goal that Duluth will aim to achieve by the year 2020. The CCP recommended goal is to reduce GHG emissions by 20 percent below the baseline year by the year projected for forecasted growth. If Duluth decides to follow this suggestion, the city will campaign to reduce GHG emissions community-wide from 1999's baseline year 2,322,834 tons of eCO2 per year, to less than 1,858,267 tons of carbon dioxide per year by 2020. GHG emissions in the City of Duluth, assuming business-as-usual, are predicted to grow 36 percent by 2020 to 3,162,470 tons of carbon dioxide per year. This means Duluth will need to take measures to reduce GHG emissions up to 1,304,203 tons of carbon dioxide per year by 2020 if the 20 percent goal is to be met.

A target provides an objective toward which to strive and against which to measure progress. There are several issues involved in setting a reduction target. Duluth will need to allow for enough time to implement the measures in its Local Action Plan, but note that the farther out the target year is, the more emissions Duluth might be pledging to reduce due to a longer period of accumulated growth in emissions. A more distant target year gives the city more time, but also increases the amount that needs to be reduced. **Table 1** presents the increase in carbon dioxide emissions (tons) in Duluth from 1999 to differing forecast years of 2010 and 2020.

Table 1

Year	Residential	Commercial	Industrial	Transport	Waste
1999	568,366.8	789,522.2	652,838.5	277,231	34,905.3
2010	655,314.6	923,435.6	775,596.4	318,249.8	51,310.8
2020	749,910.4	1,069,010.3	911,090.8	359,856.1	72,603.1

Quantifying measures initiated since the baseline year will help push Duluth forward toward its target, and hopefully inspire new creative and innovative action for future reduction strategies.

- **Milestone 3 – Develop a Local Action Plan for Duluth**

The Local Action Plan is a description of actions – policies, programs, measures – Duluth has already taken and plans to take to meet its GHG reduction target. It can be helpful to build the Local Action Plan around the measures and activities Duluth has in place, then propose new measures to close the gap between Duluth's projected growth and its reduction target.

The Local Action Plan may include:

The results of:
-The baseline emissions inventory (Milestone 1)
-The emissions forecast (Milestone 1)
-The emissions reduction target stating the reduction goal for Duluth (Milestone 2)

The set of GHG reduction actions:
-Existing actions that will be continued (Johnson Controls projects, etc.)
-New or proposed actions that together with existing programs will reach the GHG reduction target

Implementation strategies:
-Identifying costs, responsibilities, schedules, funding sources
-Procedure for monitoring the progress made toward the achievement of the target and the status of implementation of the GHG reduction actions

✓ **Step 1 – Count Existing Measures**

Many projects and programs that were implemented in Duluth to save money, including the energy audit conducted with Johnson Controls in 1995-1996, increase energy efficiency, reduce solid waste, improve local air quality, and also reduce GHG emissions. Building retrofits in a number of municipal city facilities are only some of the measures

the City of Duluth has already taken that reduce GHG emissions. Replacing mercury vapor streetlights with high pressure sodium lighting, and switching incandescent traffic signals to more efficient LED signals, also save energy and are therefore GHG reducing actions.

✓ **Step 2 – Quantify GHG Reductions of Existing Measures**
Quantifying the GHG reduction benefits helps analyze how close the existing measures are taking Duluth towards its emissions reduction target. These results can also be used to determine which existing programs are achieving the most emissions reductions and to focus new measures accordingly. Data collection forms are provided in the CCP Toolkit, and information needed includes the type of fuel affected and the amount of energy saved from each measure implemented. Project reports, updates, and program supervisors can often provide most of this information. Entering the data into the CCP Greenhouse Gas Emissions software 'Measures' section will calculate GHG reductions and cost savings achieved from each measure in Duluth.

✓ **Step 3 – Compare to the Target**
After quantifying the emissions reductions achieved from Johnson Controls retrofits, streetlight upgrades, and other conservation projects, Duluth must determine how far it has come in approaching its target and how far it still has to go. Reports generated from the software automatically perform this step by displaying the GHG reductions achieved from each measure and comparing it against the baseline emissions and the reduction target.

✓ **Step 4 – Choose New Measures**
Results from the GHG inventory and forecast will be used to look for the best areas and opportunities for reaching Duluth's reduction target. Identifying where big numbers occur, and also information on end-use energy consumption will help to further identify opportunities for emissions reductions. Since electricity is the main source of GHG emissions in the Community inventory across all sectors, it will be important for Duluth to focus action around reducing electricity consumption in private residences, commercial establishments, and places of industry. Determining what the electricity is used for (end-use consumption), whether it is lighting, machinery, or other purposes, will help show what measures need to be taken to reduce consumption.

In the case of the Corporate inventory, the Duluth Steam Co-op produces over 69 percent of all municipal GHG emissions in its steam generation. It may be important for the City of Duluth to look into cleaner energy sources for fueling steam generation, or to encourage new businesses to tap into a cleaner source of power. *Again, the task force will be important for brainstorming a list of potential projects and programs, and evaluating the ICLEI-suggested measures for feasibility in Duluth.* Not all of the measures need to produce big emissions reductions. Some may be included primarily for their educational value or for other reasons that make sense for Duluth.

Additional criteria that can be used to rate potential measures include:
-Cost vs. savings
-Staffing requirements
-Political and public support
-Impact on raising public awareness
-Co-benefits such as improving air quality, reducing traffic congestion, creating jobs and other economic opportunities, and saving money.

✓ **Step 5 – Quantify GHG Reductions of New Measures**
Data collection forms in the CCP Toolkit help gather the necessary information to estimate GHG reduction potential for each proposed measure. These sheets, along with the CCP software and help from appropriate departments, will guide the task force in their recommendations for a strong, attainable Local Action Plan.

- **Milestone 4 – Implementing the Local Action Plan**
It is important to ensure the effective accomplishment of Milestone 4 so that the measures and programs selected for Duluth's Local Action Plan will be implemented effectively and produce the desired results. The following are suggestions of how to include details for implementation such as schedules, budgets, identification of funding sources, assignment of responsibility to agencies and staff, and methods for monitoring and evaluating progress.

Key areas of the implementation section:

1. **Administration and Staffing**
   - **Overall program management (project facilitator (s))
   - -Communication and coordination (task force)
   - -Adequate resources (volunteers/student interns)
   - -Ensuring implementation of existing measures (follow-through)
   - -Coordinator position may be specified in Local Action Plan

2. **Financing and Budgeting**
   - -What actions can be made part of existing projects or expenditures? (e.g. policies favoring transit over motor vehicles)
   - -What actions will require new expenditures?
   - -Can funds be found from the existing municipal budget? (Energy Conservation Loan Fund)
   - -Energy-saving measures will likely provide enough financial savings to fund implementation of other measures in the Plan, if the savings are designated
   - -Where to go when municipal resources fall short (Minnesota Power CIP funding/loans, grants, Energy service corporations, community foundations, etc)

3. **Developing a Timeline**
   - -Overall schedule should meet reduction target date
   - -Integrate schedule with existing processes and responsibilities
   - -Provide ample time for external review and input

4. **Public Involvement in the Implementation Process**
   - -Creating a sense of ownership
   - -Recruit volunteers/interns to assist in presenting the Plan to the pubic

- **Milestone 5 – Monitor Progress and Report Results**
This is an ongoing process that needs to be built into the implementation of the Local Action Plan. It is important to monitor the progress being made toward the target and the status of implementing the GHG reduction actions so the community can feel proud and motivated by its accomplishments, and adjustments can be made to keep on track. Collecting data on all implemented measures and running them through the CCP software on a regular basis is the

best way to create progress reports. Besides tracking development, documenting GHG reduction results may be helpful in the event that national policies would begin regulating local governments as part of the Kyoto Protocol, or if emissions trading takes hold on a large scale.

Developing a working Task Force for Duluth

- **Putting together a Climate Task Team**
  Forming a task force is the most effective way to define and delegate the tasks that go into developing and implementing the Local Action Plan. A task force can also be an effective means to involve parties such as residents, businesses, and community groups in the process. The success of a strong Local Action Plan is dominantly contingent on the structure and organization of those developing it. Formal city council and mayoral resolutions adopting the emissions reduction target help get the momentum going, but bringing all the necessary and appropriate representatives from the community to the table is the most critical in the process. Duluth has a number of models and approaches to learn from when thinking about task force and Plan development. Some involve primarily city staff, while others tap heavily into community resources.

- **Brief Examples:**

Austin, TX created an interdepartmental task force with city staff from the Planning, Environmental and Conservation Services Department, including a planner, an economist, an air quality manager, a demand side management program manager, and an editor.

Fort Collins, CO hired a private consultant to assist city staff in developing the technical and logistical aspects of their Local Action Plan and to work with a Project Advisory Committee that oversaw development of the Plan. Fort Collins' Project Advisory Committee was formed to build consensus and ensure that programs were coordinated. It was comprised of council members, interested citizens, and key staff from Facilities, Fleets, Light and Power, Natural Resources, Parks and Recreation, Transportation Planning, and Traffic Operations departments.

Minneapolis and St. Paul, MN combined efforts to produce the Minneapolis – St. Paul Urban CO2 Reduction Plan in October 1993. An Executive Steering Committee made up of key decision-makers was created to direct the development of the Plan. The committee included mayors and other elected officials from both cities, representatives from Hennepin and Ramsey County Boards of Supervisors, executives from Northern States Power utility and other local businesses, and representatives from community and environmental organizations. Because of this inclusive committee process, stakeholders derived a feeling of ownership with the project. As a result, NSP entered into an agreement with the City of St. Paul to provide capital for a comprehensive municipal energy-efficiency retrofit project at zero percent financing.

Portland, OR set up a Technical Team – comprised of city, utility and state energy office staff – to assist with the technical aspects of the work. It also set up a Policy Committee with representatives from utilities, the transit agency, METRO, State Energy Office, Mayor's Office and local businesses. Members of both committees accompanied the lead staff in presenting the final plan to the planning commission and at council hearings.

- **Involve Key Players and the Community**
  Whatever route Duluth chooses to take, it is important to involve relevant players and ensure the cooperation and buy-in of appropriate departments and other entities. Key players include department heads and elected officials, who will be involved in plan preparation and be responsible for plan approval and implementation. The success of Duluth's Local Action Plan will more than likely depend on strong community support. With the majority of GHG emissions coming from the commercial sector, and a large percentage from industry and private residences, it is certainly important to build community support and public participation.

Berkeley, CA used its existing structure of Citizen Boards and Commissions to review the action plan and give input before it was presented to City Council. Staff from the Energy Office along with a consultant did the initial work to draft the plan, drawing strongly from existing city priorities and existing policy that complemented Berkeley's GHG reduction efforts. Policies that were in the midst of implementation or that were lagging behind, such as Berkeley's recycling and waste reduction program and its bicycle plan, were included as measures to reduce GHG emissions. This helped reinforce these existing goals as well as the new objective of climate protection. When circulated among the Boards and Commissions for their review, the members were able to embrace the plan and see it as integrating many city goals.

Strategies to ensure effective citizen involvement:

-Identify key individuals, businesses, institutions, and decision makers to be brought in, e.g. public officials, major employers, utilities, environmental and neighborhood organizations, Chamber of Commerce
-Establish a community task force with the help of a steering committee to work with municipal staff and elected officials
-Utilize volunteers from the community to consult in formulating the plan and in presenting it to the public

Probable Stakeholders in Duluth:

-Minnesota Power
-University of Minnesota – Duluth
-College of St. Scholastica
-All public/private schools
-Chamber of Commerce
-Duluth Authorities
-Railroad companies
-BOMA
-Northeast Minnesota Apartment Association
-ARDC
-HUDD
-Air National Guard
-MnDOT
-St. Louis County
-WLSSD
-Steam Plant
-NRRI
-Stora Enso
-MPCA

- **Get the Word Out**
  As with monitoring progress, this step is really an ongoing process. Publicizing Duluth's commitment to climate protection can help gain public support at an early stage, and might also help identify people willing to volunteer their services. The news release and press conference held by Mayor Doty in late August 2001 in connection with Susan Ode's visit

from ICLEI in Berkeley was a good first step in communicating the City of Duluth's intentions to the rest of the community. *Other effective means of outreach include:*

-Public Forums and Town Meetings
-Lecture series
-Earth Day Activities
-Media Coverage/bi-weekly or monthly newspaper article
-Awareness/education in schools
-Awards to local businesses for energy-efficiency
-Public Education displays in libraries, city buildings, etc

- **Questions for Duluth to think about while going through the Milestones:**
  -Which Milestones or other steps can be finished in the next six months?
  -What does the task force/city need to achieve this goal?
  -What barriers might arise in reaching Plan completion and implementation?
  -What ideas do we have to get past these barriers?
  -How do we get political and staff buy-in and generate concrete assistance for this work?
  -What existing planning processes might this work be able to be integrated into?
  -How do we get the community involved in our climate protection effort?
  -How can we build public awareness for climate protection?
  -How might recognition and celebration of successes be built into the process?

Information Sources

Both sections of the inventory involve collecting data and other technical information from utility companies, regional planning agencies, municipal utility billing records, and some Internet sources. The following is a comprehensive list of the data sources used for the inventory and forecast. Individuals with questions pertaining to this information can either contact Dan Green, Superintendent of Facilities Management, 723-3359, **dgreen@ci.duluth.mn.us** or direct correspondence to the below listed persons or websites.

International Council for Local Environmental Initiatives
15 Shattuck Square, Suite 215
Berkeley, CA 94704
Phone: (510) 540-8843
Fax: (510) 540-4787
Website: **www.iclei.org/us**
Contacts: Susan Ode, Maria Sanders, Melissa Royael

Torrie Smith Associates
Unit 108
95 Beech Street
Ottawa, Ontario
K1S 3J7
CANADA
Phone: (613)238-3045
Fax: (613) 238-8776
Website: www.torriesmith.com
Contacts: Katherine McCran-Leach, Ralph Torrie

Community Data Sources

Community Electricity Data
Name: Luann Lavalley, CIS Administrator
Organization: Minnesota Power
Phone: (218) 722-5642 ext. 3368
Email: **LLavalley@mnpower.com**

Community Natural Gas Data
Name: Eric Schlacks, Gas and Energy Coordinator
Organization: City of Duluth Public Works and Utilities
Phone: (218) 723-3427
Email: **eschlacks@ci.duluth.mn.us**

Community Fuel Oil/Diesel Data
Name: Paul Kim, Emission Inventory Coordinator
Organization: Minnesota Pollution Control Agency
Phone: (651) 296-6300
Email: **paul.kim@pca.state.mn.us**

Name: Kerry Leider, Facilities Management
Organization: Duluth Independent School District #709
Phone: (218) 723-4118

Name: Jerry Pelofske, Manager
Organization: Duluth Steam Co-op
Phone: (218) 723-3601

Name: Bob Rothschadl, Assessors Office
Organization: City of Duluth
Phone: (218) 723-3287
Email: **brothschadl@ci.duluth.mn.us**

Name: Bob (last name not known)
Organization: Minnesota Petroleum Marketers
Phone: 1-800-864-3813

Community Coal Data
Name: Jerry Pelofske, Manager
Organization: Duluth Steam Co-op
Phone: (218) 723-3601

Community Road Transportation Data
Name: Jim Heilig, Administrative Director
Organization: Duluth Transit Authority
Phone: (218) 722-4426

Name: Kendis Willet
Organization: Arrowhead Regional Development Council
Phone: (218) 529-7518

Community Rail Transportation Data
Name: Dick Lambert, Office of Freight, Railroads and Waterways
Organization: Minnesota Department of Transportation
Phone: (651) 296-1609

Website: **http://www.dot.state.mn.us/ofrw/waterways.html**

Name: Tim Shandel, Operations Manager
Organization: North Shore Scenic Railroad
Phone: (218) 722-1273

Variable: Rail gallons/ton-mile calculation
Publication: Environmental Impacts of a Modal Shift
Organization: Minnesota Department of Transportation
Source: Ray Skelton, Director
Organization: Duluth Port Authority
Phone: (218) 727-8525

Community Marine Transportation Data
Name: Dick Langlee, Director
Organization: Vista Fleet
Phone: (218) 722-6218

Name: Ray Skelton, Director
Organization: Seaway Port Authority of Duluth
Phone: (218) 727-8525

Community Waste Data
Name: Jack Ezell, Planning Manager
Organization: Western Lake Superior Sanitary District
Phone: (218) 722-3336 ext. 216

Name: Dan Beldon, Senior Planner
Organization: Western Lake Superior Sanitary District
Phone: (218) 722-3336 ext. 218

Community Indicator Data
Variable: Local CO2 coefficient for Minnesota Power electricity generation
Name: Mike Cashin, Senior Engineer
Organization: Minnesota Power
Phone: (218) 722-5642 ext. 3339
Email: mcashin@mnpower.com

Variable: Population
Publication Title: Tomorrow's Transportation 2025
Table Title: Table 2.2: Population 1950-2000
Source: Arrowhead Regional Development Commission/ US Census Bureau

Variable: Households
Publication: US Census 2000
Source: US Census Bureau

Variable: Commercial/Industrial Establishments
Publication Title: MDES – City of Duluth 1999 Annual Average
Website: http://www.mnworkforcecenter.org
Source: Scott Moore, MN Workforce Center
Phone: (218) 723-4775
Email: **smoore@ngwmail.des.state.mn.us**

Community Forecasting Data
Variable: Growth for all fuel types for all sectors available
Publication: Annual Energy Outlook 2001
Website: **http://www.eia.doe.gov/oiaf/aeo/**
Source: Mike Cashin, Senior Engineer
Organization: Minnesota Power
Phone: (218) 722-5642 ext. 3339
Email: **mcashin@mnpower.com**

Variable: Waste production growth
Name: Kurt Soderberg, Executive Director
Organization: Western Lake Superior Sanitary District
Phone: (218) 722-3336
Email: kurt.soderberg@wlssd.duluth.mn.us

Corporate Data Sources

Corporate Electricity Data
Name: Les Bass, City Auditor
Organization: City of Duluth – Finance
Phone: (218) 723-3352
Email: **lbass@ci.duluth.mn.us**

Name: Jim Peck, Account Manager
Organization: Minnesota Power
Phone: (218) 722-5642 ext. 3376
Email: **japeck@mnpower.com**
Name: Bill Sawyer, Project Manager
Organization: City of Duluth – Facilities Management
Phone: (218) 723-3344
Email: **bsawyer@ci.duluth.mn.us**

Name: Earl Stewart
Organization: City of Duluth – Traffic Operations
Phone: (218) 723-3580
Email: **estewart@ci.duluth.mn.us**

Corporate Natural Gas Data
Name: Mary Jo Farleigh
Organization: City of Duluth – MIS
Phone: (218) 529-8206
Email: **mfarleigh@ci.duluth.mn.us**

Corporate Oil/Coal Data
Name: Jerry Pelofske, Manager
Organization: Duluth Steam Co-op
Phone: (218) 723-3601

Corporate Vehicle Fleet Data
Name: Sue Cannon
Organization: City of Duluth – Finance
Phone: (218) 723-3250
Email: **scannon@ci.duluth.mn.us**

Name: Chuck Goman, Water and Gas
Organization: City of Duluth – Public Works and Utilities
Phone: (218) 723-3384
Email: cgoman@ci.duluth.mn.us

Name: Greg Sertich, Programmer
Organization: City of Duluth – MIS
Phone: (218) 529-8202
Email: **gsertich@ci.duluth.mn.us**

Assumptions/Calculations

Community Inventory

The following information provides a detailed explanation of how data was compiled and calculated, and what was included/excluded in the analysis. It also gives total amounts of each fuel type in units (kWh, Therms, gallons, etc.) so the numbers can be associated with the software reporting numbers listed in million Btu.

Community Electricity Data
Estimations for the amount of carbon dioxide emitted from electricity consumption are based on a local Minnesota Power CO2 coefficient provided by Mike Cashin. Actual billing records with yearly consumption and total expenditures (including taxes) were provided by Luann Lavalley. Estimates and Customer Class Definitions are as follows:

-*Residential sector*: 312,115,754 kWh - $22,102,553; A customer using electric energy supplied for residential (household) purposes.
-*Commercial sector*: 527,843,117 kWh - $31,410,664; A customer using service at a location where the purchaser is engaged in selling, warehousing, or distributing a commodity, in some business activity, in rendering professional service, or in some form of social activity. In borderline cases where the nature of the customers' activities does not differentiate clearly between Commercial and Industrial, the service is classified as Commercial.
-*Industrial sector*: 563,052,782 kWh - $23,077,915; A customer using service at a location where the purchaser is engaged in an industrial activity, such as the operation of factories, mills, machine shops, mines, oil wells, refineries, pumping plants, cleaning and dyeing works, creameries, canning establishments, stockyards, etc., that is, in extractive, fabricating or processing activities.

Community Natural Gas Data
Natural gas consumption data was provided by Eric Schlacks in Public Works and Utilities. The same Customer Class Definitions can be applied to natural gas, with the addition of transportation of gas consumption and cost to the Industrial sector. 1 CCF = 100 CF = 1 Therm
-*Residential:* 25,504,011 Therms - $14,773,901
-*Commercial:* 19,615,778 Therms - $7,735,170
-*Industrial:* 5,422,587 Therms - $1,128,842

Community Fuel Oil/Diesel Data
Unlike electricity and natural gas, one or two utility companies do not provide heating and fuel oil services. There are more than 25 major oil distributors in the Duluth-Superior area, most of which were not willing to provide details or estimates for community oil consumption sectors. The minimal data recorded in the CCP software has been calculated as follows:

Residential Sector

- Residential fuel oil consumption was calculated with a number of assumptions; three different local oil distributors were contacted by Minnesota Petroleum Marketers to provide residential heating oil consumption for three average residences each (between 1500-1600 sq. ft.) to get an average consumption for Duluth of 787 gallons/residence. The number of residences using fuel oil was calculated by taking the total number of residential accounts on file with City Assessors (26,211), subtracting the total recorded using fuel oil (7,212) and total using other fuels (15,026) to find the total not recorded with any fuel (3,973). The

percentage using fuel oil was calculated according to the total number with records with data (7,212 / 22,238 x 100) = 32%. 32% of 3,973 (total not recorded) was added to the total recorded to get 8,483 fuel oil users in the residential sector. 8,483 x 787=6,676,121 gallons.

Commercial Sector

- Due to the lack of reliable data such as total commercial floor space and numbers of commercial establishments using oil, diesel/oil use in the commercial sector has only been calculated for various larger accounts where data was on file with the Minnesota Pollution Control Agency in St. Paul. The local oil distributors contacted all agreed that accurately estimating commercial usage was virtually impossible without more comprehensive data, and they were either unable or unwilling to provide the numbers. The total commercial usage that could be calculated is 196,325 gallons of light fuel oil (#1,2); 95,540 gallons of diesel; and 1,387,800 gallons of heavy fuel oil (#6). *These numbers are in no way an estimation of the total commercial/industrial oil consumption, but rather a sample of a few oil consumers in Duluth.*

Community Coal Use Data

Numbers for tons of coal burned in Duluth reflect 1996 totals provided by Jerry Pelofske for the Duluth Steam Co-op only; Bituminous: 2,010 tons, Sub-Bituminous: 35,281 tons. No other direct coal consumption was calculated.

Community Road Transportation Data

Emissions from personal and commercial vehicles were calculated using annual vehicle miles traveled (VMT) data generated by the Minnesota Department of Transportation. The 1999 VMT for Duluth roadways was 391,270,875 miles; this number includes all routes and all vehicles. Jim Heilig with the Duluth Transit Authority provided DTA bus-specific data for 1999: 2,045,913 miles using 466,036 gallons of diesel fuel. However, these numbers are automatically included in the total VMT, so this data is simply for a better breakdown. Total fuel use was determined by using the total VMT in the CCP software default calculations; gasoline: 19,982,718 gal, diesel: 1,828,435 gal, propane: 490,478 gal, CNG: 490,478 gal.

Community Rail Transportation Data

The North Shore Scenic Railroad purchased 21,416 gallons of diesel during 1999, and Tom Shandel in Operations estimated that most of that would have been used within the year. Rail transport of grain, iron ore, and coal through Duluth to the ports is the main source of diesel fuel consumption for rail transportation, but total gallons used in Duluth were not possible to calculate by contacting individual railroad companies. An estimation was calculated as follows:

- The total annual tonnage of goods that left the Duluth-Superior's 31 terminals in 2000 was 41,239,513 tons. Dick Lambert with the Office of Freight, Railroads and Waterways at MnDOT estimated that approximately 90% of those goods were grain, iron ore, and coal; 95 percent of which are transported to the terminals by rail. A MnDOT report 'Environmental Impacts of a Modal Shift' provided the gallons/ton-mile calculation of 204. The ton-mileage for Duluth is based on the estimated 15 miles of track going through Duluth to the various terminals, and an approximation of 2,592,631 gallons of diesel fuel use was determined. *This number does not include the limestone transported from the waterways out of Duluth, nor is it in any way an exact calculation of the total fuel consumed by the rail sector. It is meant to provide a rough estimate for CCP consideration.*

Community Marine Transportation Data

Emissions from commercial shipping were calculated with data from the Seaway Port Authority of Duluth. The different gallons per hour (GPH) burned by 1000 ft, AAA, and Ocean ships were used for both the hours the ships were loading at the docks and hours they were underway in the port. Ray Skelton estimated the transit time for all ships to be a total of 1 hour (1/2 hour to and 1/2 hour from the canal to the docks). Loading time varied depending on the type of ship. The ships use #2 diesel fuel at the docks, and MDO Bunker C when underway, so totals for all 1,122 commercial ships that came into the Duluth Harbor during 1999 were calculated using specific GPH data for each type of ship, length of loading time, and number of trips. The total number of 699,080 diesel gallons also includes the estimated 37,000 gallons used by the Vista Fleet yearly. MDO Bunker C fuel total (emissions similar to heavy fuel oil) is 418,150 gallons. Smaller, private boats, which more than likely contribute a large amount of eCO2 emissions due to unregulated motors, were not included in this study due to difficulty of obtaining data.

Community Waste Data

Total tons of waste generated by the Duluth community in 1999 (62,384) were calculated by using 77 percent of St. Louis County reporting totals to reflect Duluth's portion. These numbers and percentages were provided by Jack Ezell at WLSSD. The percentage breakdown used in the software reporting for different types of waste was provided by Dan Beldon at WLSSD as part of a May 1999 study of the garbage delivered to the solid waste facility. A more specific breakdown is as follows:

-Plastic 13%	-Construction and Demolition 1%	-Yard Waste 3%
-Household Hazardous Waste 1%	-Wood 2%	-Metals 7%
-Textiles 3%	-Food Waste 14%	-Glass 3%
-Durables 1%	-Paper 39%	-Other 13%

Community Forecasting Data

Growth multipliers for fuel and electricity consumption projections reflect national trends. Forecasts for the residential, commercial, industrial, and transportation sectors for electricity, natural gas, fuel oil, diesel, gasoline, and coal are based on U.S. Department of Energy projections found in the "Annual Energy Outlook 2001" report published by the Energy Information Administration available at **www.eia.doe.gov/oiaf/aeo/**. Mike Cashin with Minnesota Power stated that the U.S. Department of Energy forecasting data was consistent with predicted growth in northern Minnesota. However, forecasting data was not available for diesel fuel or heavy fuel oil in the commercial sector, nor was it available for CNG or MDO Bunker C in the transportation sector. Therefore, these fuels do not reflect any growth in the 2020 forecast reports generated by the CCP software.

Corporate Electricity, Natural Gas, and Oil Data
The information used to estimate annual consumption of electricity and natural gas by municipal facilities was derived from summary sheets, utility bills, and purchase records for 1996. Some individualized account data was not available, so 1996 municipal electricity totals were calculated using an average monthly consumption and cost for the three missing months of data: January, February, and June. The total was determined by adding up account totals for the nine months data was available, finding average monthly consumption and cost, multiplying that by three, and then adding that to the nine month total. The Buildings sector includes not only actual facilities, but also parks and lots where area lighting is in place. Its total electricity consumption in 1996 was 7,057,856 kWh. All street lighting electricity totals are from Earl Stewart, both metered and non-metered: 3,949,861 kWh, as well as individual traffic signals: 1,926,245 kWh, for a total of 5,876,106 kWh. Electricity used in Water/Sewage divisions amounted to 16,540,805 kWh, and the Steam Plant used 1,894,985 kWh. Natural gas consumption for municipal accounts was provided by Mary Jo Farleigh; minus 7 accounts that could not be found dating back to 1996. The totals are Buildings: 348,642 Therms, Water/Sewage: 60,535 Therms, and Steam Plant: 2,549,417 Therms. Bill Sawyer estimated that the total amount of oil used mostly for heating by municipal facilities is under $2,000 per year, and since no complied records for oil consumption exist, it was excluded from the study. The only oil consumption data recorded is the number provided by Jerry Pelofske for the Duluth Steam Co-op: 9,944 gal.

Corporate Coal Data
All coal consumption data recorded for City of Duluth operations is used by Duluth Steam Co-op; Bituminous: 2,010 tons, Sub-Bituminous: 35,281 tons.

Corporate Vehicle Fleet Data
Vehicle fleet gasoline and diesel consumption and cost was calculated for each department from fuel purchase records maintained by Greg Sertich in MIS; gasoline: 256,339 gal, diesel: 117,058 gal. Data for the FAVR program in which city employees drive their own vehicles for business purposes was provided by Sue Cannon in Finance. Actual gallons of gasoline were calculated by taking the 2001 Annualized Business Mileage total and dividing it by the US Department of Energy's 1997 Fuel Efficiency Guide average of 23 mpg. 1997 data was chosen since the FAVR program does not allow cars older than 1995, and 1997 is between 1995-2001. Also, most drivers use compact cars, mid-size cars, or light trucks/SUVs and 23 mpg is an average for those types of vehicles. Total cost also includes the fixed costs added onto the mileage totals. Chuck Goman provided total CNG usage estimates for one year for 11 CNG vehicles used by the city: 13,043 Therms. Although Arlie Bordenkircher estimated 23 propane vehicles in the municipal fleet, Bob Troolin in Maintenance Operations said that the 18 propane vehicles used in his division do not use much fuel, and he had no specific records for individual vehicles. Chuck Goman said the two or three Water and Gas vehicles use very little fuel as well, so propane vehicles have not been included in the calculations.

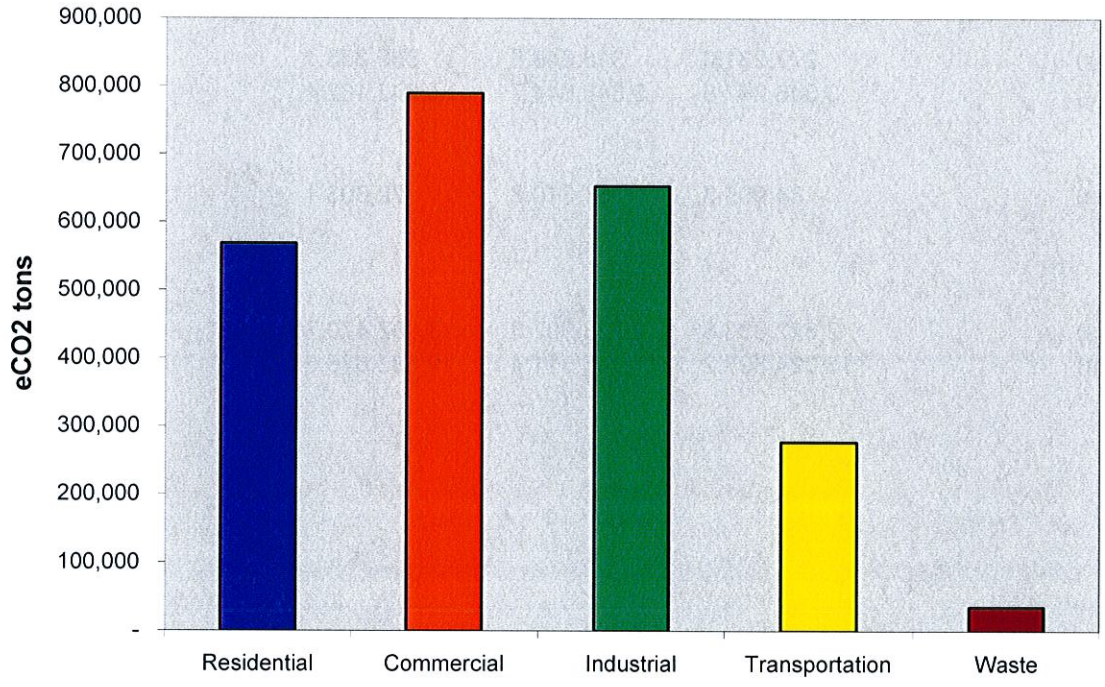
Corporate Waste Data
Because municipal waste is not kept separate from the total tons going to WLSSD, this sector was not possible to calculate.

Duluth
Community Greenhouse Gas Emissions
Time Series Reports

Year	1999	2010	2020
Residential			
eCO2 Output (tons)	568,336.8	655,314.6	749,910.4
Energy (million Btu)	4,546,181.0	5,079,063.9	5,642,557.0
Commercial			
eCO2 Output (tons)	789,522.2	923,435.6	1,069,010.3
Energy (million Btu)	4,668,528.2	5,315,203.9	5,998,183.5
Industrial			
eCO2 Output (tons)	652,838.5	775,596.4	911,090.8
Energy (million Btu)	2,463,940.5	2,910,398.9	3,400,713.5
Transportation			
eCO2 Output (tons)	277,231.0	318,249.8	359,856.1
Energy (million Btu)	3,346,247.6	3,840,644.7	4,342,182.4
Waste			
eCO2 Output (tons)	34,905.3	51,310.8	72,603.1
Total			
eCO2 Output (tons)	2,322,833.8	2,723,907.3	3,162,470.7
Energy (million Btu)	15,024,897.2	17,145,311.4	19,383,636.5

Duluth
Community Greenhouse Gas Emissions in 1999
Base Year Sector Summary

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Residential	568,337	24.5	4,546,181
Commercial	789,552	34.0	4,668,528
Industrial	652,839	28.1	2,463,941
Transportation	277,231	11.9	3,346,248
Waste	34,905	1.5	N/A
Total	2,322,834	100.0	15,024,897



This report has been generated for Duluth, Minnesota with assistance from software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of the International Council for Local Environmental Initiatives.

Duluth
Community Greenhouse Gas Emissions in 1999
Base Year Report by Source

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Electricity	1,546,915	66.6	4,788,436
Natural Gas	298,587	12.9	5,054,238
CNG	757	0.0	12,814
Gasoline	209,059	9.0	2,511,317
Diesel	59,845	2.6	727,332
Light Fuel Oil	75,702	3.3	957,903
Heavy Fuel Oil	18,336	0.8	208,775
Propane	3,138	0.1	45,148
Bituminous Coal	4,987	0.2	48,248
Sub-Bituminous Coal	65,079	2.8	607,781
MDO Bunker C	5,525	0.2	62,905
Paper Products	26,819	1.2	
Food Waste	8,953	0.4	
Plant Debris	-248	0.0	
Wood/Textiles	-619	0.0	
Total	2,322,834	100.0	15,024,897

This report has been generated for Duluth, Minnesota with assistance from software created by Torrie Smith Associates for the Cities for Climate Protection Campaign of the International Council for Local Environmental Initiatives.

Community Greenhouse Gas Emissions in 1999
Base Year Report by Sector and Source

	Fuel used	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Residential Sector				
Electricity	312,115,754 kWh	344,129	14.8	1,065,241
Natural Gas	25,504,011 Therms	150,669	6.5	2,550,401
Light Fuel Oil	6,676,121 gal	73,539	3.2	930,538
Subtotal		568,337	24.5	4,546,181
Commercial Sector				
Electricity	527,843,117 kWh	581,983	25.1	1,801,512
Natural Gas	19,615,778 Therms	115,883	5.0	1,961,578
Diesel	95,540 gal	1,092	0.0	13,269
Light Fuel Oil	196,325 gal	2,163	0.1	27,364
Heavy Fuel Oil	1,387,800 gal	18,336	0.8	208,775
Bituminous Coal	2,010 tons	4,987	0.2	48,248
Sub-bituminous Coal	35,281 tons	65,079	2.8	607,781
Subtotal		789,522	34.0	4,668,528
Industrial				
Electricity	563,052,782 kWh	620,804	26.7	1,921,682
Natural Gas	5,422,587 Therms	32,035	1.4	542,259
Subtotal		652,839	28.1	2,463,941
Transportation				
Gasoline	19,982,718 gal	209,059	9.0	2,511,317
Diesel	5,141,562 gal	58,753	2.5	714,064
Propane	490,478 gal	3,138	0.1	45,148
CNG	128,139 Therms	757	0.0	12,814
MDO Bunker C	418,150 gal	5,525	0.2	62,905
Subtotal		277,231	11.9	3,346,248
Waste				
Paper Products	39%	26,819	1.2	
Food Waste	14%	8,953	0.4	
Plant Debris	3%	-248	0	
Wood/Textiles	5%	-619	0	
Other	39%	N/A	N/A	
Subtotal		34,905	1.5	
Total		2,322,834	100.0	15,024,897

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Community Greenhouse Gas Emissions in 1999
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Residential			
Duluth Residential			
Electricity	344,129	14.8	1,065,241
Natural Gas	150,669	6.5	2,550,401
Light Fuel Oil	73,539	3.2	930,538
Subtotal	568,337	24.5	4,546,181
Subtotal Residential	568,337	24.5	4,546,181
Commercial			
DLH Air National Guard Base			
Diesel	13	0.0	162
Light Fuel Oil	86	0.0	1,091
Subtotal	100	0.0	1,254
Duluth Commercial			
Electricity	581,983	25.1	1,801,512
Natural Gas	115,883	5.0	1,961,578
Subtotal	697,866	30.0	3,763,090
Georgia Pacific-DLH Hardboard			
Diesel	781	0.0	9,488
Heavy Fuel Oil	17,694	0.8	201,466
Subtotal	18,475	0.8	210,954
ISD #709			
Light Fuel Oil	145	0.0	1,832
Subtotal	145	0.0	1,832
NW Airlines-Airbus Maintenance			
Diesel	20	0.0	247
Subtotal	20	0.0	247
Northland Crushing Inc.			
Diesel	126	0.0	1,528
Subtotal	126	0.0	1,528

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Community Greenhouse Gas Emissions in 1999
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Steam Plant			
Diesel	152	0.0	1,843
Light Fuel Oil	176	0.0	2,230
Bituminous Coal	4,987	0.2	48,248
Sub-Bituminous Coal	65,079	2.8	607,781
Subtotal	70,394	3.0	660,103
UMD			
Light Fuel Oil	1,058	0.0	13,382
Heavy Fuel Oil	642	0.0	7,310
Subtotal	1,700	0.1	20,692
WLSSD			
Light Fuel Oil	698	0.0	8,829
Subtotal	698	0.0	8,829
Subtotal Commercial	789,522	34.0	4,668,528
Industrial			
Duluth Industries			
Electricity	620,804	26.7	1,921,682
Natural Gas	32,035	1.4	542,259
Subtotal	652,839	28.1	2,463,941
Subtotal Industries	652,839	28.1	2,463,941
Transportation			
Marine Transportation			
Diesel	7,988	0.3	97,089
MDO Bunker C	5,525	0.2	62,905
Subtotal	13,513	0.6	159,994
Rail Transportation			
Diesel	29,871	1.3	363,041
Subtotal	29,871	1.3	363,041

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Community Greenhouse Gas Emissions in 1999
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Road Transportation			
Gasoline	209,059	9.0	2,511,317
Diesel	20,894	0.9	253,934
Propane	3,138	0.1	45,148
CNG	757	0.0	12,814
Subtotal	233,847	10.1	2,823,213
Subtotal Transportation	277,231	11.9	3,346,248
Waste			
Solid Waste/Landfill			
Paper Products	26,819	1.2	
Food Waste	8,953	0.4	
Plant Debris	-248	0.0	
Wood/Textiles	-619	0.0	
Subtotal	34,905	1.5	
Subtotal Waste	34,905	1.5	
Total	2,322,834	100.0	15,024,897

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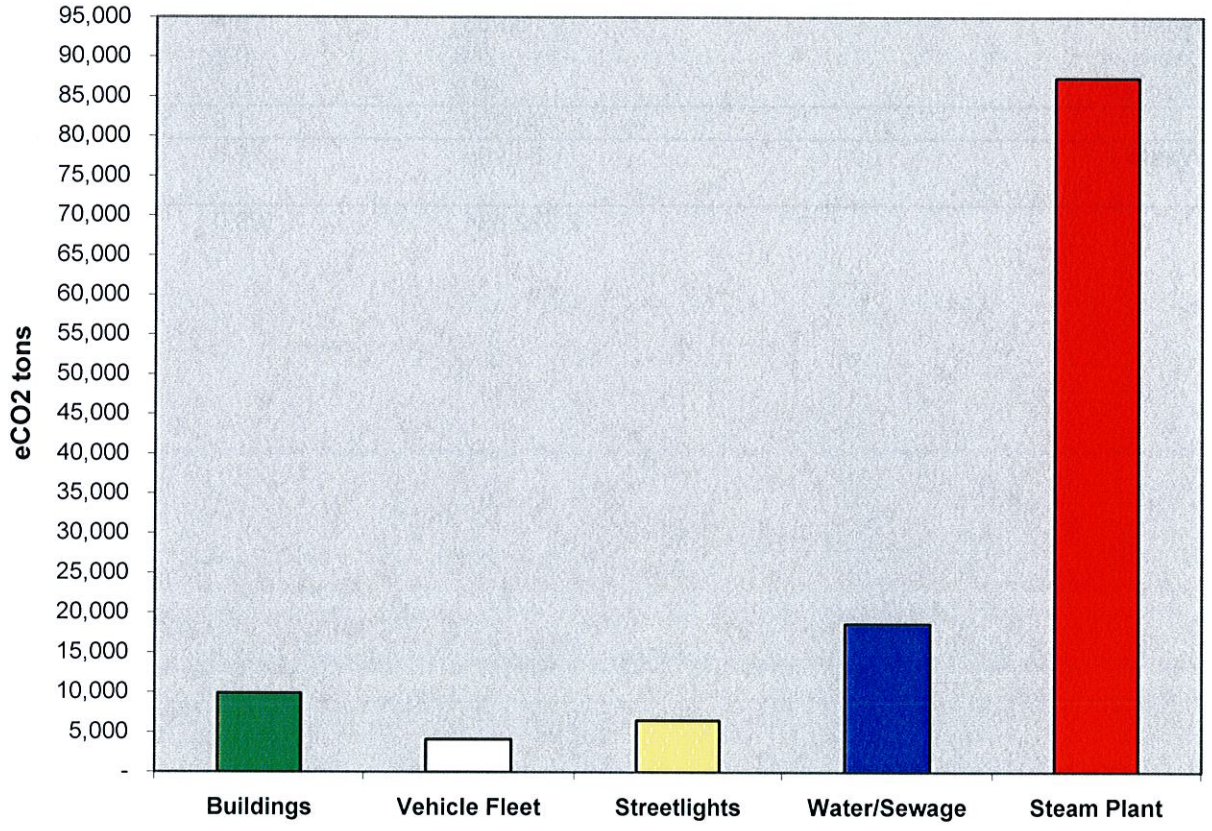
Duluth

Corporate Greenhouse Gas Emissions in 1996
Base Year Sector Summary

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Buildings	9,849	7.8	58,952	672,966
Vehicle Fleet	4,097	3.2	49,777	524,175
Streetlights	6,485	5.1	20,055	565,519
Water/Sewage	18,612	14.7	62,507	865,175
Steam Plant	87,329	69.1	918,841	1,384,394
Total	126,370	100.0	1,110,132	4,012,229



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Duluth

Corporate Greenhouse Gas Emissions in 1996

Base Year Report by Source

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Electricity	34,619	27	107,064	1,944,934
Natural Gas	17,478	14	295,860	610,010
CNG	77	0	1,304	N/A
Gasoline	2,682	2	32,215	411,233
Diesel	1,338	1	16,257	112,942
Fuel Oil	110	0	1,386	5,184
Bituminous Coal	4,988	4	48,259	
Sub-bituminous Coal	65,080	52	607,786	927,926
Total	126,370	100	1,110,132	4,012,229

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Corporate Greenhouse Gas Emissions in 1996
Base Year Report by Sector and Source

	Fuel used	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Buildings					
Electricity	7,057,856 kWh	7,789	6.2	24,088	476,431
Natural Gas	348,642 Therms	2,060	1.6	34,864	196,534
Subtotal		9,849	7.8	58,952	672,966
Vehicle Fleet					
Gasoline	256,340 gal	2,682	2.1	32,215	411,233
Diesel	117,059 gal	1,338	1.1	16,257	112,942
CNG	13,043 Therms	77	0.1	1,304	N/A
Subtotal		4,097	3.2	49,777	524,175
Streetlights					
Electricity	5,876,106 kWh	6,485	5.1	20,055	565,519
Subtotal		6,485	5.1	20,055	565,519
Water/Sewage					
Electricity	16,540,805 kWh	18,254	14.4	56,453	830,617
Natural Gas	60,535 Therms	358	0.3	6,054	34,558
Subtotal		18,612	14.7	62,507	865,175
Steam Plant					
Electricity	1,894,985 kWh	2,091		6,468	72,367
Natural Gas	2,549,417 Therms	15,061		254,942	378,917
Light Fuel Oil	9,944 gal	110		1,386	5,184
Bituminous Coal	2,010 tons	4,988		48,259	
Sub-bituminous	35,281 tons	65,080		607,786	927,926
Subtotal		87,329	69.1	918,841	1,384,394
Total		**126,370**	**100.0**	**1,110,132**	**4,012,229**

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Duluth

Corporate Greenhouse Gas Emissions in 1996
Base Year Report by Subsector

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Buildings				
Aerial Lift Bridge	303	0.2	1,123	18,049
Animal Shelter	40	0.0	124	2,612
Armory Toolhouses	616	0.5	7,093	46,572
Bayfront Park	34	0.0	106	3,776
Bldg Maintenance Shop	231	0.2	2,885	20,488
Canal Park street lighting	75	0.1	233	4,411
Casino Ramp	322	0.3	997	17,195
Chester Park facilities	156	0.1	1,069	14,349
City Center West	220	0.2	682	14,189
City Hall	1,069	0.8	5,140	64,936
Coney Island Ramp	26	0.0	80	1,719
Crosswalks/area lighting	17	0.0	52	2,274
Duluth Community Clubs	368	0.3	3,940	31,688
Duluth Recreation Centers	120	0.1	371	10,687
Duluth Zoo	1,805	1.4	10,999	106,450
Enger/Lester Golf Courses	208	0.2	644	15,226
Firehalls	670	0.5	6,436	52,733
Fleet Services	260	0.2	1,959	19,034
Fryberger Arena	394	0.3	1,218	23,417
General City Facilities	475	0.4	2,033	34,797
Glen Avon Hockey Bldg	40	0.0	123	3,170
Goodfellowship Club	72	0.1	223	5,367
Grant/Central Field	54	0.0	430	4,807
Leif Erickson Park	24	0.0	73	1,625
Main Library	762	0.6	2,358	39,807
Merritt Park Field House	22	0.0	68	2,286
Palladio Skywalk	45	0.0	139	2,628
Park Point	13	0.0	40	1,087
Pedestrian bridge (Canal)	31	0.0	95	1,974
Peterson Arena	351	0.3	1,087	22,059
Police-Garage (Canal)	119	0.1	473	7,779

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Duluth

Corporate Greenhouse Gas Emissions in 1996
Base Year Report by Subsector

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Portman Square Field	73	0.1	225	3,076
Radio Tower	0	0.0	1	62
Toolhouses	452	0.4	5,107	39,854
Wade Stadium	170	0.1	677	13,449
Washington Center	105	0.1	325	6,727
Wheeler Field	105	0.1	325	12,604
Subtotal Buildings	9,849	7.8	58,952	672,966
Vehicle Fleet				
Admin. Services-Fleet Division	41	0.0	490	3,682
Admin. Services-Property Mgt.	63	0.0	753	6,024
DECC	1	0.0	11	86
Duluth Public Library	9	0.0	113	860
FAVR program-2001	171	0.1	2,049	182,136
Finance-Assessors Division	5	0.0	64	484
Fire Department	168	0.1	2,025	14,870
Job Training-special grant	6	0.0	72	535
Parks/Rec-Golf Division	0	0.0	1	8
Parks/Rec-Parks/Rec Division	46	0.0	547	4,130
Parks/Rec-Zoo Division	9	0.0	114	860
Planning-Business Development	6	0.0	73	557
Police Department	947	0.7	11,370	85,689
PW&U-Engineering	82	0.1	985	7,430
PW&U-Park Maintenance	106	0.1	1,283	9,392
PW&U-Street Maintenance	1,045	0.8	12,683	88,653
PW&U-Traffic Engineering	69	0.1	832	6,532
PW&U-Utility Operations	1,222	1.0	14,714	110,037
Steam Plant	24	0.0	293	2,211
W&G CNG Vehicles	77	0.1	1,304	N/A
Subtotal Vehicle Fleet	4,097	3.2	49,777	524,175

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Duluth

Corporate Greenhouse Gas Emissions in 1996
Base Year Report by Subsector

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Streetlights				
Metered Street Lighting	2,207	1.7	6,825	129,097
Non-metered Street Lighting	2,152	1.7	6,656	312,064
Traffic signals-2001	2,126	1.7	6,574	124,358
Subtotal Streetlights	6,485	5.1	20,055	565,519
Water/Sewage				
Gas Distribution	59	0.0	581	5,077
Gas Purchase	17	0.0	52	1,206
Propane Air Plant	5	0.0	14	625
Sewer Pumping	723	0.6	2,720	53,343
Water & Gas Administration	158	0.1	489	9,534
Water & Gas Distribution	730	0.6	6,001	53,763
Water Distribution	15	0.0	45	1,083
Water Pumping	16,905	13.4	52,603	740,545
Subtotal Water/Sewage	18,612	14.7	62,507	865,175
Steam Plant				
Steam generation	87,329	69.1	918,841	1,384,394
Subtotal Steam Plant	87,329	69.1	918,841	1,384,394
Total	126,370	100.0	1,110,132	4,012,229

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Buildings				
Aerial Lift Bridge				
Electricity	290	0.2	896	16,560
Natural Gas	13	0.0	227	1,489
Subtotal	303	0.2	1,123	18,049
Animal Shelter				
Electricity	40	0.0	124	2,612
Subtotal	40	0.0	124	2,612
Armory Toolhouse				
Electricity	241	0.2	746	15,269
Natural Gas	375	0.3	6,348	31,302
Subtotal	616	0.5	7,093	46,572
Bayfront Park				
Electricity	34	0.0	106	3,776
Subtotal	34	0.0	106	3,776
Bldg Maintenance Shop				
Electricity	74	0.1	230	5,274
Natural Gas	157	0.1	2,655	15,214
Subtotal	231	0.2	2,885	20,488
Canal Pk street lighting				
Electricity	75	0.1	233	4,411
Subtotal	75	0.1	233	4,411
Casino Ramp				
Electricity	322	0.3	997	17,195
Subtotal	322	0.3	997	17,195
Chester Park facilities				
Electricity	113	0.1	350	10,039
Natural Gas	42	0.0	719	4,310
Subtotal	156	0.1	1,069	14,349

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
City Center West				
Electricity	220	0.2	682	14,189
Subtotal	220	0.2	682	14,189
City Hall				
Electricity	937	0.7	2,897	52,074
Natural Gas	133	0.1	2,243	12,862
Subtotal	1,069	0.8	5,140	64,936
Coney Island Ramp				
Electricity	26	0.0	80	1,719
Subtotal	26	0.0	80	1,719
Crosswalks/Area lighting				
Electricity	17	0.0	52	2,274
Subtotal	17	0.0	52	2,274
Duluth Community Clubs				
Electricity	165	0.1	510	12,110
Natural Gas	203	0.2	3,430	19,578
Subtotal	368	0.3	3,940	31,688
Duluth Recreation Centers				
Electricity	120	0.1	371	10,687
Subtotal	120	0.1	371	10,687
Duluth Zoo				
Electricity	1,414	1.1	4,373	68,022
Natural Gas	391	0.3	6,626	38,428
Subtotal	1,805	1.4	10,999	106,450
Enger/Lester Golf Courses				
Electricity	208	0.2	644	15,226
Subtotal	208	0.2	644	15,226

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Firehalls				
Electricity	355	0.3	1,098	21,770
Natural Gas	315	0.2	5,338	30,964
Subtotal	670	0.5	6,436	52,733
Fleet Services				
Electricity	177	0.1	546	10,886
Natural Gas	83	0.1	1,413	8,148
Subtotal	260	0.2	1,959	19,034
Fryberger Arena				
Electricity	394	0.3	1,218	23,417
Subtotal	394	0.3	1,218	23,417
General City Facilities				
Electricity	434	0.3	1,342	30,655
Natural Gas	41	0.0	691	4,143
Subtotal	475	0.4	2,033	34,797
Glen Avon Hockey Bldg				
Electricity	40	0.0	123	3,170
Subtotal	40	0.0	123	3,170
Good Fellowship Club				
Electricity	72	0.1	223	5,367
Subtotal	72	0.1	223	5,367
Grant/Central Field				
Electricity	35	0.0	108	2,876
Natural Gas	19	0.0	322	1,931
Subtotal	54	0.0	430	4,807
Leif Erickson Park				
Electricity	24	0.0	73	1,625
Subtotal	24	0.0	73	1,625

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Main Library				
Electricity	762	0.6	2,358	39,807
Subtotal	762	0.6	2,358	39,807
Merritt Park Field House				
Electricity	22	0.0	68	2,286
Subtotal	22	0.0	68	2,286
Palladio Skywalk				
Electricity	45	0.0	139	2,286
Subtotal	45	0.0	139	2,286
Park Point				
Electricity	13	0.0	40	1,087
Subtotal	13	0.0	40	1,087
Pedestrian bridge (Canal)				
Electricity	31	0.0	95	1,974
Subtotal	31	0.0	95	1,974
Peterson Arena				
Electricity	351	0.3	1,087	22,059
Subtotal	351	0.3	1,087	22,059
Police Garage/Canal Pk				
Electricity	112	0.1	345	6,959
Natural Gas	8	0.0	127	820
Subtotal	119	0.1	473	7,779
Portman Square Field				
Electricity	73	0.1	225	3,076
Subtotal	73	0.1	225	3,076
Radio Tower				
Electricity	0	0.0	1	62
Subtotal	0	0.0	1	62

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Toolhouses				
Electricity	183	0.1	567	13,687
Natural Gas	268	0.2	4,540	26,167
Subtotal	452	0.4	5,107	39,854
Wade Stadium				
Electricity	159	0.1	491	12,271
Natural Gas	11	0.0	186	1,179
Subtotal	170	0.1	677	13,449
Washington Center				
Electricity	105	0.1	325	6,727
Subtotal	105	0.1	325	6,727
Wheeler Field				
Electricity	105	0.1	325	12,604
Subtotal	105	0.1	325	12,604
Subtotal Buildings	9,849	7.8	58,952	672,966
Vehicle Fleet				
Admin. Services-Fleet Division				
Gasoline	32	0.0	389	2,967
Diesel	8	0.0	101	715
Subtotal	41	0.0	490	3,682
Admin. Services-Property Mgt.				
Gasoline	61	0.0	729	5,848
Diesel	2	0.0	23	176
Subtotal	63	0.0	753	6,024
DECC				
Gasoline	1	0.0	11	86
Subtotal	1	0.0	11	86

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Duluth Public Library				
Gasoline	9	0.0	113	860
Subtotal	9	0.0	113	860
FAVR Program-2001				
Gasoline	171	0.1	2,049	182,136
Subtotal	171	0.1	2,049	182,136
Finance-Assessors Division				
Gasoline	5	0.0	64	484
Subtotal	5	0.0	64	484
Fire Department				
Gasoline	97	0.1	1,167	8,810
Diesel	71	0.1	857	6,060
Subtotal	168	0.1	2,025	14,870
Job Training-special grant				
Gasoline	6	0.0	72	535
Subtotal	6	0.0	72	535
Parks/Rec-Golf Division				
Gasoline	0	0.0	1	8
Subtotal	0	0.0	1	8
Parks/Rec-Parks/Rec Division				
Gasoline	43	0.0	516	3,871
Diesel	3	0.0	31	259
Subtotal	46	0.0	547	4,130
Parks/Rec-Zoo Division				
Gasoline	9	0.0	114	860
Subtotal	9	0.0	114	860

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Planning-Business Development				
Gasoline	6	0.0	73	557
Subtotal	6	0.0	73	557
Police Department				
Gasoline	945	0.7	11,355	85,587
Diesel	1	0.0	15	102
Subtotal	947	0.7	11,370	85,689
PW&U-Engineering				
Gasoline	81	0.1	973	7,353
Diesel	1	0.0	12	77
Subtotal	82	0.1	985	7,430
PW&U-Park Maintenance				
Gasoline	54	0.0	653	4,925
Diesel	52	0.0	630	4,467
Subtotal	106	0.1	1,283	9,392
PW&U-Street Maintenance				
Gasoline	135	0.1	1,617	12,375
Diesel	910	0.7	11,066	76,277
Subtotal	1,045	0.8	12,683	88,653
PW&U-Traffic Engineering				
Gasoline	59	0.0	708	5,641
Diesel	10	0.0	125	891
Subtotal	69	0.1	832	6,532
PW&U-Utility Operations				
Gasoline	942	0.7	11,317	86,120
Diesel	279	0.2	3,397	23,917
Subtotal	1,222	1.0	14,714	110,037

Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Steam Plant				
Gasoline	24	0.0	293	2,211
Subtotal	24	0.0	293	2,211
W&G CNG Vehicles				
CNG	77	0.1	1,304	N/A
Subtotal	77	0.1	1,304	N/A
Subtotal Vehicle Fleet	4,097	3.2	49,777	524,175
Streetlights				
Metered Street Lighting				
Electricity	2,207	1.7	6,825	129,097
Subtotal	2,207	1.7	6,825	129,097
Non-metered Street Lighting				
Electricity	2,152	1.7	6,656	312,064
Subtotal	2,152	1.7	6,656	312,064
Traffic signals-2001				
Electricity	2,126	1.7	6,574	124,358
Subtotal	2,126	1.7	6,574	124,358
Subtotal Streetlights	6,485	5.1	20,055	565,519
Water/Sewage				
Gas Distribution				
Electricity	30	0.0	93	2,237
Natural Gas	29	0.0	488	2,840
Subtotal	59	0.0	581	5,077
Gas Purchase				
Electricity	17	0.0	52	1,206
Subtotal	17	0.0	52	1,206

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Propane Air Plant				
Electricity	5	0.0	14	625
Subtotal	5	0.0	14	625
Sewer Pumping				
Electricity	688	0.5	2,129	49,766
Natural Gas	35	0.0	592	3,578
Subtotal	723	0.6	2,720	53,343
Water & Gas Administration				
Electricity	158	0.1	489	9,534
Subtotal	158	0.1	489	9,534
Water & Gas Distribution				
Electricity	460	0.4	1,421	28,063
Natural Gas	271	0.2	4,580	25,700
Subtotal	730	0.6	6,001	53,763
Water Distribution				
Electricity	15	0.0	45	1,083
Subtotal	15	0.0	45	1,083
Water Pumping				
Electricity	16,882	13.4	52,210	738,104
Natural Gas	23	0.0	394	2,441
Subtotal	16,905	13.4	52,603	740,545
Subtotal Water/Sewage	18,612	14.7	62,507	865,175

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Corporate Greenhouse Gas Emissions in 1996
Base Year Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)	Cost ($)
Steam Plant				
Steam Generation				
Electricity	2,091		6,468	72,367
Natural Gas	15,061		254,942	378,917
Light Fuel Oil	110		1,386	5,184
Bituminous Coal	4,988		48,259	
Sub-bituminous Coal	65,080	69.1	607,786	927,926
Subtotal	87,330	69.1	918,841	1,384,395
Total	126,370	100.0	1,110,132	4,012,229

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Community Greenhouse Gas Emissions in 2020
Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Residential			
Duluth residential			
Electricity	488,663	15.5	1,512,643
Natural Gas	192,856	6.1	3,264,513
Light Fuel Oil	68,391	2.2	865,401
Subtotal	749,910	23.7	5,642,557
Subtotal Residential	749,910	23.7	5,642,557
Commercial			
DLH Air National Guard Base			
Diesel	13	0.0	162
Light Fuel Oil	78	0.0	993
Subtotal	92	0.0	1,156
Duluth Commercial			
Electricity	826,415	26.1	2,558,148
Natural Gas	148,331	4.7	2,510,820
Subtotal	974,746	30.8	5,068,967
Georgia Pacific-DLH Hardboard			
Diesel	781	0.0	9,488
Heavy Fuel Oil	17,694	0.6	201,466
Subtotal	18,475	0.6	210,954
ISD #709			
Light Fuel Oil	132	0.0	1,667
Subtotal	132	0.0	1,667
NW Airlines-Airbus Maintenance			
Diesel	20	0.0	247
Subtotal	20	0.0	247

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Community Greenhouse Gas Emissions in 2020
Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Northland Crushing Inc.			
Diesel	126	0.0	1,528
Subtotal	126	0.0	1,528
Steam Plant			
Diesel	152	0.0	1,843
Light Fuel Oil	160	0.0	2,029
Bituminous Coal	5,186	0.2	50,178
Sub-Bituminous Coal	67,682	2.1	632,093
Subtotal	73,181	2.3	686,143
UMD			
Light Fuel Oil	962	0.0	12,178
Heavy Fuel Oil	642	0.0	7,310
Subtotal	1,604	0.1	19,487
WLSSD			
Light Fuel Oil	635	0.0	8,034
Subtotal	635	0.0	8,034
Subtotal Commercial	1,069,010	33.8	5,998,184
Industrial			
Duluth industries			
Electricity	869,125	27.5	2,690,355
Natural Gas	41,966	1.3	710,359
Subtotal	911,091	28.8	3,400,713
Subtotal Industrial	911,091	28.8	3,400,713

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Community Greenhouse Gas Emissions in 2020
Detailed Report

	Equiv CO2 (tons)	Equiv CO2 (%)	Energy (million Btu)
Transportation			
Marine Transportation			
Diesel	11,264	0.4	136,895
MDO Bunker C	5,525	0.2	62,905
Subtotal	16,788	0.5	199,800
Rail Transportation			
Diesel	42,118	1.3	511,887
Subtotal	42,118	1.3	511,887
Road Transportation			
Gasoline	267,595	8.5	3,214,486
Diesel	29,460	0.9	358,047
Propane	3,138	0.1	45,148
CNG	757	0.0	12,814
Subtotal	300,950	9.5	3,630,495
Subtotal Transportation	359,856	11.4	4,342,182
Waste			
Solid Waste/Landfill			
Paper Products	55,783	1.8	
Food Waste	18,623	0.6	
Plant Debris	-515	0.0	
Wood/Textiles	-1,287	0.0	
Subtotal	72,603	2.3	
Subtotal Waste	72,603	2.3	
Total	3,162,471	100.0	19,383,636

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