



CLIMATE PROTECTION PLAN

FINAL

January 2002 Update



Prepared by
Jayne Somers
City of Madison Engineering Division
City-County Building Room 115
210 Martin Luther King Jr. Boulevard
Madison, WI 53710

ACKNOWLEDGEMENTS

The 2002 update was amended by David Benzschawel, City Engineering Division. We would like to thank the following individuals for their assistance in collecting data and giving advice and support during the development of this Plan:

City of Madison Environmental Action Team (Formed December 1998)

David Benzschawel, Engineering
Peter Blossom, City Architect
Dorothy Conniff, Community Services
Michael Dailey, Engineering
David Denig-Chakroff, Water Utility
George Dreckman, Recycling Coordinator
David Dryer, Transportation
Marilyn Dukes-Winters, Water Utility
John Hausbeck, Public Health
Hickory Hurie, Planning and Development
Peter Munoz, Mayor's Office
Mark Olinger, Planning and Development
Judy Olson, Alderperson
Sharon Persich, Metro Transit
Ken Ringle, Purchasing
Jayne Somers, Engineering
William Vandenbrook, Motor Equipment

City of Madison

Susan Bauman, Mayor
Larry Nelson, City Engineer
David Benzschawel, Engineering
Mike Martinelli, City Forester
Arthur Ross, Pedestrian and Bicycle Coordinator
Bernie Wendricks, Former Assistant City Engineer

Madison Gas & Electric

Cathy Berklund, Sales Services Director
Joanne Kelly, Director, Residential and Community Services

Alliant Energy

Gary Ambach, Marketing Manager

State of Wisconsin

Alex DePillis, Wisconsin Energy Bureau
Neil Howell, Dept. of Administration (DOA)
Jeffery Knight, DOA
Eric Mosher, Department of Natural Resources (DNR)
Martin Romero, DOA
Elizabeth Stolp, DOA

Dane County

Gerald Mandli, Solid Waste Manager
John Reindl, Recycling Manager

International Council for Local Environmental Initiatives

Abby Young, Director, US Cities for Climate Protection Campaign
Bill Drumheller, Program Assistant
Prisna Nuengsigkapan, Quantification Program Assistant
Matt Nichols, Sustainable Transportation Program

For more information on this Plan, please contact:

David Benzschawel
City of Madison Engineering Division
Tel. 608-266-4091
Fax 608-264-9273
e-mail: dbenzschawel@ci.madison.wi.us

An electronic version of the Plan text, as well as links to various City programs, can be found at our website: <http://www.ci.madison.wi.us/environment/default.htm>

Funding for this Plan was provided by ICLEI.

TABLE OF CONTENTS

Executive Summary	5
<u>INTRODUCTION:</u>	
Climate Change	9
➤ Air Pollution and Climate Change	
➤ Potential Impacts of Climate Change in Wisconsin	
➤ Cities and Climate Change	
A Climate Protection Plan	10
Madison’s Greenhouse Gas Analysis and Results	11
Sector Growth Projections	11
Greenhouse Gas Emission Reduction Target	12
The City of Madison	12
➤ University of Wisconsin	
<u>RESOURCE USAGE PATTERNS and EXISTING ENVIRONMENTAL PROGRAMS</u>	14
Energy	
➤ Utility Power Plants in Madison	
➤ State of Wisconsin Steam Plants	
➤ Community Energy Use	
- Electricity	
- Natural Gas	
- Heating Oil, Propane and Diesel Fuel	
➤ Sector Greenhouse Gas Emissions	
Transportation	17
➤ Vehicles	
➤ Streets and Roadways	
➤ Boats	
➤ Metro Transit	
➤ Bicycles	
➤ Pedestrians	
➤ Airport	
➤ Rail	
➤ Rideshare Program	
➤ State Fleet	
➤ Taxis	
➤ Parking	
➤ Sector Greenhouse Gas Emissions	
Solid Waste and Recycling	22
➤ Waste Generation	
➤ Landfills	
➤ Recycling	
➤ Composting	

Tree Planting 25

City Government 26

- Environmental Staff and Programs
- Buildings
- Fleet
- Purchasing
- Streetlights
- Traffic Signals
- Waste Generation and Recycling
- Madison Metropolitan Sewerage District
- Madison Water Utility
- Madison Area Sustainable Lifestyle Campaign “Eco-Teams”
- Community Development Authority (CDA)
- Madison Metropolitan School District

LOCAL ACTION PLAN: 31

Listing of Measures with Description

- Waste and Recycling
- Climate Change Education and Tree Planting
- Energy
- Transportation

Plan Implementation 40

- Immediate Next Steps
- Staffing
- Funding

Appendix A: Community Greenhouse Gas Emissions

1. 1990 Analysis
2. 1996 Analysis
3. 2010 Projections

Appendix B: City Government (Corporate) Greenhouse Gas Emissions

1. 1990 Analysis
2. 1996 Analysis

Appendix C: Community Existing and Proposed Measures to Reduce Greenhouse Gas Emissions

Appendix D: City Government Existing and Proposed Measures to Reduce Greenhouse Gas Emissions

Appendix E: Common Council Resolutions

Appendix F: Madison Steam and Generation Plant Locations and Local Utility Generation Mix

Appendix G: Recycling Program Data

Appendix H: Excerpt from “1998 Report Card on Madison’s Environmental Health”

Appendix I: Nine Springs Digester Gas Data

Appendix J: *Rideshare, Etc.* Data

Appendix K: Energy Star Partnership Requirements

Appendix L: UW Waste Generation and Recycling

Appendix M: Public Hearing Minutes (April 24, 2000)

Appendix N: Summary of Written Comments on Draft Plan

Appendix O: Summary of Changes from Draft to Final Plan

EXECUTIVE SUMMARY

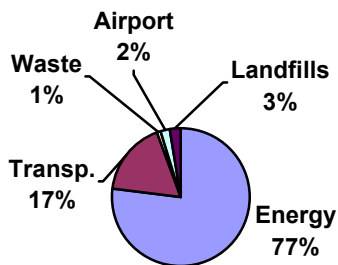
The earth's climate is predicted to change because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases – primarily carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons. The heat-trapping property of these gases is undisputed. Although there is uncertainty about exactly how and when the earth's climate will respond to enhanced concentrations of greenhouse gases, observations indicate that detectable changes are under way. Fossil fuels are the main source of carbon dioxide and local governments can play a key role in a community's use of energy.

The Madison Common Council realized that local actions taken to reduce greenhouse gas emissions and increase energy efficiency provide many local benefits: decreasing air pollution, creating jobs, reducing energy expenditures and saving money for the City government, its businesses and its citizens. Consequently, on March 3, 1998, our Common Council committed Madison to analyzing and reducing the emission of greenhouse gases. By passing Council Resolution 23181, the City of Madison joined a family of more than 290 cities and counties around the world in the Cities for Climate Protection Campaign. The City of Madison Engineering Division proceeded to conduct a greenhouse gas analysis for Madison and develop this Climate Protection Plan. Following is a summary of the analysis, Madison's existing environmental programs, and recommendations for future measures to reduce greenhouse gas emissions¹.

Madison Greenhouse Gas Emissions (tons CO₂)

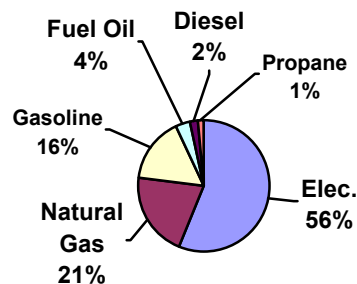
	1990	1996
Energy	2,985,872	4,077,163
Transportation	621,397	782,960
Waste	57,007	57,957
Airport	75,712	75,712
Landfills	84,863	84,863
Total	3,824,851	5,078,655
Per Capita Emissions	20	24.9

1990 CO₂ Emissions by Source



Energy use is by far the greatest contributor of greenhouse gas emissions in our community (77%). The largest single consumer of energy and source of greenhouse gas emissions in Madison is the State of Wisconsin. The State's energy use is 32% of the City's total commercial/institutional sector usage. Purchases of electricity by the University alone account for 9% of MG&E's total electricity sales.

1990 CO₂ Emissions by Fuel



¹ The accuracy of the data and analysis is the responsibility of the author. Please submit any comments, corrections or additions to the City of Madison Engineering Division.

The following table shows Madison’s per capita emissions relative to select Cities for Climate Protection members.

1990 Greenhouse Gas Emissions

City	Population	Tons CO2	Per Capita Emissions
Ann Arbor, MI	109,592	1,694,293	15.5
Overland Park, KS	138,171	2,280,000	16.5
Schenectady Co., NY	149,285	1,832,676	12.3
Chula Vista, CA	168,000	1,214,000	7.2
Madison, WI	190,766	3,824,852	20.0
Tuscon, AZ	405,390	9,527,394	23.5
Twin Cities, MN	628,000	14,000,001	22.3

Madison Environmental Programs

The following is a summary of Madison’s strongest environmental programs. Madison can build on these strengths to achieve its greenhouse gas reduction goals.

- First curbside recycling program in the nation (began collecting newspapers in 1968). Madison currently recycles 50% of its waste.
- Extensive bicycle program with bike racks, lockers, and over 100 miles of bikeways.
- Extensive Metro Transit bus system with 164 buses daily.
- Methane gas utilization at sewerage plant and two largest landfills for electricity and steam generation.
- Streetlight conversion from mercury vapor and incandescent bulbs to high-pressure sodium (11,000 fixtures).
- Conversion of 200 red traffic signals to light-emitting diode (LED) fixtures.
- School District, City, and County participation in the EPA Energy Star Buildings Partnership.
- Full member in the ICLEI Cities for Climate Protection Campaign.
- Largest wind power project (11 MW) in the eastern United States. Implemented by the local utility, MG&E, production from the 17 wind turbines began in June 1999. The wind program sold out faster than any other green power program in the U.S.
- Rideshare Etc. program operates 67 vanpools with 900 riders.
- No pesticide or fertilizer use on green spaces or parks.
- 2500 trees planted per year.
- Sustainable Lifestyle Campaign started 40 neighborhood ecoteams.

Local Action Plan

This Climate Protection Plan is a living document and input from the public is sought and encouraged. A plan can never be put into action without support from all key stakeholders. In the case of this Climate Protection Plan, which is very broad reaching and covers almost all aspects of our community, it is especially important to incorporate your ideas.

Madison’s Climate Protection Plan focuses on City, County, and State facilities and programs as well as local utility and commercial sector energy efficiency measures. There is less emphasis on residential and industrial energy use, transportation, and waste as these sectors constitute a smaller proportion of our emissions. Following is a summary of the proposed measures to reduce greenhouse gas emissions in Madison.

The greatest contribution to reducing emissions in Madison is the continuation of three existing programs which require state government and private sector support:

- Madison Pride and other recycling programs: 56,578 tons CO₂
- MG&E energy efficiency programs: 35,098 tons CO₂

- Utilization of methane gas for electricity generation at County landfills and Madison Metropolitan Sewerage Plant: 20,163 tons CO₂

Other significant proposed new measures are:

- Energy efficiency retrofits of City buildings: 4108 tons CO₂
- Curbside recycling of box board and mixed household paper: 9990 tons CO₂
- Commercial green building program: 7281 tons CO₂
- Green Fleet program
- Clean Cities program with new fueling facilities
- Traffic signal red bulb conversion to LEDs: 1400 tons CO₂

Additional proposed new measures, while individually smaller in CO₂ savings, are very important and add up to over 30,000 tons of CO₂ reduced. The following table summarizes quantified new measures. A complete description of all proposed measures is at the end of this Plan.

MADISON CLIMATE PROTECTION PLAN

Quantified Proposed Action Measures to Reduce Greenhouse Gas Emissions

<u>Measure</u>	<u>Savings (tons CO₂)</u>
<i>City Programs</i>	
Add mixed-paper and box board to curbside recycling program	9990
Continue city tree planting program	63
Include green building requirement for TIF funds	7281
Continue Sustainable Lifestyle Campaign	242
Implement commercial sector green building program	15210
Convert all red traffic signals to LED fixtures	1400
Increase use of Metro Transit bus system	64
Convert 600 streetlights to high-pressure sodium	1400
<i>City Fleet</i>	
Use ethanol in existing flex-fuel vehicles (25-30 autos)	67
Add fuel efficiency to criteria for new vehicle purchase	1057
Conduct training on efficient driving for fleet drivers	1057
Include training or info. on alternatives to fleet use	211
<i>City Buildings</i>	
Retrofit FIFTEEN largest energy-using bldgs., incl. one to Energy Star standards	4108
Introduce green building considerations in new building design	259
Conduct education program for employees on energy efficiency	517
Add renewable energy source to one MORE city building	26
<i>Metro Transit</i>	
Increase green power purchase by 25% (to 50%)	1425
<i>Private Programs</i>	
Double industry participation in EPA ClimateWise Program	2661
Continuation of energy efficiency programs (MG&E and Alliant Energy)	35098
Plant 120 trees per year (MG&E)	4
Increase Yellow Bike program	593

Increase Bike-to-Work Week participation	35
--	----

∇ Measure is contingent upon access to Public Benefits Fund

State and County Programs

Implement VOLUNTARY Dane County Green Building Program	15210
Increase state fleet alternative fuel vehicles to 2000 - DONE	1094

* on-going

✓ measures not included in the analysis for tons of CO₂ reduced

Introduction

CLIMATE CHANGE

Air Pollution And Climate Change

The world's population is burning carbon-based fossil fuels faster than the earth's natural systems can absorb the by-products of combustion. These by-products include carbon dioxide (CO₂), hazardous air pollutants (HAPs) and criteria air pollutants such as sulfur dioxide (SO₂), particulate matter (PM), volatile organic compounds (VOCs), carbon monoxide (CO) and nitrogen oxides (NO_x). Increased CO₂ emissions are resulting in higher concentrations of CO₂ in the atmosphere, raising concern about elevated temperatures and climate change. Scientific evidence of atmospheric warming continues to grow and there is broad international agreement that reducing CO₂ emissions is a sensible precaution until more is known about global warming. Evidence of the detrimental health impacts of HAPs, CO, NO_x, SO₂, and PM is well documented and studied, however. Any efforts to reduce fossil fuel combustion will improve air quality and help mitigate the negative impacts of uncontrolled energy use on human and ecosystem health.

Potential Impacts Of Climate Change In Wisconsin

The United States Environmental Protection Agency predicts the most likely climate changes will be in precipitation, soil moisture, sea level, and temperature. Global warming would do more than add a few degrees to today's average temperatures. Cold spells still would occur in winter, but heat waves would be more common. Some places would be drier, others wetter. Perhaps more important, precipitation may come in short, intense bursts which could lead to flooding. Over the next century, Wisconsin's climate may change significantly. Based on projections, by 2100 temperatures in Wisconsin could increase by about 4F. Small changes in temperature can dramatically alter the climate (the temperature during the Ice Age was only 5-10F colder than the Earth's average temperature today). Precipitation is predicted to increase by 15-20%. The frequency of extreme hot days in summer is expected to increase along with the general warming trend. Higher temperatures and increased frequency of heat waves could increase the number of heat-related deaths and the incidence of heat-related illnesses. Wisconsin, with its irregular, intense heat waves, seems somewhat susceptible. In Milwaukee, one study projects that a 3F warming could almost double heat-related deaths during a typical summer from 30 to about 55. The elderly, particularly those living alone, are at greatest risk. There is concern that climate change could increase concentrations of ground-level ozone. If a warmed climate causes increased use of air conditioners, air pollution emissions from power plants will also increase. Warming and other climate changes could expand the range of disease-carrying insects, thus increasing the potential for transmission of diseases such as malaria and dengue fever. If conditions become drier, the current range and density of forests could be reduced and replaced by grasslands and pasture.² We can already see possible impacts of warming in Madison, including Lake Mendota freezing later and for shorter periods than in the past.

Cities And Climate Change

One city alone cannot resolve the issue of climate change. However, as more cities take action to reduce greenhouse gases, current climate change trends may be affected. Cities are internationally recognized for their role in contributing to and reducing carbon dioxide emissions. Cities that take action found they can impact how cities are built, where roads are placed, and make local decisions which affect the way citizens live, work, and play. Local energy use varies significantly depending on urban form, land use, transportation, and utilization of energy. Cities make decisions on all these elements and are important partners in climate protection because they exercise key powers over urban and transportation infrastructure, waste management, parks, and local buildings and facilities. These items all relate directly to the contribution of greenhouse gas emissions and correlated energy use.

² U.S. Environmental Protection Agency (Sept.1997). "Climate Change and Wisconsin". Office of Policy, Planning and Evaluation. EPA 230-F-97-008ww.

A CLIMATE PROTECTION PLAN

In 1998, the City of Madison applied for and received a grant from the International Council of Local Environmental Initiatives (ICLEI) Cities for Climate Protection Campaign (CCP) to develop a Climate Protection Plan. A resolution was passed by the Madison Common Council in March 1998 endorsing the Plan (see Appendix E). ICLEI's purpose is to improve the capacity of local authorities to prevent environmental problems, respond effectively to problems when they arise, and enhance the natural and built environment at the local level. The CCP Campaign recognizes that municipalities are the level of government closest to the people and the success of global action depends on support from people in communities everywhere.

Madison is one of 78 jurisdictions in the United States developing a Climate Protection Plan. Greenhouse gas reduction plans provide a bottom-up approach to a complex problem and are being used as models for cities across the country. The plan creates local policy measures which have multiple benefits to the City while at the same time identifying a carbon dioxide reduction goal through the implementation of those measures. In other words, even without the benefits of carbon dioxide reduction, these policies reduce consumption and aim toward a cleaner, more pedestrian friendly and integrated City. Local actions to reduce greenhouse gas emissions and increase energy efficiency provide many local benefits: decreased air pollution, more jobs, reduced energy expenditures, and money saved for City government, its businesses and its citizens.

A new study funded by the United States Department of Energy (DOE) Energy Fitness Program shows that implementing cost-effective energy efficiency technologies in Wisconsin would, by 2010, create 8,500 jobs, increase disposable income by \$490 million and gross state product by \$41 million, and reduce state greenhouse gas emissions by 7.7 million tons and projected statewide electricity use by 9 million megawatt hours.³ According to RENEW Wisconsin, \$6 billion dollars goes out of state each year to purchase coal, oil, and natural gas since Wisconsin has no fossil fuel resources of its own.

The State of Wisconsin developed a Climate Change Action Plan in May 1998. Madison is the first city in Wisconsin to develop a Climate Protection Plan. The Plan will be implemented primarily through voluntary efforts. Some of the action measures will be implemented by municipal government to demonstrate leadership in CO₂ reduction and encourage personal and organizational action throughout the community.

There are four steps in developing a Climate Protection Plan:

- Conduct a baseline greenhouse gas analysis for 1990
- Forecast greenhouse gas emissions for 2010
- Establish a greenhouse gas reduction target
- Develop an implementation plan to meet the reduction goal

An Environmental Action Team composed of representatives from various City departments was formed in December 1998 to oversee the development of this Climate Protection Plan. The Team has been meeting bimonthly and their participation is critical to the Plan's success.

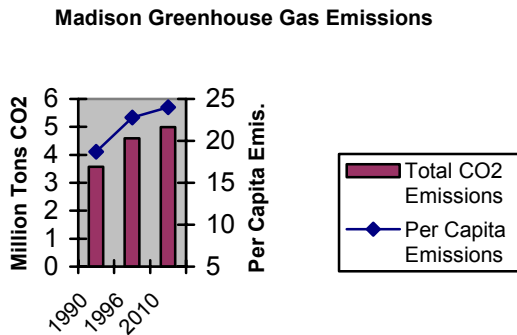
A draft Madison Climate Protection Plan was completed in February 2000, approximately 14 months after receipt of the ICLEI grant. The Draft Plan was distributed for review to various public and private entities via e-mail, post and the City environmental webpage. Excellent comments were received from many state and local government staff as well as the Wisconsin Environmental Decade (see Appendix N for a summary of comments received). In addition, the Madison Commission on the Environment hosted a public hearing April 24, 2000. The hearing was attended by 15 citizens, 9 of which testified. Of these, 7 were in favor of Plan adoption but several wanted to see the Plan strengthened (see Appendix M for meeting minutes). A press release announcing the

³ UW-Madison, WDNR, and the Leonardo Academy (February 1998). "The Economic and Greenhouse Gas Emissions Impacts of Energy Efficiency Investments: A Wisconsin Case Study"

draft Plan and public hearing was published by local newspapers and aired on radio for Earth Day.

GREENHOUSE GAS EMISSIONS ANALYSIS AND RESULTS

The first step in developing a plan to reduce greenhouse gases is to identify sources and quantities of emissions in Madison. An emission inventory was conducted for the baseline year of 1990 and an interim year of 1996. This inventory includes only carbon dioxide (generated by combustion of fossil fuel) and methane (generated from landfill waste decay). The inventory covers residential, commercial, industrial and transportation sector emissions of CO₂ and Madison's portion of landfill gas generation. The inventory includes the airport but does not cover a small subset of emissions that are not readily controlled by local government actions (such as locomotive engines). Generally, CO₂ emissions are lower in temperate climates, areas of high urban density, and cities which utilize hydropower for electricity generation. CO₂ emissions are higher in areas of temperature extremes where more energy is spent on heating and cooling and utilities burn coal (such as Madison).



As with any plan, many assumptions were made and data collection to improve our analysis continues. A value for the electricity sector of 0.26 tons CO₂/mmBtu was used. This is based on the statewide generation mix of Wisconsin's electric utilities. Madison's greenhouse gas analysis considers all electricity consumed in the City, not just power plants located within the City limits. This plan is a work in progress and costs and indicators will be added to aid city officials and others in their decision-making. It should be noted for natural gas usage that 1990 and 1996 were extreme winter weather years in Wisconsin.

1990 had 6686 degree days, which is warmer than usual. 1996 had 8124 degree days, which is colder than usual. Average annual degree days are 7600.

SECTOR GROWTH PROJECTIONS

Projections of greenhouse gas emissions in 2010 were made based on growth factors for each sector. The emissions assume a business-as-usual scenario with no measures taken to reduce fossil fuel use. The projected percentage growth in each sector since 1990 is as follows:

Electricity *

Expected Growth from 1990 - 2010

Residential	32% [±]
Commercial	46%
Industrial	56%

Natural Gas *

Expected Growth from 1990 - 2010

Residential	64%
Commercial	22%
Industrial	28%

Transportation and Waste

Expected Growth from 1990 - 2010

Vehicle Miles Traveled	26%
Waste Generation	30%
Population	20-30%

* Electricity and natural gas growth is based on MG&E service area projections. MG&E forecasts growth for each customer class based on historical trends in use per customer, customer growth, and population growth.

[±] This is average growth over the 20 yr. period. Current growth is expected to be 1.6% per year.

GREENHOUSE GAS EMISSION REDUCTION TARGET

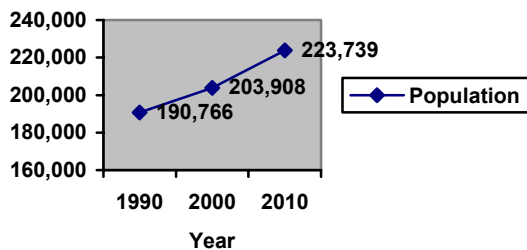
Many cities are selecting a goal of 20% below 1990 emissions and this is what ICLEI recommends. The City of Madison has selected this goal for its internal government operations. It is unclear, however, that Madison can achieve this goal community-wide. The City held an informational public hearing April 24, 2000 to gather community input on the Plan. The consensus of those who testified at the meeting was that the Plan should be more aggressive. An emission reduction goal of 7% below 1990 values was therefore selected. While still ambitious, it was felt that a high goal should be set in order to show the seriousness of the problem and our commitment. This is the same goal the United States committed to under the 1997 Kyoto Protocol (yet to be ratified by Congress).

The cost of reaching this goal is unknown at this time. The current measures quantified represent only ~13% of our target. This means that additional assumptions about the various measures will have to be made in order to determine the magnitude of their savings.

CITY OF MADISON

Madison is the capital of Wisconsin and the second-largest city in the state. The city is primarily commercial and institutional with a relatively small industrial base. Madison is the headquarters for most state agencies and the main campus of the University of Wisconsin (60,000 students, faculty, and staff). The city is situated between two lakes with the downtown area located on an isthmus. Madison, at 43°N latitude, has an average temperature of 20°F in the winter and 68°F in the summer.

Madison's Population Growth



The 1990 census reported the population in Madison to be 190,777. Population in 2000 is estimated to be approximately 203,908 and growing at a rate of 1.2% per year. Madison has one of the lowest unemployment rates in the United States (1.3%). City residents, as well as City government, are fairly progressive and have a strong environmental record. In recent years Madison has been voted one of the best cities to live in the United States (Money Magazine, July 1996).

The City of Madison operates under the mayor/aldermanic form of government. City residents elect a mayor and alderpersons to represent 20 districts in the city. Over 60 committees, boards and commissions play an instrumental role in the decision-making process.

The University of Wisconsin - Madison

The State of Wisconsin is the largest single source of greenhouse gas emissions in Madison and the University is the largest state facility in the city. The University's purchase of electricity from MG&E constituted 9% of MG&E total sales in 1992. The following is a short summary of the University, its resource use, and its environmental programs.

The UW-Madison is a city within a city – equivalent to the 10th largest city in Wisconsin. Significant infrastructure is required to accommodate the university's facility needs. The University has 10,649 acres of land and some 850 buildings, including its own police force, food service, maintenance staff and hospital. The University has a total fleet of about 700 vehicles (a few are propane-powered). With 11,600 parking spaces for a campus population of nearly 60,000, UW-Madison has the lowest ratio of parking to population in the Big Ten. There are two interconnected steam generating plants that are at or near capacity. Coal, natural gas, paper pellets, tires, and wood chips fuel the boilers. Energy production and fuel use is:

1999

1996

Steam 800,000 lbs/hr
Cooling 32,000 tons
Electricity 9.8 MW

Coal 86,188 tons
Paper Pellets 15,096 tons
Natural Gas 1,047,139 million cubic feet (CF6)
Oil 860,068 gallons

The University generated 22,500 tons of rubbish and recycling (including ash) in 1996 (see Appendix L for a breakout of the waste stream). UW has a Solid Waste Alternatives Project (SWAP) to recycle equipment and supplies. The SWAP facility is open to the general public one day a week.

Resource Usage Patterns and Existing Environmental Programs

ENERGY

Utility Power Plants

There are 2 MG&E power plants located in Madison. The largest plant, Blount Street, is primarily coal-fired but also burns some alternative fuels and natural gas. There are also two gas combustion turbines located at the Sycamore substation.

State of Wisconsin Plants

Five steam plants are operated by the State of Wisconsin Department of Administration (DOA). Two of these are located on the University of Wisconsin (UW)-Madison campus – Charter Street, primarily coal fired (also burns alternative fuels such as paper pellets) and Walnut Street, primarily natural gas. The others, Capital Heat and Power, Hillfarms and Mendota Health, utilize a variety of fuels including coal, natural gas, and oil.

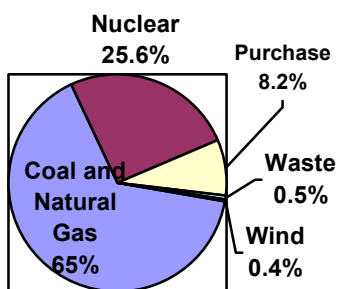
Following are summaries of Madison's energy use by fuel type and sector.

Energy Use: Electricity

There are two electric utilities serving Madison: Madison Gas and Electric (MG&E) and Alliant Energy. MG&E provides approximately 90% of Madison's electricity, with Alliant Energy providing approximately 10%. Both utilities generate most of their electricity from fossil fuel (see Appendix F for the generation mix of MG&E and Alliant Energy). MG&E currently has 25% nuclear generation which will be phased out by 2005 and replaced with natural gas fired combined cycle generation. Although not included in Madison's greenhouse gas analysis, this shift in generation will increase carbon dioxide emissions by approximately 2 million tons (assuming gas use versus coal), significant in comparison with Madison's 1990 total emissions of 3.8 million tons. There is a shortage of electric power in the Madison area, partially due to inadequate transmission lines. MG&E plans to meet the growing demand for electricity by adding natural gas plants.

Both MG&E and Alliant Energy have diesel back-up generator programs in place. MG&E sites

MG&E 1999 Elec. Generation (725 MW)



generators at local businesses. The generators can be run to provide power to the business during an electrical outage or provide power to the grid during periods of high electric demand, thus avoiding potential brown or black-outs (Madison is summer peaking for electricity due to the air conditioning load).

MG&E installed 17 wind turbines (11 MW) in 1999 in Kewaunee County. This is the largest wind project in the eastern United States. These turbines generate 25,000,000 kWh of electricity, enough to power 4400 homes. The electricity from the wind turbines was sold

under a voluntary green power purchase program and sold out in record time, faster than any utility green power program in the United States (9 months). 75% of wind customers are in Madison. MG&E expects its next renewable energy project to be four pilot photovoltaic installations (5 kW each) in the Madison area over the next two years. In 1999, Alliant Energy also installed 127 MW of wind turbines in Iowa (enough to power 38,000 homes).

Alliant Energy has participated in the Climate Challenge Program to voluntarily report carbon dioxide emission reductions since 1991. Through 1998, Alliant recorded 5.5 million metric tons of reductions in its total service area. This was achieved through a variety of projects: generating plants, plant improvements, energy efficiency projects, and environmental stewardship projects (includes planting over 100,000 trees).

Although restructuring of the electric power sector is not likely in the near future for Wisconsin, two changes have occurred in the electric sector. The first is the creation of a Public Benefits Fund to implement energy efficiency programs statewide. The second is a mandate for inclusion of renewable energy in all utilities' generation mix. Utilities were mandated to increase renewable energy generation by 50MW statewide (1997 WI Act 204). MG&E has more than met this obligation with the wind project and 3 MW of wind is now included in MG&E's rate base/tariff. The following tables show the energy use in Madison by fuel, sector and utility.

Residential Electricity Sales (kWh)

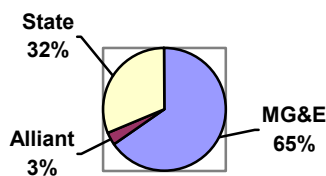
	1990	1996
MG&E	418,293,720	498,541,568
Alliant Energy	<u>37,646,435</u>	<u>44,874,707</u>
Total	455,940,155	543,416,275

Alliant Energy did not provide 1990 data so an estimate of 9% of MG&E sales was used.

Major Commercial and Institutional Energy Suppliers (kWh)

	1990	1996
MG&E	1,244,172,800	1,482,897,900
Alliant Energy	54,788,050	59,799,221
UW	437,954,500	549,945,000
Capital Heat	36,610,000	52,071,500
Mendota Health	45,634,848	43,651,350
Hill Farms	<u>9,267,969</u>	<u>8,922,650</u>
Total	1,819,160,198	2,197,287,621

1990 Major Commercial and Institutional Energy Suppliers



The data for UW, Capital Heat, Mendota Health, and Hill Farms was received from DOA in mmBtu and converted to kWh in order to fit into the software package and be compared with utility generation. The standard conversion factor of 3412 Btu/kWh could not be used since this assumes a typical power plant. The State of Wisconsin's plants are district heating and cooling and have low distribution losses. These plants may be up to 70% efficient versus 30% for a utility plant. Therefore, the standard conversion (or efficiency) was doubled (with a conservative assumption of 60% efficiency). Some state

data is available by fuel source but unfortunately the software does not allow for a direct entry of coal or alternative fuels in the commercial sector.

Industrial Electricity Sales (kWh)

	1990	1996
MG&E	132,124,550	157,475,880
Alliant Energy	<u>54,568,650</u>	<u>59,579,221</u>
Total	186,693,200	217,055,101

Commercial and industrial data were provided combined for both MG&E and Alliant Energy. For this analysis, 90.4%⁴ of MG&E and 50% of Alliant Energy electricity sales were classified as commercial. 9.6% of MG&E and 50% of Alliant Energy sales were classified as industrial. Alliant Energy's non-metered customers were divided equally between commercial and industrial use.

Energy Use: Natural Gas (therms)

	1990	1996	2010
Residential	39,869,343	56,396,385	65,385,723
Commercial	39,053,863	48,838,752	47,645,713
Industrial	<u>39,053,863</u>	<u>48,838,752</u>	<u>49,988,945</u>
Total	117,977,069	154,073,889	163,020,381

MG&E is the only utility provider of natural gas in Madison. 1990 MG&E data could not be sorted by municipality so 1992 actuals were used. MG&E commercial and industrial data was combined. It was divided equally between the two sectors for this analysis.

Energy Use: Heating Oil, Propane, and Building Diesel

Residential (gallons)

	1990	1996
Heating Oil	329,521,619	498,541,568
Propane	<u>29,656,945</u>	<u>44,874,707</u>
Total	359,178,564	543,416,275

Number of households using heating oil and propane was surveyed in the 1990 census. Fuel use per household was estimated using an average household (hh) in Dane County (136 gal/hh distillate oil, 1.81 gal/hh kerosene, and 84.24 gal/hh lp). The following table lists the number of Madison households in 1990 using various fuels for their home heating. Electricity and natural gas from utilities account for 91% of home heating fuels.

	# of households	% of total hh
utility gas	56214	72.67
bottled tank or LP	734	0.95
electricity	14191	18.35
fuel oil & kerosene	4763	6.16
coal or coke	57	0.07
wood	200	0.26
solar	43	0.05
other	803	1.04
<u>none</u>	<u>351</u>	<u>0.45</u>
Total	77356	100

⁴ Assumptions regarding MG&E commercial and industrial data were based on historical sales records.

Total commercial use of fuels is unknown and not included in this analysis. State power plant energy use is included under electricity to avoid double counting.

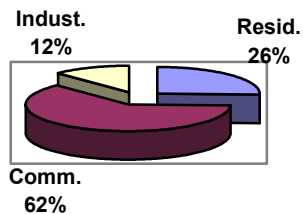
Industrial (gallons)

	Annual
Heating Oil	15,158
Diesel	7,668
<u>Propane</u>	<u>28,821</u>
Total	51,647

Industrial sector data was taken from the 1998 Wisconsin Department of Natural Resources (DNR) Air Emissions Inventory. Fuel use is assumed to have remained constant since 1990. All natural gas use by industry is assumed to be purchased from MG&E. Sawdust used by Oscar Mayer (527.8 tons) is not included in the analysis.

Two companies located in Madison, Promega and Ohmeda, are members of the EPA Climate Wise program.

Energy Sector Emissions (2,985,872 tons CO₂)



TRANSPORTATION

Vehicles

According to the Federal Highway Administration "Highway Statistics Annual Report", vehicle miles traveled (VMT) is calculated using the following equation:

$$\text{VMT} = \frac{\text{motor vehicles in urban areas}}{\text{total motor vehicles (urban \& rural)}} \times \text{avg. mi. traveled/vehicle} \times \text{Madison registered vehicles}$$

VMT is projected to increase 26% by 2010, close to the population growth rate.

	1990	1996
Vehicle miles traveled	1,064,100,000	1,225,200,000
Registered vehicles in Madison	160,219	169,215
Avg. mi. traveled/vehicle (national avg.)	10,556	11,807

Vehicle fuel efficiency for all years is estimated to be:

Vehicle Type	Fuel	Miles per Gallon
Personal vehicle	Gasoline and diesel	18

Personal vehicle	Propane and natural gas (CNG)	17
Commercial vehicle	Gasoline and diesel	14
Commercial vehicle	Propane and natural gas (CNG)	13
Bus	Diesel	4

(source: ICLEI)

The distribution of vehicle fuel use is estimated to be:

Fuel Type	Percentage of Total Fuel Use (%)
Gasoline	90.5
Diesel	6.5
Propane	1.5
CNG	1.5
Total	100

(source: ICLEI)

Streets and Roadways

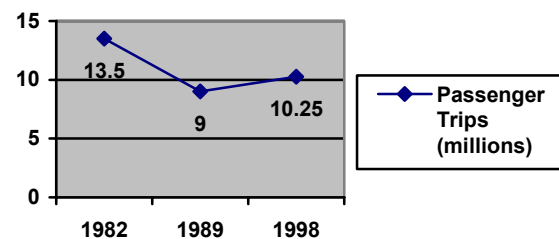
The present arterial roadway system in the Madison urban area generally consists of high-volume traffic roadways leading into the city in a radial pattern from a Beltline route. This system evolved as people began living outside of the central city while working downtown. However, with the growth of various office and research parks on the edge of the city, work trips are now taking place among the outer neighborhoods and suburbs as well as to the central city.

Boats

Madison has several large lakes located within the City (Lake Mendota, Lake Monona, and Lake Wingra) as well as the Yahara River, which connects Lakes Mendota and Monona. There is considerable motorized recreational boat traffic in the summer (including fishing and water skiing). In addition, there are a fair number of jet skis. National CO₂ emissions for marine craft are 3% of the total transportation sector⁵. Since Madison does not have large scale commercial fishing or freight traffic, an estimate of 2% of vehicle miles traveled was added for boats and jet skis.

Metro Transit Bus System

Metro Transit is a national leader in seat-miles per capita provided to its service area. Metro currently operates 164 buses on 23 fixed routes encompassing a 58.6 square-mile area in the Madison area. Average weekday ridership is approximately 40,000. Annual ridership peaked in 1982 at 13.5 mill. passengers (see graph). Since 1989, growth in ridership is ~2% per year.



Metro Transit has several programs to encourage ridership. Monthly and commuter passes, Metro Quik Tix, and 2-4-1 reduced cash fares all offer substantial ride discounts to regular Metro customers. Metro also offers Park and Ride Lots just outside of town. Base cash box fare was \$1.25 but recently increased to \$1.50 due to higher fuel costs.

The Associated Students of Madison (ASM) Bus Pass Program is a cooperative venture of the ASM, the University of Wisconsin, and the City of Madison. The Program provides discounted access to Madison Metro buses for students at UW-Madison during the academic year. Inaugurated in the fall of 1996, this program provides nearly all UW-Madison students with a pass good for unlimited rides on Metro. In exchange, ASM pays a set rate to the City of Madison. Program costs are covered by segregated fees levied on students each semester. Each student pays approximately \$20 per

⁵ U.S. Department of Transportation Federal Highway Administration (June 1998). "Transportation and Global Climate Change". Wash. DC.

semester to maintain the program. In contrast, a student would have to spend \$350 to purchase an equivalent, unlimited Metro pass each month of the academic year.

While the primary purpose of the ASM Bus Pass Program is to provide a cost-effective transportation alternative to UW-Madison students, the program also provides a number of subsidiary benefits as well. The Program makes a positive contribution to the regional environment for all local residents by easing demand for increased parking and road capacity on the campus and throughout the isthmus, as well as reducing air pollution. It provides the City with guaranteed income for, and commitment to, Madison Metro and introduces new consumers to public transportation as a cost-effective and efficient transportation mode. At the same time, the availability of a discounted bus pass enhances housing options for students, who now have convenient, inexpensive access to the entire metropolitan housing market.

Each semester over 20,000 students or 50% of the student body pick up their ASM Bus Pass. UW students using the pass account for close to 20% of Metro's total revenue ridership, taking over 1.8 million rides during the Academic Year 1997-98 and providing \$1.2 million in guaranteed revenue annually to the City in support of these services.

Bicycles

Madison has an extensive bike system comprised of paths, lanes, or designated routes throughout the City. With over 100 miles of bikeways, and more being planned and constructed each year, Madison recognizes the bicycle as a viable means of transportation as well as a popular life long recreational, health and fitness activity. A map of the bikeway system is available free of charge to residents and visitors. With more than 150,000 bicycles in Madison, there is a 3:2 ratio of bicycles to cars. Over 100,000 trips per day are made by bicycle, weather permitting, helping to keep our air clean and our streets less congested. Madison was rated the Fourth Best City for Bicycling in North America by Bicycling Magazine (November 1995).

Since 1995, two free bicycle programs in Madison have been operated by Budget Bicycle, a large private bike shop: Red Bikes and Yellow Bikes. The Red Bike program provides between 50-125 bicycles for citizens to use in the downtown Madison area. The bikes, painted all red, can be seen around the city and are sometimes even found in outlying towns. The Yellow Bike program is a longer-term loan option – a \$75 deposit is required and a helmet and lock are provided. The deposit is refunded upon return of the bicycle.

Pedestrians

Madison has a pedestrian/transit mall, State Street, which runs from the University to the Capital through the main downtown commercial area. State Street is closed to automobile traffic (buses, taxis, and bicycles are allowed). A Pedestrian Transportation Plan for Madison was adopted in 1997.

Airport

The Dane County Regional Airport, located in Madison, is the second largest commercial airport in the state. More than 100 commercial planes depart and arrive at the Airport on an average day. These planes carry more than a million passengers a year. The Airport occupies 4000+ acres, has 110 buildings, 4500 employees, and an economic impact to the area exceeding \$100 million annually. Although only four miles from the City's central business district, there is no easy public transportation to the Airport from downtown. Most passengers use private vehicles or taxis. Metro Transit has one bus route which services the Airport. The Airport is undergoing expansion but projected growth in fuel use is unknown at this time.

The fuel use data below was received from Wisconsin Aviation, the airport fuel supplier. Another company had this contract previously, so no data is available for 1990. Therefore, 1996 data was used in the 1990 analysis and 1998 data was used for 1996. CO₂ emissions were calculated using

a factor of 20 lbs. CO₂ per gallon of fuel. Emissions from fuel use at the Airport are accounted for in the “Other” sector in the software reports, not transportation.

Airport Fuel Use	1996	1998
Jet Fuel	7,180,212	7,404,610
Aviation Fuel	373,619	343,649
<u>Auto Fuel</u>	<u>17,326</u>	<u>26,125</u>
Total Gallons	7,571,157	7,774,384

Rail

Currently, there is only freight rail service in Madison. The closest Amtrak passenger service access point is in Columbus, 26 miles northeast of Madison in Columbia County. Amtrak is considering putting a station in Madison. Both light rail and commuter rail have been considered by various local government and state agencies. Metro Transit commissioned the *Transit Corridor Study: Feasibility Analysis of Light Rail and Improved Bus Services* in April 1992. Subsequent to this study, the Dane County Board of Supervisors adopted Res. 125, 94-95 in October 1994, establishing a committee of citizens and elected officials to explore the feasibility of implementing commuter rail in Dane County. The committee and its four subcommittees conducted over 20 public meetings, received input from transportation and planning experts and officials, and sponsored two informational trips on the Chicago area’s Metro commuter rail system.

Commuter rail is not “light rail”. Commuter rail systems typically operate on the same tracks as freight rail systems, and use diesel locomotives – equipment similar to Amtrak passenger trains – hauling single-level or bi-level rail cars. Some systems use self-propelled rail diesel cars. Typically, commuter rail provides passenger service during peak hours, providing service to a region with many trips into central areas. Most commuter rail systems are integrated with other transit services, such as bus systems, to encourage transfers throughout the region. Among the characteristics of the typical commuter rail system are the following:

- Oriented to peak period work commuters
- Usually connect suburban places/villages with a city center
- Often use existing rail trackage
- Trains have 3-8 passenger cars and a locomotive per train set
- Generally \$1-3 million capital cost per track mile
- Often operate in joint passenger/freight environment

Light rail, on the other hand, is usually comprised of electric powered multi-car or single-car trains operating on either exclusive or shared right-of-ways. It is distinguished by moderate capacity with frequent stops, oriented to all-day, frequent service, and has typical capital start-up costs of \$10-30 million per track mile.

The *Transit Corridor Study: Feasibility Analysis of Light Rail and Improved Bus Services* determined that large capital improvements and startup costs were required (\$183-\$306 million). New trackage, guideways, electrification, yards and shops, and stations would all be required. Considering the costs and projected operating revenue, the City of Madison determined that the transit corridor could not yet support the substantial investment.

Rideshare Program

The Dane County Rideshare Etc. Program serves area commuters who are interested in sharing the ride to work by assisting with information and name-matching for carpools, vanpools, mass transit, and bicycling to work. By working with the area’s large employers, options to use alternative means of transportation are encouraged for commuting. Rideshare Etc. includes 67 vanpools. 95% of the vans come to Madison and approximately 900 riders utilize the vanpool program. The average home-to-work distance of vanpool riders is 17.1 miles and annual VMT reduced is approximately

2,880,000. The program, started in 1974 with 5 vans, now has the participation of 1330 commuters and results in a reduction of 12,000 vehicle miles per day (see Appendix J for Rideshare brochure).

State Fleet

Throughout Wisconsin, the State has 7400 vehicles in its fleet, approximately 1100 of which are alternative fuel vehicles (~15%). The Governor of Wisconsin, Tommy Thompson, established the Governor's Alternative Fuel Task Force in 1990. The distribution of current state alternative fuel vehicles is as follows:

Fuel Type	Number of Vehicles
Ethanol (E85)	870
Propane	150
CNG	80
Soy diesel	4
Total	1104

In Madison, the State has an ethanol pumping station on Dickinson St. and there is one private station (Stop-N-Go) on University Avenue. In 1998, the fuel pumped from the Dickinson St. station was 19,000 gallons of ethanol (E85) and 16,000 gallons of propane. MG&E operates a compressed natural gas (CNG) pumping station at its Blount St. facility.

Taxis

Badger Cab of Madison has been running its entire fleet of 37 vehicles on propane since 1981. The use of propane has resulted in cost savings (25 cents less per gallon over gasoline) and increased vehicle safety. Engines run cleaner and require less maintenance (oil changes have been extended from 2,000 to 4,000 miles). The cost of converting its cars to propane was approximately \$1500 per vehicle. This cost was recovered in approximately six months due to the lower fuel and maintenance costs. Badger Cab uses approximately 350,000 gallons of liquid propane a year.

Parking

The City operates five public parking ramps downtown. The cost for parking averages \$0.75/hour. Total parking stalls in City-owned ramps and lots is approximately 5000. 10% of these are rented on a monthly basis and there is a waiting list for monthly stalls. A preference is given to carpoolers on the waiting list.

The City operates two parking programs in conjunction with Metro Transit: Park & Bus and Park & Ride. Park & Bus allows for unlimited free bus rides on any Metro bus in the downtown area with a parking ramp entrance ticket. Park & Ride provides free parking on the periphery of the city with Metro bus service downtown.

The University of Wisconsin-Madison has very limited parking for commuter students (600 stalls for a student body of 40,000). This encourages bicycling and Metro Transit use by students.

The City of Madison does not provide parking to its employees. Eligible carpools are immediately entitled to a parking space (bypassing the waiting list) in any City parking ramp offering monthly parking (except the State Street Capitol Ramp). In addition, non-City residents participating in the City's Carpool Program save \$10-\$20 per month by paying the lower "resident" monthly rate. The monthly parking rates for the four City ramps surrounding the Capitol are as follows:

Location	Carpool/Resident	Non-resident
Capitol Square North Ramp	\$75	\$90
Civic Center Ramp (Carpool Only)	\$85	n.a.
Government East Ramp	\$95	\$115
State Street Capitol Ramp	\$85	\$95

Transportation Sector Greenhouse Gas Emissions

Emissions from motor vehicles was estimated by the software using vehicle miles traveled. Greenhouse gas emissions from the transportation sector were 621,397 tons CO₂ in 1990.

WASTE AND RECYCLING

Generation

Madison's solid waste generation (in tons) is as follows:

	1990	1996
City Trucks (Resid.)	50284	52438
Comm. & Apt. Waste	70000	70000
<u>Const. & Demolition</u>	<u>64000</u>	<u>64000</u>
Total	184284	186438

This assumes 70% of Dane County's commercial waste and 50% of Dane County's construction and demolition waste is from Madison (data from 1994 Dane County Waste Quantity and Composition Study).

Composition of waste from Madison's household collection program going to the Rodefild landfill is listed below in tons:

	1990	% of Total	1996	% of Total
Paper and paper products	18454.2	36.7	19402	37
Food waste	5631.8	11.2	7341.3	14
Plant debris	1156.5	2.3	1940.2	3.7
Wood, furniture, textiles	2413.6	4.8	6030.4	11.5
<u>All other waste</u>	<u>22627.8</u>	<u>45</u>	<u>17724</u>	<u>33.8</u>
Total	50283.9	100	52437.9	100

Landfills

Madison has 8 closed landfills in the City. All of these landfills are fairly small and old and all but one collects the methane gas generated during decomposition. Only three of the eight landfills flare the gas to destroy it – the others vent to the atmosphere. Madison's waste currently goes to Rodefild, a Dane County landfill. In previous years, Madison waste was also landfilled at Verona, another County landfill. Both of these large landfills have methane collection and energy recovery. See Appendix A for a list of landfills ("Waste-in-Place") which includes dates of operation, size, and CO₂ emissions. Although the County landfills are not located in Madison, they receive all our waste and therefore their methane emissions and recovery measures are included in our analysis.

It is estimated that Dane County generates 1000 tons/day of waste, with 600 tons/day hauled out of the county. Of the total waste received at the Rodefild landfill (400 tons/day or 120,000 tons/year), approximately 50% comes from City of Madison trucks, with another 16% coming from Madison via private haulers for a total of 66% or 264 tons/day (80,000 tons/year). The majority of the construction and demolition waste goes to two private landfills, Mad-Prairie and Terra, as well as Rodefild. Waste received at these private landfills in 1987 was 50,000 tons and 9030 tons respectively. Construction waste was not included in the greenhouse gas emission analysis.

Engines to generate electricity from landfill methane gas were installed at Verona in July 1995 (previously gas was flared) and Rodefild in December 1998. The electricity produced at Verona is sold to Badger Prairie Health Care Center and Alliant Energy (for the grid). The electricity produced

at Rodefeld is sold to MG&E through a 10 year contract. The electricity produced at the two landfills was as follows (kWh):

	1996	1998
Verona	276,696	3,390,608
<u>Rodefeld</u>	<u>0</u>	<u>12,810,048</u>
Total	276,696	16,200,656

Recycling

The City of Madison was the first city in the nation to begin curbside recycling when it began collecting newspapers in 1968. Since then Madison has expanded its solid waste diversion to include yard waste, appliances and scrap metal, waste oil, glass, plastic, metal household containers, magazines and catalogs, and corrugated cardboard. Madison also composts solid waste at the Columbia County facility in Portage, Wisconsin. Madison recycles approximately 50% of its waste and the City has a webpage to assist citizens with recycling information located at <http://www.ci.madison.wi.us/streets/streets.html>. Dane County also has a recycling program and website at <http://www.co.dane.wi.us/pubworks/recyc.htm>

The history of Madison's recycling program is one of gradual expansion. After newspaper recycling began in 1968, Madison started recycling ferrous metal and wood products in 1972. Ferrous metal was removed as part of a refuse shredding operation designed to reduce the volume of solid waste before it was sent to the landfill. The wood waste program captured logs for use by sawmills. In 1976 the program was expanded to include curbside collection of all tree trimmings. The program became mandatory in 1989.

In 1976, bulk metal items such as appliances and rain gutters were recycled. In 1989 a program to remove PCB capacitors from appliances was started and in 1992 the removal and recycling of CFC's and mercury switches began. In 1979 Madison was one of the first communities in the United States to start a waste-to-energy facility when it began processing refuse derived fuel (RDF). The RDF program continued for fourteen years. The program was discontinued in 1994 due to the lack of stable markets for RDF and budgetary concerns.

In 1980 Madison began leaf "recycling". This voluntary program collected leaves and distributed them to area farmers. The leaves were land spread to improve the soil. Leaf and yard waste diversion became mandatory in 1989 and most material is now taken to one of three compost sites operated by Dane County.

In 1987 the City established a drop off program for glass. Plastic, aluminum, and steel cans were added by 1989. In 1989, the City helped three community groups begin curbside recycling collection in their neighborhoods while the City conducted a pilot collection project in other areas. Mandatory curbside collection began in 1991. In 1993 a pilot home composting program was implemented. The program has been expanded to cover 5,000 households.

Curbside Recycling

In September 1968, the City of Madison became the first community in the nation to begin curbside recycling. The program was expanded citywide in 1970 and became mandatory in 1986. Papers were collected in a specially designed metal rack installed on refuse packers. Today, newspapers are collected on the recycling trucks. The recycling racks are used to collect for phone books and small metal items for recycling.

In 1987, Madison began a drop off recycling program for household containers. The 13 drop-off sites remained in operation through 1992. The drop off program was ended because the use of the sites declined dramatically after the start up of curbside recycling in 1991. In 1991, Madison began the curbside collection of aluminum, corrugated cardboard, glass, PETE and HDPE plastic, and steel cans. In 1994 magazines and catalogs were added to the program.

Madison's innovative collection program uses clear, recyclable plastic bags for the collection of glass, plastic, and metal containers. The bag system has helped Madison keep collection costs down by cutting stops. Madison uses 30 cubic yard enclosed recycling trucks. The trucks have two compartments, one for paper products and one for the bagged containers. The trucks are dual side drive and are operated by a single person. 10 to 12 recycling trucks are on the street each day. Each vehicle averages two trips per day to the Material Recovery Facility (MRF). The average volume per load is 4,500-5,500 pounds.

The material collected in the curbside program is taken to Recycle America of Madison. This MRF is owned and operated by Waste Management Inc. Madison boasts a 97% participation rate for the curbside program. Approximately 265 tons of material are collected each week.

Curbside Recycling Cost

As Madison's curbside recycling program has expanded, it has become more cost effective. Increased revenues from the sale of material has also played a role in lowering the cost of recycling. At the same time, the cost of refuse collection has increased. Recycling has allowed the City to reduce its main line refuse fleet from 26 trucks per day in 1991 to 20 trucks per day today. However, refuse costs continue to increase due primarily to the increase in disposal costs.

Wood and Brush Salvage

In 1972 Madison began to salvage logs for use by sawmills. In 1976 the program was expanded to include the production of wood chips. In 1985 the City purchased a large Morbark chipper to handle large pieces of wood. Most wood and brush salvaged is converted to wood chips. Many larger logs are sent to the Oak Hill Correctional Facility where inmates split them for firewood.

The Street Division provides monthly brush collection. Most brush is chipped at the curb using tow-behind chippers. Large piles of brush and tree trimmings from the Forestry Division are hauled to a central site for processing by the Morbark chipper. Wood chips are made available free of charge to area residents. The City also hauls semi loads of chips to area farmers for use as animal bedding or as a base for agricultural compost.

Waste Oil Recycling

The waste oil recycling program began in 1978. The program was designed to keep do it yourself oil changers from pouring used oil into sewers where it washes into Madison's lakes. The City has four waste oil collection sites. Madison's public waste oil collection sites operated for years using only 250 gallon fuel oil tanks. As the use of these sites increased, problems began to develop and Madison has begun to upgrade the sites. A new 1,000 gallon tank and containment system was installed at the Monona site in 1993 and a 500 gallon tank was put in at the First Street site in 1994. In 1995 new double wall collection tanks were installed at Glenway and at School Road and the First Street site was also replaced. Oil filter recycling also began in 1995.

Madison collected the following recycled material (units are tons unless otherwise specified):

	1990	1996
Brush Salvage	6921	7921
Bulk Metal Salvaged	1053	1091
Yard Waste/Leaves Salvaged	16269	20609
Newspapers, Magazines, Corrugated Cardboard, Plastic, Aluminum Cans, and Glass	4140	14219
Tires	91	171
Ferrous Metals Salvaged	765	0
Refuse Derived Fuel Delivered	14113	0
In-house Office Paper Recycled	199	426

Compost	0	1151
Total Recovery Effort	43551	45588
Reclaimed Waste Oil (gallons)	42866	55714

Computer Recycling

In April 2000 the City of Madison and Dane County recycling departments sponsored the second computer recycling event. 355 households (vehicles) dropped off 25,843 lbs. of equipment. The majority of this was plastic hardware and software. The numbers nearly doubled from last year. Some of the machines will be reused in the community.

Composting

Dane County operates three composting sites which receive 25,000 tons/yr. of organic waste. The City of Madison, along with several surrounding cities and Dane County, also has a very successful residential compost bin sale program. Some years the response has been so great there was a shortage of bins.

TREE PLANTING

Dutch Elm disease devastated the City in the 1960s and destroyed an estimated 40% of our street tree population. We also lost tens of thousands of elm trees in our parks and on private property. While we numerically have more trees now than we did 25 years ago, the trees on average are smaller in diameter and the number of trees per acre is less due to annexation of agricultural land.

CITY GOVERNMENT

Environmental Staff and Programs

The City of Madison has the following staff directly responsible for environmental programs:

- City Architect – Energy efficiency in City buildings and the Energy Star Buildings partnership.
- Recycling Coordinator – Madison Pride recycling program and the Sustainable Lifestyle Campaign.
- Environmental Epidemiologist - Environmental issues which affect public health.
- Principal Engineer II – Commission on the Environment and Climate Protection Plan activities.
- Assistant to the Mayor – Environmental issues in the Mayor's Office.
- Principal Engineer I – Landfills.
- Pedestrian and Bicycle Coordinator – Development, safety, and access issues.
- Engineer (hourly) – Development of Climate Protection Plan, environmental data collection, and greenhouse gas emissions analysis.
- Engineer (hourly) – Development and maintenance of the City Environmental Web Page.

The Commission on the Environment was formed in 1972 to advise the Mayor and Common Council on environmental matters which affect the City. The Commission meets monthly and is interested in water, land, and air quality issues.

The City Department of Public Health has issued several Report Cards on Madison's Environmental Health. The Report Card summarizes air quality, water quality, food safety, animal control, and chemical and physical hazards in the City. See Appendix H for the first two pages of the 1998 Report Card.

In August 1999 Madison established an Environmental Web site on the City's home page. The Climate Protection Plan and other City environmental initiatives are posted on this page. The site, which is continually updated, is located at <http://www.ci.madison.wi.us/environment/default.htm>

Total cost of electricity and gas purchased by the City from MG&E in 1998 was approximately \$4.98 million excluding the School District. The average cost paid by city facilities was \$0.05/kWh and \$0.49/therm. The City generated 153,580 tons of CO₂ in 1990, approximately 4% of community-wide emissions. The following components of City Government which generate greenhouse gas emissions were analyzed as part of the Plan.

Buildings

The City has approximately 250 buildings. Around 100 of these are heated and/or cooled (~1.5 million s.f.). The top energy-using buildings have been tracked since 1988 using a software program called Fast Accounting System for Energy Reporting (FASER). In 1990 City buildings used 995,299 therms of natural gas and 15,986,473 kWh of electricity for a total cost of approximately \$1.3 million.

The City adds insulation, increases insulation when re-roofing, upgrades doors, replaces windows, etc. when remodeling and upgrades equipment efficiency when replacements are done. The energy savings from these measures has not been documented. Approximately \$300,000 to \$500,000 has been spent on the measures, with paybacks between 6 months to 20 years. Annual savings from these measures is estimated to be \$40,000/year.

Fleet

The City has approximately 1100 vehicles in its fleet. 25-30 (2.5%) of these are flex-fuel vehicles which can utilize 85% ethanol. The Motor Equipment Division is responsible for all City-owned vehicles except the Water Utility, Metro Transit, and the School District, which operate their own fleets. City-wide vehicle fuel use in 1996 was (in gallons):

	Gasoline	Diesel	Propane
Motor Equip.	410,681	441,047	
Water Util.	69,111	32,352	
<u>Sewerage</u>	<u>19,327</u>	<u>36,650</u>	<u>500</u>
Total	499,119	510,049	500

The Motor Equipment Division has an aggressive recycling program that reclaims all used oil, anti-freeze, oil filters, cleaning solvents, oily rags and absorbants. The Motor Equipment program was implemented by Terry Holmes and Mary Christian who were recognized as Wisconsin's Recyclers of the Year by the Associated Recyclers of Wisconsin.

Purchasing

The City has been buying copier and printer paper with high recycled content for at least ten years. They also purchase park benches and some curb blocks made out of recycled plastics. A few departments purchase Energy Star office equipment (such as copiers) but this practice is not widespread due to the higher initial capital cost of the machines.

Streetlights

The City has upgraded 95% of its streetlights from mercury vapor and incandescent to high-pressure sodium. The program, in partnership with MG&E, started in 1975 and is almost complete. In March 1975, the City had 7105 mercury vapor and incandescent streetlights which used 703,237 kWh or an average of 99 kWh per light. In March 1999, the City had 11,188 streetlights (with 600 mercury vapor left) and used 535,472 kWh or an average of 48 kWh per light. The energy savings from the conversion of 6505 streetlights to high-pressure sodium is 3,981,060 kWh/yr.

Traffic Signals

The City has approximately 10,000 traffic signal bulbs. A pilot project was started in 1993 to convert red bulbs to energy-efficient light-emitting diodes (LEDs). Red LEDs (versus green or yellow) are the most cost-effective since they are cheaper and have a shorter payback because of their high usage. Of the red bulbs in the City (~3333), 200 (or 6%) have been converted to LEDs. So far, large 12" diameter signals and Don't Walk symbols have been targeted for replacement. The energy savings from this conversion is 100,740 kWh/yr (assuming red is on 1/2 of the time). The City plans to continue this conversion to LEDs as bulbs burn out.

Metro Transit

The bus fleet is all diesel and the average age of a bus is 8.5 yrs. Fuel efficiency of older buses is 3.5 mi./gal; new buses get 5 mi./gal. The diesel fuel use for Metro was:

1990	1,141,000 gallons
1999	1,458,105 gallons

The 25-30% increase in fuel use was due to increased system miles with a new transfer point system. Bike racks were added to all buses in early 2000.

Waste Generation and Recycling

In 1996, the City of Madison generated 9225.01 tons of solid waste. The waste composition is as follows:

	Tons	% of Total Waste Stream
Mixed refuse	88.94	1%
Plant debris	1420.76	16%
Street sweeping	7133.05	77%
Grit screening	<u>582.26</u>	<u>6%</u>
Total	9225.01	100%

The City recycles office paper, newspapers and aluminum cans in the City-County Building and most other City facilities. 426 tons of office paper were recycled in 1996. The City-County Building also utilizes cloth towels for hand drying, which saves paper and electricity.

Motor Equipment currently recycles the following amounts each year:

- Automotive batteries (approx. 275)
- Anti-freeze (approx. 500 gallons)
- Engine oil (approx. 10,000 gallons)
- Crushed oil filters (45 40-gallon containers)
- Magazines and newspapers (approx. 800 lbs.)
- Corrugated cardboard and boxboard (approx. 9400 lbs.)
- Sorted office waste (approx. 4060 lbs.)

Motor Equipment also recycles air filters, light bulbs, plastic, glass, steel, aluminum, yard waste, scrap metal, wooden pallets and aerosol cans. Metal and plastic barrels are distributed to the Parks or Streets Divisions for reuse.

The biosolids produced at the Nine Springs Wastewater Treatment Plant are recycled to agricultural land as a fertilizer and soil conditioner through the Sewerage District's Metrogro Program. This program has received national recognition and is used as a model by USEPA. Farmer interest in the program is very high, with demand for the product exceeding supply.

The Sewerage District also has a mercury thermometer exchange program called "Catch the Fever". A free digital thermometer is given in exchange for a mercury-containing fever thermometer.

Madison Metropolitan Sewerage District

Formed in 1930, the Madison Metropolitan Sewerage District was created to serve the wastewater collection and treatment needs of the surrounding area. The District owns and operates a wastewater collection system and the Nine Springs Wastewater Treatment Plant. The District encompasses an area of 145 square miles and receives and treats wastewater from 42 municipal organizations, the largest being the City of Madison.

The treatment plant currently has the capability of providing secondary treatment for 50 million gallons of wastewater per day. The average daily flow in 1999 was 44 million gallons per day (16 billion gallons/yr). In 1991, approximately 73.4% of the wastewater treated was from the City of Madison.

The Nine Springs Treatment Plant has fully utilized the methane (digester gas) generated during decomposition of waste since 1930. The methane utilization system is quite complex. Methane gas is used in boilers to heat hot water, the anaerobic digester, and buildings, as well as fuel for aeration blowers and engines which generate electricity. In addition, waste heat from the generators and blowers is captured and re-used for building heat and the digester (co-generation). The heating

value of digester gas is 550 Btu per cubic foot (cf). The Nine Springs digester gas data is plotted on graphs in Appendix I. A summary follows:

	1990	1996
Daily Average Digester Gas Use (cf)	300,000	650,000
Daily Average Energy (million Btu)	150	350

The two engines, added in 1991, generated 6,528,059 kWh of electricity in 1996. All of the electricity is consumed on-site and constitutes 26.3% of the Nine Springs electricity needs (24,787,259 kWh). Total use of electricity for the collection system and Nine Springs was 32,202,808 kWh in 1996, with 25,674,749 kWh purchased from MG&E. The Sewerage District also used 56,477 gallons of gasoline, diesel, and LP in 1996.

Madison Water Utility

Madison Water Utility, a municipal utility, provides water to homes, businesses, and industry in Madison and some of the surrounding communities. The Madison water supply is obtained from 23 deep wells having an average diameter of 20 inches and an average depth of 802 feet, the deepest being 1175 feet. Most of these consist of a well, pumphouse, reservoir, and the necessary pumping equipment from which the water is pumped into the distribution system. The total capacity of the 23 wells is more than twice the average daily demand, thus providing an ample reserve to meet peak conditions and the demand for fire protection service. Many of the wells and booster stations have high efficiency motors and furnaces.

The maximum daily pumpage in July 1989 was 57,670,000 gallons. The Water Utility's energy use in 1996 was:

Electricity	18,948,796 kWh
Natural Gas	64,693.88 therms
Diesel	32,352 gallons
Gasoline	69,111 gallons

Studies by the U.S. Geological Survey indicate that nearly all of the water that is pumped from the sandstone formations has fallen as precipitation on the Yahara River watershed. This precipitation soaks into the ground and moves back and forth between the sandstone and the lakes and streams. Since the total pumpage in the Madison area is only a small percentage of the precipitation on the watershed, Madison should have an adequate ground water supply for the foreseeable future.

Madison Area Sustainable Lifestyle Campaign Eco-Teams

In March 1999, the Madison Area Sustainable Lifestyle Campaign launched a program to improve the quality of life in Madison and Dane County. The program partners – the City of Madison, Dane County, Madison Gas & Electric, and the Madison Metropolitan Sewer District – pooled \$90,000 to launch the initiative.

The program consists of forming neighborhood Eco-Teams designed to involve people in taking direct action to reduce impacts their lifestyle may have on the environment. To date, 18 Eco Teams have formed in the Madison area and begun implementing energy efficiency, water conservation, waste reduction, and alternative transportation measures which will reduce our community's pollution. 101 households are involved and include 277 people, or 2.74 people per household (HH). The Madison Eco-Teams have exceeded the program's expectations, reducing waste by 39% (395 pounds per HH per year) and reducing water usage by 41% (23,493 gallons per HH per year). Annual CO₂ emissions were cut 5668 lbs. per HH per year, with a savings of \$290 per HH per year.

Community Development Authority (CDA)

The City of Madison's Community Development Authority owns and operates apartment buildings, townhouses, duplex apartments, and houses for low-and moderate-income families and eligible individuals. These apartments are federally funded through the Department of Housing and Urban Development (HUD) and are managed here in Madison by the CDA's Housing Operations Unit. Energy use in CDA buildings was 2,656,471 kWh and 168,444 therms in 1998.

Madison Metropolitan School District

The School District has 41 schools with approximately 3,861,460 s.f. The total cost for energy (gas and electric) in 1996 was \$3,157,476 or approximately \$0.82/s.f.

The Madison school district provides for the transportation of all students in grades K-5 living more than 1.5 miles from their assigned school or in an area where recognized unusual hazards exist. This transportation is provided on school buses which are contracted through private bus companies. The price of fuel and other expenses is part of the daily rate paid to each company. Currently, five companies are providing bus service. Their names and fuel use (where available) is listed below:

Bus Company	1990 Fuel Use in Gallons
Badger Bus Lines	Not available
Evergreen Transport	Not available
Richardson Bus Service	31,000 (annual avg.)
Rite-Way Leasing Company	Not available
Verona Bus Service	27,306
Total to date	58,306*

* only 2 of the 5 companies reported at this time

As a general policy, transportation is not provided for students above grade 5 (ss. 121.54).

Local Action Plan

The following measures are proposed to reduce Madison’s greenhouse gas emissions by 2010. Some of the measures have been approved by the departments or agencies involved; others have not. Emission reduction estimates from the measures are conservative so we expect if any measures are unacceptable, they will be replaced by other appropriate measures with equal or greater savings. Measures which are not easily quantified or recommend reviewing city policies are not given credit for CO₂ reductions at this time and are marked with a ✓. This plan was updated in January, 2002.

Following the summary tables of measures and their potential implementation dates is a short description of each measure. Some of the measures are related so the descriptions have been combined. Please note that the implementation dates are not necessarily when the measure will begin; rather, it is when the measure is expected to be completed. Some measures are on-going and these have been highlighted with an asterick. The CO₂ savings from each quantified measure is listed in the Executive Summary as well as Appendices C & D.

MADISON WASTE AND RECYCLING PROGRAMS
Proposed New Measures to Reduce Solid Waste and Increase Recycling

Measure

Implement by Dec.:

City Programs

Add green procurement specs to city purchasing requiremnts✓	2002
City participation in Buy-Nothing Day (Nov.26) and Use-Less Stuff Day (Nov.24) – ongoing annual event✓	2002
Increase city employee education regarding resource waste✓	2002
Add mixed-paper and box board to curbside recycling program	2002
Review pay-as-you-throw option for residential waste mgmt. ✓	2002
Increase public education on impacts of consumption and how to simplify your life and reduce waste✓	2005

Green Procurement

The City will review its purchasing practices and see where it can improve on the products purchased by various departments. In addition to initial purchase price, life-cycle energy costs will be considered as part of the procurement process.

Reduced Waste and Consumption

The City will participate in the annual Buy-Nothing and Use-Less Stuff Days by increasing education of residents on the impacts of waste generation. This will include support of local efforts on how to simplify your life, such as Sustain Dane. In addition, increased education of employees regarding waste in the workplace will be conducted.

Expanded Curbside Recycling

The City will add mixed paper and box board to its curbside recycling pick-up. This will reduce household waste considerably.

Pay-As-You-Throw/Mixed-paper

The City has decided not to implement a Pay-As-You-Throw program for trash collection nor mixed-paper recycling at this time. The Pay-as-you-Throw program charges households per barrel or bag of trash collected rather than including trash collection as a flat fee in the property tax.

State and County Programs

Increase state landfill tipping fees✓ - DONE	
Work with City on lobbying for U.S. plastic standardization✓	2005

Landfill Tipping Fees

Tipping fees in Wisconsin are quite low in comparison to other states. The recent increase in landfill tipping fees would therefore discourage waste generation and encourage recycling.

Plastic Standardization

Plastic containers in the United States are produced with many types of plastic for which recycled markets do not exist. Madison only picks up PTE and HDPE (#1 and #2) to be recycled and even these resale markets are poor due to low virgin material costs. If plastics were standardized in the U.S. (like Europe), then markets would exist for these recycled plastics. The City of Madison will discuss this issue with state and national representatives.

MADISON PROGRAMS TO SEQUESTER CARBON AND INCREASE ENVIRONMENTAL AWARENESS

Proposed New Measures

<u>Measure</u>	<u>Implement by Dec.:</u>
City Programs	
Climate Change Education Program✓	2002
Earth Day Education Effort (ongoing annual event) ✓	2002
Continue city tree planting program	2010

✓ measures not included in the analysis for tons of CO₂ reduced

Climate Change Education

In addition to local newspaper articles and radio airtime, several articles on the Climate Protection Plan have been printed in local newsletters. Under the Plan, these educational efforts will continue and increase, including the City of Madison Engineering staff speaking to the public about the impacts of fossil-fuel combustion and greenhouse gas emissions. The City’s web page and list server also promote our programs.

Earth Day Education Effort

Many of the education efforts regarding the Climate Protection Plan and greenhouse gas emissions have surrounded Earth Day. The City is proposing to continue to host this event and approximately five others during the course of the year. We expect to continue to partner on these promotions with the local utilities and environmental groups.

Tree Planting

Most of the tree planting on City property is done by the City Forester. Approximately 2300 trees are planted each year. One-half of these are generally replacements for dead, dying, or vandalized trees - the rest are new plantings. The Parks Division plants approximately 125 trees per year in the parks and greenways. MG&E currently provides 100 trees annually for planting in right-of-ways. They plan to increase this number to 120 trees per year. Therefore, a total of approximately 2600 trees will be planted each year in Madison by the City and MG&E.

MADISON ENERGY PROGRAMS Proposed New Measures to Reduce Emissions and Energy Use

<u>Measure</u>	<u>Implement by Dec.:</u>
City Buildings	
Energy efficiency savings fund	2003
Retrofit one large building to Energy Star standards	2003
Introduce green building considerations in new building design- DONE	
Conduct education program for employees on energy efficiency- DONE	
Retrofit nine other largest energy-using buildings	2005
Add one more renewable energy source to another city building	2010

Energy Efficiency Savings Fund

Savings from energy efficiency measures implemented throughout city departments currently go back into the general fund. Therefore, there is no incentive for departments to save energy and no long-term funds to implement additional efficiency measures. A fund should be created to capture the energy efficiency savings for on-going efficiency measures. The Common Council choose not to implement this program yet but could do so in the near future.

Building Retrofits

The top 10 energy-using buildings were audited by MG&E in 1998 and an engineering firm was hired by the City to implement the audit recommendations. In 1999, the City signed a Memorandum of Understanding (MOU) with the USEPA for the Energy Star Buildings partnership. This MOU commits the City to upgrading one of its buildings to Energy Star requirements within two years and 60% of feasible City buildings to Energy Star requirements within 7 years (See Appendix K for details). Some retrofits were finished in 2000 and 2001. Work remains and ten more buildings are being audited. There is \$100,000 budgeted for 2002.

Green Buildings

The City occasionally adds new buildings or expands existing ones. The designs shall take into account energy efficiency and other green building measures. Not all green building measures are usually implemented in every building though due to limited initial capital funding. The City has no program to take the energy savings and put them back into the capital accounts.

Energy Efficiency

A concerted effort will be made to educate employees about saving energy and other resources. This would include shutting computers off at night, making double-sided copies, purchasing efficient equipment (including soda machines), etc.

Renewable Energy

The City will add at least one renewable energy source to a new or existing city building. This would likely be solar, but other options will be considered as well.

Metro Transit

Increase green power purchase by 25% (to 50%)	2003
---	------

Wind Power Purchase

Metro Transit has agreed to consider increasing their purchase of wind power from 25% to 100% over the next few years.

School District

Implement Energy Star MOU✓	2005
----------------------------	------

Energy Star

The School District and Dane County have signed the Energy Star MOU, which commits them to the same requirements as the City (listed above and in Appendix K). The school district plans to spend approximately \$270,000 in building retrofits.

City Programs

Include green building requirement for TIF funds	2003
Review energy efficiency requirements in building code✓	2003
Continue Sustainable Lifestyle Campaign	2002
Implement commercial sector green building program	2003
Implement program to reduce use/improve efficiency of small engines✓	2005
Convert all traffic signals to LED fixtures	2005
Implement measures to reduce urban heat island effect	2010

TIF Funds

The City will include a green building requirement for developers which receive tax-increment financing (TIF) from the City. Possible language for the TIF will be drafted and reviewed by staff.

Building Code

The City does not require any additional energy efficiency measures over what is required in the state code. The City will review the state code, as well as Dane County and other city green building ordinances (such as Austin, TX), to see if it would be beneficial to strengthen the requirements locally.

The Sustainable Lifestyle Campaign

Eco-Teams reduced energy consumption by 13% (gas and electric) between March – December 1999. The program is expected to continue for at least the next three years, after which it is hoped that the critical mass of Eco-Teams will disseminate the ideas informally to other neighbors and new teams.

Commercial Green Building Program

Commercial and institutional energy use is the single largest source of CO₂ emissions in Madison. Building heating, cooling, and lighting comprise the majority of electricity and other fuel use. The City has a grant proposal written for a commercial green building program. This proposal could be submitted to various funding agencies.

Small Engines

The City shall attempt to identify and quantify the emissions from the most commonly used small engines such as lawnmowers, snow blowers, and leaf blowers. The City shall review ways to lessen

the emissions from the community's use of this equipment, including information dissemination and a possible ordinance regulating usage. In addition, the City of Madison government shall review and improve its own usage of this type of equipment.

LED Traffic Signals

The City has only converted 6% of its red bulbs to LED fixtures. The remaining 3133 bulbs will be converted to LEDs, for a savings of 1,578,092 kWh/year. The payback period for the LEDs would be approximately 4 years.

Heat Island Effect

Black asphalt on roads and roofs cause buildings and cities to gain heat from the sun during hot summer months. Since Madison is summer peaking for electricity (air conditioning load), it would be advantageous to explore more reflective materials and colors as we continue to add impervious surface. Creating green spaces with plantings on existing large commercial building roofs can also help absorb heat and decrease the cooling load.

State Facilities

Assist building occupants in implementing green building measures	2003
Complete bldg. audits and give audit results to bldg. occupants✓	2003
Decrease growth in energy generation through demand-side mgmt. ✓	2010
Increase use of renewable energy sources✓	2010

Energy Efficiency and other Green Building Measures

Most state buildings were audited during the 1990's. The results of these audits, however, have not been widely distributed. Since DOA manages buildings for various state agencies, building occupants feel removed from building operation (an example of this is the GEF II building). We encourage DOA to work more closely with building occupants to promote energy conservation.

Renewable Energy Use

We encourage the State to increase its use of renewable energy to offset its large energy needs, which are currently met with fossil fuels. New building design could incorporate daylighting, photovoltaics, and other green building measures.

Private Programs

Promote green building practices to builders (MG&E) [∇] - DONE	2001
Promote shift from gasoline to electric lawn mowers (MG&E) ✓ - DONE	2001
Coordinate underground facilities with bike path develop. (MG&E) ✓ ONGOING	2003
Conduct climate protection seminars and workshops for businesses and neighborhoods (MG&E) [∇] ✓ - DONE	2001
Develop and distribute climate protection brochure (MG&E) [∇] ✓	2002
Add four photovoltaic pilot installations (MG&E) - DONE	2003
Double industry participation in EPA Climate Wise Program	2005
Implement renew. energy portfolio stndrds. (MG&E & Alliant Energy) ✓	2005
Continue sponsorship of EcoTeams (MG&E)	2006*
Continuation of energy efficiency programs (MG&E and Alliant Energy) [∇]	2010*
Add three cogeneration projects (MG&E)	2010*
Increase sales of CNG to fleets (MG&E) ✓	2010*
Increase tree plantings per year (MG&E) - DONE	2010*

∇ Measure is contingent upon access to Public Benefits Fund

*on-going

✓ measures not included in the analysis for tons of CO₂ reduced

Madison Gas and Electric (MG&E)

MG&E has proposed about a dozen measures to reduce greenhouse gas emissions. Many of the measures are educational or marketing based. Some of the educational measures could be implemented in conjunction with the City's efforts.

Climate Wise Membership

The City proposes to work with the State to increase the number of industry members in the USEPA Climate Wise program. Climate Wise is an innovative partnership between government and industry that offers companies a nonregulatory approach to reducing greenhouse gas emissions. The program works with industries to develop flexible, comprehensive strategies for achieving energy efficiency and pollution prevention. To date, there are only 3 Climate Wise members in Dane County.

Renewable Energy Portfolio Standards

Wisconsin utilities are now required to have 0.5% renewables by 2001 and 2.2% by 2011 (with growth required in 2 year increments during the ten years). MG&E and Alliant Energy will have to meet this requirement.

MADISON TRANSPORTATION PROGRAMS

Proposed New Measures to Reduce Emissions and Single Occupancy Vehicle Use

<u>Measure</u>	<u>Implement by Dec.:</u>
<i>City Fleet</i>	
Explore using ethanol in 25-30 existing flex-fuel vehicles	2003
Add fuel efficiency to criteria for new vehicle purchase - DONE	2001
Conduct training on efficient driving for fleet drivers	2001
Conduct study of current fleet. Inventory vehicles, use and fuel effic. DONE	2001
Include training or info. on alternatives to fleet use - DONE	2001
Pilot test 1-2 propane, hybrid, or electric vehicles- DONE	2002

Ethanol Use

The City does not have funds to buy ethanol so flex-fuel vehicles currently use gasoline. The State DOA has an ethanol pumping station in Madison but at this time cannot accommodate the City's vehicles. The only other alternative to installing an additional ethanol pump for the City fleet is one private ethanol station on University Avenue. A petroleum distributor is considering locating a private ethanol pump on the east side of Madison for the postal service's new flex-fuel fleet. Fueling cards would be needed to allow employees to use these non-City fuel pumps. The City hopes to promote AFV fueling facilities in 2002 and fund the fuels in 2003.

Fuel Efficient Vehicles

Fuel efficiency is not one of the three main criteria (safety and performance, cost and uniformity) used when selecting a new vehicle for city purchase. With some modifications in the purchasing specifications or training, fuel efficiency could be added to vehicle selection criteria with little or no cost. This would increase overall fuel efficiency of the fleet and save the city money in fuels costs.

Efficient Driving

Vehicle fuel efficiency is also affected by how the vehicle is driven. One way to improve vehicle performance and reduce fuel and maintenance costs is to train fleet drivers on efficient driving.

Fleet Inventory, Options to Reduce Driving, and Alternative-Fuel Vehicles

The City is currently reviewing ways to improve fleet performance and reduce fuel costs and air emissions. A Green Fleet resolution is before Council and would include establishing fleet goals and conducting a fleet inventory and yearly monitoring. The City has already purchased two Ford Focus vehicles, which are more fuel efficient, in order to test their performance and maintenance needs. Likewise, the City will seek out hybrid or alternative fuel vehicles to test under normal fleet use.

Metro Transit

Buy 1 hybrid or alternative fuel bus ✓	2003
Reexamine alter. transport. modes such as light & commuter rail ✓	2005

Alternative Fuel Bus

We propose that Metro Transit explore purchasing a hybrid or alternative fuel bus to pilot test.

Rail

The city, Dane County and Wisconsin DOT have been studying various transit-rail options under the Transport 2020 Alternatives Analysis project. WDOT has also considered inter-city high-speed rail with Amtrak service. These studies reviewed past studies, such as the 1992 Madison Transit Corridor Study, and also looked at land use policies and incentives and controls which would be needed to realize the reallocation of employment and population growth included in analysis scenarios. Many of these are the same measures needed to reduce reliance on single-occupant vehicles and should be explored further.

City Programs

Review parking policies and requirements to encourage alternate modes of transportation ✓	2004
Encourage flex-time work hours ✓ - DONE	2001
Increase TDM and City employee carpooling, bus, and bike use ✓ DONE	2001
Continue Sustainable Lifestyle Campaign	2002
Encourage private sector transportation demand mgmt. (TDM) ✓	2005
Increase mode-share of pedestrians and bicycles through densification and other policies ✓	2010*
Add bike lanes, racks, and lockers ✓	2010*

Parking Policies and Requirements

These policies should be examined to ensure they are not unintentionally encouraging automobile use.

Flex-time

The City will review its policies on flex-time in order to avoid traffic congestion and idling, which cause increased air pollution and greenhouse gas emissions. Currently, large numbers of employees begin and end work at the same time.

Transportation Demand Management (TDM)

14 fleet vehicles are used at night by city employees who carpool. Programs such as these should be encouraged.

Sustainable Lifestyle Campaign

Eco-teams reduced gasoline use by 157 gallons per household (HH) per year, a 22% reduction in driving between March – December 1999. The program is expected to continue for at least the next three years, after which it is hoped that the critical mass of Eco-Teams will disseminate the ideas informally to other neighbors and new teams.

Private Sector TDM

Large companies and institutions should locate near transportation corridors or encourage alternative forms of transportation for employees.

Pedestrian and Bicycle Mode Share

There has not been a mode split study conducted in Madison to determine the percent of our population utilizing various modes of transportation (approximately 6-9% of all Wisconsin work trips are made by walking and bicycling). Measures to increase the use of bicycles and walking, such as densification and bike racks, lanes, and lockers, should be encouraged. Madison’s current policy is to add bike lanes whenever road improvements are made.

County Programs

Increase park and ride lots✓ - ADD MORE	2003
Review alternatives to building additional parking ramps(airport etc)✓	2003
Implement parking cash-out program✓	2003
Implement Smart Growth measures to reduce sprawl✓	2005
Implement TDM to reduce single-occupancy vehicles (SOV) trips (incl. possible commuter rail) ✓	2010*

Parking and Smart Growth

Dane County can influence driving patterns through Smart Growth planning as well as parking policies. These would reduce urban sprawl and vehicle use. An example of an opportunity to discourage driving would be to offer transportation alternatives for the airport rather than increasing airport parking ramps. Dane County provides subsidized parking and is planning to implement a parking cash-out program.

State Programs

Increase fleet alternative fuel vehicles to 2000 (now ~ 1000) DONE	2001
Review alternatives to building additional parking ramps (UW, etc.) ✓	2003
Implement parking cash out program ✓	2003
Increase drivers license test emphasis on pedestrian/bicycle rights ✓	2003
Use Federal highways funds for programs to reduce SOV trips ✓	2010*
Work with City & County to lobby for increased CAFÉ standards ✓	2010*
Increase use of vanpools ✓	2010*

Alternative Fuel Fleet Vehicles

The Governors Alternative Fuel Task Force has set a goal of 2000 alternative fuel vehicles by the end of 2000. Although delayed, they hope to reach the goal by 2001.

Parking Ramps and Cash-Out Program

UW faculty and staff, as well as employees of some other state agencies, receive subsidized parking. In addition, the University is planning to build several new parking ramps on campus. A parking cash-out program would pay all employees a monthly sum for transportation and the market cost for parking would be charged. This money can then be applied to parking and Metro or kept by employees as an incentive to bike or walk. In this way a transportation benefit is given to all employees, not only those who drive. The current system of parking subsidies encourages driving and discourages other modes of transportation.

Driver Education

The rights of pedestrians and bicyclists could be emphasized during driver training and state tests. Often drivers believe that streets belong to cars and pedestrians and bicyclists should stay off them, or at least out of their way. Enforcement of failure to yield by drivers would improve safety and make residents and their children more comfortable walking and biking to school or work.

Private Programs

Increase Yellow Bike program DONE	2001
Implement parking cash-out programs ✓	2004
Increase Bike-to-Work Week participation	2010*

* on-going

✓ measures not included in the analysis for tons of CO₂ reduced

Yellow Bike Program

200 yellow bikes are currently available and the program is expected to double in the near future.

Bike-to-Work Week

In the summertime, it is estimated that over 11% of residents bike to work and Madison has a successful Bike-to-Work Week program run by the Bicycle Federation of Wisconsin. 1704 bikers participated in the May 1999 program; 216 or 13% of these were first time bicycle commuters.

PLAN IMPLEMENTATION

Engineering staff met with MG&E and they have approved the proposed measures in this Plan. The Mayor has requested meetings with the Governor and Dane County Executive Offices to discuss the Plan implementation and receive their support for the proposed measures. It is recommended that the measures implemented and the savings realized be documented and an annual report prepared each year through 2010. Only through careful monitoring will the Plan's success be realized.

Immediate Next Steps

The City submitted the Draft Plan to ICLEI February 9, 2000 and the final payment for the grant was received April 11, 2000. The Final Plan was approved by Council September 19, 2000. The next steps are:

- Post final plan on City web site (December 2000)
- Begin plan implementation (Winter 2000)
- Apply for possible grants to assist with implementation (Spring 2001)

Staffing

The City Engineer has appointed an Environmental Manager to coordinate sustainability programs. In addition, some funding is available for an hourly engineer to continue the maintenance of the City Environmental Web site and Climate Protection Plan implementation in the short term. The role of the Commission on the Environment and/or Environmental Action Team could also be expanded to include implementation of sustainability programs within the City.

Funding

Money may be provided in the 2003 Capital Budget. Data will be gathered early 2002 to justify a significant budget request in May 2002 for the 2003 Capital Budget. The City will be applying for grants in 2002 and also soliciting contributions from the private sector for green vehicles and joint advertising campaigns.