City of Bloomington
Common Council

Legislative Packet

Committee of the Whole

12 April 2006

Office of the Common Council
P.O. Box 100
401 North Morton Street
Bloomington, Indiana 47402

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City of Bloomington Indiana

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Bloomington, Indiana 47402

Office of the Common Council
(812) 349-3409
Fax: (812) 349-3570
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To: Council Members
From: Council Office
Re: Weekly Packet Memo
Date: April 7, 2005

Packet Related Material

Memo
Agenda
Calendar
Notices and Agendas:
None
Legislation for Discussion
Ord 06-07 To Amend Title 2 of the Bloomington Municipal Code Entitled "Administration And Personnel" - Re: Amending Chapter 2.21 Entitled "Department of Law" to Include "Gender Identity" as a Protected Class

(Please see the 5 April 2006 Council Legislative Packet for the legislation, summary and background material)

Contact: Councilmember Sabbagh (sabbaghd@bloomington.in.gov) or Sturbaum (sturbauc@bloomington.in.gov) at 349-3409
Daniel Sherman or Stacy Jane Rhoads at 349-3409 or council@bloomington.in.gov

Res 06-05 Supporting the Kyoto Protocol and the Reduction of the Community's Greenhouse Gas Emissions

- Memo from Councilmember Rollo *(with links to various websites)*; *Draft Version of* Preliminary Assessment of Greenhouse Gas Emissions Associated with Activities in Bloomington, Indiana: Inventory and Trends *(by Michael Steinhoff, Environmental Commission Intern)*; *Draft Version of* A Framework for Developing a Greenhouse Gass Reduction Plan for Bloomington Indiana *(by Eric Roberts, Environmental Commission Intern)*

Contact: Councilmember Rollo at 349-3409 or rollod@bloomington.in.gov

Memo

Chair of Meeting: Volan

Two Items Ready for Discussion at the Committee of the Whole on Wednesday, April 12th

There are two items ready for discussion at the Committee of the Whole next week. The first is **Ord 06-07**, which would add "gender identity" as a protected class to the City's Human Rights Ordinance and can be found in the 5 April 2006 Council Legislative Packet. The second is **Res 06-05**, which supports the local reduction of greenhouse gases as proposed in the Kyoto Protocol, and can be found summarized below and included in this packet.

Res 06-05 - Supporting the Kyoto Protocol and the Reduction of the Community's Greenhouse Gas Emissions

In celebration of Earth Day, Councilmember Rollo is sponsoring a resolution that calls for a reduction of local greenhouse gas emissions. In support of this directive, the resolution documents the effects of human-induced global warming and points out that many US cities and States are addressing the problem by adopting the Kyoto Protocol or some other similar emissions-reduction program.

As is spelled out in the resolution, the phenomenon of human-induced global warming is virtually without scientific dispute. The world's most highly-regarded scientific organizations have recognized climate disruption and called for drastic cuts in emissions. These organizations include: the Intergovernmental Panel on Climate Change (IPCC), the National Academy of Sciences, the Royal Society, the American Meteorological Society, the American Geophysical Union, the American Association for the Advancement of Science, and the national science academies of the G8 nations. The IPCC, in particular, has warned that the world has already reached the level of dangerous concentrations of carbon dioxide in the atmosphere.

Indeed, based on the geologic record, scientists warn that we are currently at a "tipping point" or threshold at which human-induced change will result in a rapid acceleration of climate change in the near future.[1] Greenhouse gas levels reached a

[1] The resolution talks about this in terms of humans effecting "positive feedback" such as methane release from melting tundra, ocean hydrate deposits and albedo effects. Albedo is a measure of reflectivity of a surface or body. Exposed land is darker colored and absorbs more energy. As the ice melts, more land is exposed. This absorbs more

record high last year and experts fear that rapid processes triggered by climate change may overwhelm our ability to respond.

The effects of warming are well established: average global sea level has increased by four-eight inches in the 20th century; Artic sea thickness has declined by 40 percent; and nine of the ten hottest years on record have occurred over the past decade. Furthermore: warming triggers profound ecosystem stress that may cause the extinction rate of other animals to accelerate rapidly. Carbon dioxide increases have caused acidification of the oceans and threaten the base of the oceanic food chain and obviously, climate disruption threatens the agricultural productivity.

In February 2005, the Kyoto Protocol went into effect. The Kyoto Protocol is an international agreement to address global warming and calls for a reduction of greenhouse gas emissions in the U.S. of seven percent below 1990 levels by 2012. So far, the U.S. and Australia have refused to ratify the Protocol while almost the rest of the world (162 of 192 countries) has ratified the agreement. And while the U.S. has not ratified the measure, nine U.S. States and 192 U.S. cities have adopted the Kyoto Protocol or similar climate control agreements whereby these governments are reducing global warming pollutants through programs that provide economic and quality of life benefits.

This resolution recognizes the need to reduce emissions in our own community and resolves that the:

1) City join other communities – both U.S. communities and other nation-states – in recognizing that human-induced climate change is a threat to humanity; and

2) Council support the Mayor's signing of the U.S. Mayors' Climate Protection Agreement; and

3) City develop an implementation plan – with guidance from the Environmental Commission - to cut greenhouse gas emissions with an aim of meeting the Kyoto Protocol; and

4) City take a leadership role within the community to increase energy efficiency and atmospheric carbon reduction; and

5) City urge Indiana Congressional Delegation and representatives of Indiana State government to adopt similar measures to reduce greenhouse gas emissions.

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heat, melting more ice. Light colored ice reflects back the Sun's energy efficiently. The altitude of the melting ice is reduced so it becomes harder for new ice to form. Similarly, exposed water is darker and absorbs more heat.

While this resolution calls for a reduction in local greenhouse gas emissions, it does not specify how the reduction shall be achieved. Instead, it charges the City – with guidance from the Environmental Commission – with developing a plan. The Environmental Commission has retained two interns who have prepared an inventory and trends of local greenhouse gas emissions as well as a framework for developing a plan to reduce those emissions. These reports are in draft form and are scheduled for approval by the Commission later this month. They are included in the packet to show what the Commission has done so far to evaluate and address the problem and are briefly summarized below and are only recommendations at this point.

Draft Inventory and Trends for Bloomington Greenhouse Gas Emissions (Inventory Report) prepared by Michael Steinhoff

The Inventory Report establishes baseline levels of greenhouse gas emissions for the 1990 and 2004 in order to: determine baseline and current conditions, identify activities where we could see the best reductions, and to set realistic goals. It focuses on four main contributors to greenhouse gas emissions: transportation, use of electricity, use of natural gas, and the disposal of solid waste. Estimates in the Inventory Report are derived from data in the Commission's Bloomington Environmental Quality Indicator Report and other sources, and carbon emission factors established by an international panel. However, the Inventory Report acknowledges these estimates are imprecise largely because the data on human activity and greenhouse gas emissions is not available in a convenient form.

Overall Goal: The Inventory Report indicates that we would need to reduce emissions of greenhouse gases from our 2004 level of about 957,000 metric tons to about 711,000 metric tons to meet the Kyoto Protocol.

Electricity - About 34% of our greenhouse gas emissions in 2004 were due to the consumption of electricity, which is generated by the burning of coal (95%) and natural gas (5%). That means the commercial, residential, and industrial activities in the community released a total of 322,229 metric tons of CO_2 in 2004 and would need to reduce emissions to 201,695 metric tons to comply with the Kyoto Protocol.

Transportation - About 29% of our greenhouse gas emissions in 2004 were attributable to transportation, which comes from the burning of petroleum in motor vehicles. That means we generated about 277,394 metric tons of CO_2 in 2004 and would need to reduce emissions to 248,726 metric tons in order to meet the Kyoto

Protocol. The Inventory also indicates that the petroleum-related emissions will *dramatically increase* in the next few years *unless* the community changes its driving habits by reducing the average number of miles we drive each day. There is better news in regard to City operations, because we have very accurate records regarding fuel consumption and the fleet of vehicles, and because we have begun introducing bio-diesel, which is considered emission-neutral (because the bio-diesel emits no more CO_2 than the soy beans would have otherwise produced).

Natural Gas - The burning of natural gas accounted for about 25% of our greenhouse gas emissions in 2004 and would need to fall from 241,061 metric tons of CO_2 to 193,622 metric tons in order to approach the levels set in the Kyoto Protocol. The Inventory notes that natural gas is, in many ways, a cleaner burning fuel. It also acknowledges that the estimates are rough given the change in providers from Indiana Gas to Vectren and the information these utilities provide.

Solid Waste - The release of methane from the solid waste we dispose accounted for about 12% of our greenhouse gas emissions in 2004 and would need to be reduced from about 116,918 to 67,023 metric tons in order to meet the Kyoto Protocol. Methane is about 23 times as potent as CO_2 and is generated as the result of recent land filling practices which bury solid wastes in compressed layers that don't admit oxygen. Reductions here could be achieved by capturing the methane (which is quite expensive), composting organic matter, and increasing the recycling of solid wastes.

Inventory Report Recommendations - The Inventory Report recommends:

- urging the County to join in this commitment, because data compiled at a county level is more plentiful and the measure of activities within the entire county would provide a better gauge of the community's net effect on global warming;
- undertaking a comprehensive waste audit to better determine who disposes what and who recycles what throughout the year;
- urging the State to require the testing of vehicle emissions or change its tax-reporting requirements to help the city ascertain the amount of fuel purchased here;
- developing better relationships with the largest providers of energy – electricity and natural gas – in order to obtain better data; and
- encouraging entities to prepare indicator reports like the Environmental Commission's Bloomington Environmental Quality Indicator's (BEQI)

Report in order to develop better measures of activities and their related emissions.

Framework for Developing a Greenhouse Gas Reduction Plan for the City (the Framework) prepared by Eric Roberts

The Framework provides a menu of options for meeting the Kyoto Protocol. It borrows these options from other cities including Portland, Oregon; Madison, Wisconsin; Berkeley, California; and Ann Arbor, Michigan.

The framework is comprised of an executive summary, six options for reducing greenhouse gas emissions, and seven appendixes of resources.

A brief review of the options follows.

1. **Establishing the Conditions for Change** – This option recommends that the City "research the current state of greenhouse gas emissions, integrate greenhouse gas reduction into all relevant public policy, and educate individuals, businesses, and community groups on the importance of greenhouse gas reduction." This option entails research, education, and outreach that should be ongoing and concurrent with any of the other five options;
2. **Increasing Energy Efficiency** – The City and the community may decide to use less energy and consume fewer fossil fuels. The framework sets forth actions that can be taken within the City and community in two-year increments over the next six years;
3. **Reducing the Need for Fossil-Fueled Transportation –** This recommendation points out that the reduction in the use of cars and the use of fossil-fuels in cars are considered essential to any significant reduction in greenhouse gases;
4. **Increasing Renewable Energy Resources** – The Framework also recommends that the City should explore alternative sources of energy that reduce the overall production of greenhouse gases;
5. **Reducing Waste and Increase Recycling** – The City and community can reuse and recycle more materials and set increasingly-higher recycling goals over the next six years; and
6. **Offsetting the Greenhouse Gas Effects by Planting More Trees and Creating a System of Credits for Such Projects –** The Framework suggests that the City can take steps to capture CO_2 emissions by planting trees and offset emissions by a system of credits that would retire over time.

NOTICE AND AGENDA
COMMON COUNCIL COMMITTEE OF THE WHOLE
7:30 P.M., WEDNESDAY, APRIL 12, 2006
COUNCIL CHAMBERS
SHOWERS BUILDING, 401 N MORTON

Chair: Stephen Volan

1. Ordinance 06-07 To Amend Title 2 Entitled "Administration and Personnel"- Re: Amending Chapter 2.21 Entitled "Department of Law" to Include "Gender Identity" as a Protected Class

Sponsor: Councilmembers David Sabbagh and Chris Sturbaum

2. Resolution 06-05 Supporting the Kyoto Protocol and the Reduction of the Community's Greenhouse Gas Emissions

Sponsor: Councilmember Dave Rollo

Posted and Distributed: Friday, April 7, 2006

City of
Bloomington
Indiana

City Hall
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Bloomington, Indiana 47402

Office of the Common Council
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To: Council Members
From: Council Office
Re: Calendar for the Week of April 10-14, 2006
Date: April 7, 2006

Monday, April 10, 2006

1:30 pm Safe Routes to School, McCloskey
3:00 pm Smokefree Policy Committee, Hooker Room
4:00 pm Deadline for Jack Hopkins Social Services Funding Applications, Council Office
4:30 pm Plat Committee, Hooker Room
5:30 pm Plan Commission, Council Chambers

Tuesday, April 11, 2006

12:00 pm Habitat Women's Build, Hooker Room
5:30 pm Bloomington Community Arts Commission, Kelly
6:00 pm Bloomington Commission on Sustainability, McCloskey

Wednesday, April 12, 2006

2:00 pm Hearing Officer, Kelly
4:00 pm Board of Housing Quality Appeals, McCloskey
4:00 pm Commission on the Status of Black Males, Hooker Room
4:30 pm Environmental Resources Advisory Council, Showers Building, Room 250
7:30 pm Common Council Committee of Whole, Council Chambers

Thursday, April 13, 2006

12:00 pm Housing Network, McCloskey
3:30 pm Bloomington Historic Preservation Commission, Council Chambers
5:15 pm Solid Waste Management District, Solid Waste Management Facilities, 3400 Old SR 37
5:30 pm Commission on the Status of Women, McCloskey
7:00 pm Inclusive Recreation Advisory Council, McCloskey

Friday, April 14, 2006

City Holiday—Offices Closed

Saturday, April 15, 2006

7:00 am Bloomington Community Farmers' Market, Showers Common

Posted and Distributed: Friday, April 7, 2006

RESOLUTION 06-05

SUPPORTING THE KYOTO PROTOCOL AND THE REDUCTION OF THE COMMUNITY'S GREENHOUSE GAS EMISSIONS

Whereas The atmospheric level of greenhouse gases has hit a record high, with the greatest annual increase in these gases having been recorded just within the last year; and

Whereas Well-documented effects of climate disruption include: average global sea level increases of four to eight inches during the 20th century; a 40 percent decline in Artic sea-ice thickness; nine of the ten hottest years on record occurring in the past decade; profound ecosystem stress that may cause the extinction rate of other animals to accelerate rapidly; carbon dioxide increases that have triggered acidification of the oceans and threaten the base of the oceanic food chain; a projected sea level rise from meltwater that could inundate coastal cities, estuaries, cropland and aquifers; and climate disruption that threatens the agricultural productivity of the world, even as world population increases by approximately 80 million people per year; and

Whereas Experts have identified the evidence of abrupt and rapid change in the geological record and warn that that we are current at such a punctuated moment, or "tipping point -- a threshold where human contributions to global warming result in positive feedback, such as albedo effects, methane release from melting tundra, or ocean hydrate deposits -- that may vastly accelerate climate change in the near future; and

Whereas Processes that unfold in rapid succession could overwhelm our ability to adapt; and

Whereas The Intergovernmental Panel on Climate Change (IPCC), the international community's most respected assemblage of scientists, has found that human activities are largely responsible for increasing concentrations of warming pollution; and

Whereas The IPCC has made repeated calls for reduction of greenhouse gases and recently called for "very deep cuts" in emissions, stating that the world has "already reached the level of dangerous concentrations of carbon dioxide in the atmosphere;" and

Whereas The National Academy of Sciences, the Royal Society, the American Meteorological Society, the American Geophysical Union, the American Association for the Advancement of Science, and the national science academies of the G8 nations have all echoed the warnings of the IPCC; and

Whereas The United States constitutes less than five percent of the world's population, yet produces nearly a quarter of the world's greenhouse gas emissions; and

Whereas Despite its disproportionate contribution to pollution, the U.S. federal government has refused to ratify the Kyoto Protocol; and

Whereas The Kyoto Protocol is an amendment to the United Nations Framework Convention on Climate Change and calls for the U.S. to reduce greenhouse gas emissions to seven percent below 1990 levels by 2012; and

Whereas Under bipartisan leadership, 162 nations, nine US States and 192 US cities have adopted the Kyoto Protocol or similar climate protection agreements whereby these governments are reducing global warming pollutants through programs that provide economic and quality of life benefits such as: reduced energy bills, green space preservation, air quality improvements, reduced traffic congestion, improved transportation choices, and economic development and job creation through energy conservation and new energy technologies; and

Whereas Many U.S. companies who have adopted greenhouse gas reduction programs have also expressed a preference for the U.S. to adopt mandatory emissions targets and timetables as a means by which to remain competitive in the international marketplace; and

Whereas We can take many steps on a local level to lessen emissions and to engage technologies that will enhance our economy through energy savings; and

Whereas Taking steps to curb emissions will foster the economic health of our community and prepare us for energy resource limitation in the coming years;

NOW, THEREFORE, BE IT HEREBY RESOLVED BY THE COMMON COUNCIL OF THE CITY OF BLOOMINGTON, MONROE COUNTY, INDIANA, THAT:

1. The City of Bloomington join other communities in the United States and the world that recognize human induced climate change as a threat to humanity.

2. The Common Council support the Mayor's signing of the United States Mayors' Climate Protection Agreement.

3. That the City of Bloomington develop a Community Greenhouse Gas Reduction Plan with guidance from the Environmental Commission, to cut our community's greenhouse gas emissions, with an aim of meeting the reductions stated in the Kyoto Protocol.

4. That the City of Bloomington take a leadership role within the community to increase energy efficiency and atmospheric carbon reduction.

5. That we urge our Congressional Delegation, and our State Government Representatives, to adopt similar measures to reduce greenhouse gas emissions.

PASSED AND ADOPTED by the Common Council of the City of Bloomington, Monroe County, Indiana, upon this _____ day of _____, 2006.

_____
CHRIS STURBAUM, President
Bloomington Common Council

ATTEST:

_____
REGINA MOORE, Clerk
City of Bloomington

PRESENTED by me to the Mayor of the City of Bloomington, Monroe County, Indiana, upon this _____ day of _____, 2006.

_____
REGINA MOORE, Clerk
City of Bloomington

SIGNED and APPROVED by me upon this _____ day of _____, 2006.

_____
MARK KRUZAN, Mayor

SYNOPIS

This resolution documents the effects of human-induced global warming, calls for Bloomington to join other US cities and governments in meeting the greenhouse gas emission reductions outlined in the Kyoto Protocol and encourages the City to take a leadership role within the community to reduce atmospheric carbon emissions and increase efficiency. The resolution also calls upon the Indiana Congressional Delegation and State legislators to adopt provisions to reduce the emissions of greenhouse gases.

City of Bloomington
Office of the Common Council

To: Members of the Common Council
From: Dave Rollo, District IV
Re: *Resolution 06-05: Supporting the Kyoto Protocol and the Reduction of the Community's Greenhouse Gas Emissions*
Date: 07 April 2006

Global warming is widely-recognized as a threat to human society. The Intergovernmental Panel on Climate Change has concluded that most of the warming occurring over the past 50 years is attributable to human activities. [1] Carbon emissions[2] from human exploitation of fossil hydrocarbons has increased dramatically and is a chief contributor to the warming of the planet.[3] This human-induced warming is evident in the form of the warming of surface waters of the ocean,[4] the melting of polar ice caps, glaciers and permafrost, and stress on a variety of ecosystems.[5]

At the present rate of increase in greenhouse gases, it is possible to model future gas levels, and corresponding climate change with high probability (within certain ranges, 2.5 -10.4 degrees Fahrenheit).[6] Based on this modeling technology, experts project that Indiana will become drier and agriculture will suffer as the planet warms.[7]

In response to these rapid changes, leading scientific associations are calling for attention and action on climate change.[8] The most widely-known of these calls to action is the Kyoto Protocol.[9] The Kyoto Protocol requires a reduction of greenhouse gas emissions in the U.S. of seven percent below 1990 levels by 2012. So far, the U.S. and Australia have refused to ratify the Protocol while almost the rest of the world (162 of 192 countries) has ratified the agreement. And while the U.S. has not ratified the measure, nine U.S. States and 192 U.S. cities have adopted the Kyoto Protocol or similar climate control agreements whereby these governments are reducing global warming pollutants through programs that provide economic and quality of life benefits.

This resolution recognizes the need to reduce emissions in our own community and joins with other U.S. cities to do just that. The Environmental Commission and its interns,[10] have completed a study that provides information on our own current carbon emissions, on what other communities are doing to limit their own emissions, and provides a variety of options that we may choose to undertake to reduce our contribution of greenhouse gases.[11]

This Council measure complements the *U.S. Mayors' Climate Protection Agreement* that Mayor Kruzan intends to sign during Earth Week 2006.[12]

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[1] Intergovernmental Panel on Climate Change, Third Assessment Report: http://www.ipcc.ch/
[2] Chiefly, carbon dioxide and methane.
[3] Union of Concerned Scientists: http://www.ucsusa.org/global_warming/;
Pentagon report: http://observer.guardian.co.uk/international/story/0,6903,1153513,00.html
[4] The warming of surface waters has been implicated in stronger typhoons and hurricanes and in mass coral reef mortality known as "coral bleaching."
[5] Stanford report: http://www.stanford.edu/dept/news/pr/03/root18.html
[6] Union of Concerned Scientists, FAQ on Global Warming:
http://www.ucsusa.org/global_warming/science/global-warming-faq.html
[7] Climate change in Indiana: http://www.ucsusa.org/greatlakes/glregionind.html
[8] See G8 joint scientific academies agreement: http://www.nationalacademies.org/onpi/06072005.pdf
[9] http://unfccc.int/essential_background/kyoto_protocol/items/1678.php
Wikipedia has a good summary: http://en.wikipedia.org/wiki/Global_warming
[10] The interns are led by Professor Deb Backhus at I.U.'s School of Public and Environmental Affairs.
[11] *See* enclosed Environmental Commission Report in your packet.
[12] U.S. Mayor's Climate Protection Agreement: http://www.ci.seattle.wa.us/mayor/climate/default.htm

Preliminary Assessment of Greenhouse Gas Emissions Associated with Activities in Bloomington Indiana: Inventory and Trends

A Report by the City of Bloomington Environmental Commission
Bloomington Indiana, March 2006

Prepared by
Michael Steinhoff
Environmental Commission Intern, 2005/2006

Executive Summary

In order for the City of Bloomington to take actions regarding its impacts on climate change, those impacts must first be quantified. The purpose of this report is to establish a baseline of greenhouse gas emissions in order to evaluate the current status of emissions in Bloomington, identify those sectors where the largest reductions could be achieved, and assist in setting a realistic goal for emissions reductions.

It is hard to imagine any human activity which does not contribute in some way to the release of greenhouse gasses. Whether directly through combustion of fossil fuels in our cars or indirectly from the production and transportation of the products we use every day, almost everything we do has an impact. Accounting for the aggregate emissions generated in our daily lives would be nearly an impossible task. As such, the scope of the inventory is limited to the major source categories of transportation, heating and electric energy consumption, and solid waste. This level of scope is consistent with inventories of other cities that have joined the Mayor's Agreement on Climate Change. Each section of this report describes the accounting procedure, and the sources of uncertainty associated with those calculations. Calculations were performed for the most recent year in for which complete sets of data are available (2004), and for a baseline year by which to set a reduction goal (1990). The basic procedure for the calculations took raw data about activity in the major source categories, mainly from the Bloomington Environmental Quality Indicator (BEQI) report, and multiplied that by a carbon emission factor for that activity. The carbon emission factors used in this case were those published by the Intergovernmental Panel on Climate Change (IPCC). The IPCC was established by the World Meteorological Organization and the United Nations Environment Program "to facilitate understanding of the risk of human induced climate change, its potential impacts and options for adaptation"[2]. Emission factors published by IPCC are the same ones used by countries that have joined the international Kyoto Protocol and are therefore considered to be accurate. In most cases for this report, a few additional calculations were required to manipulate the raw data into the correct units for its respective emission factor.

The Kyoto Protocol calls for a 7% reduction of greenhouse gas emissions by 2012. Many of the other cities that have joined the Mayor's Agreement on Climate Change also use this timeframe as their target goal. This report was written with that goal in mind; however Bloomington is entering the game at a disadvantage with only six years to achieve this goal. Figures in each category demonstrate the potential difficulty of reaching the goal. The Mayor's Agreement on Climate Change does not dictate a timeline and a realistic goal for Bloomington should be set along with a finalized action plan for greenhouse gas reductions. The magnitude of the goal is quite large. In order to reach the goal of the Kyoto Protocol, Bloomington will need to reduce it's greenhouse gas emissions by 219,090.8 tons of carbon dioxide equivalents from 2004 levels, not counting the increases that will occur due to population growth. Figures 1 and 2 illustrate the relative proportions of CO_2 emissions from the major source categories estimated in this report. These figures should help determine where the largest reductions could be achieved at the least cost.

Figure 1.

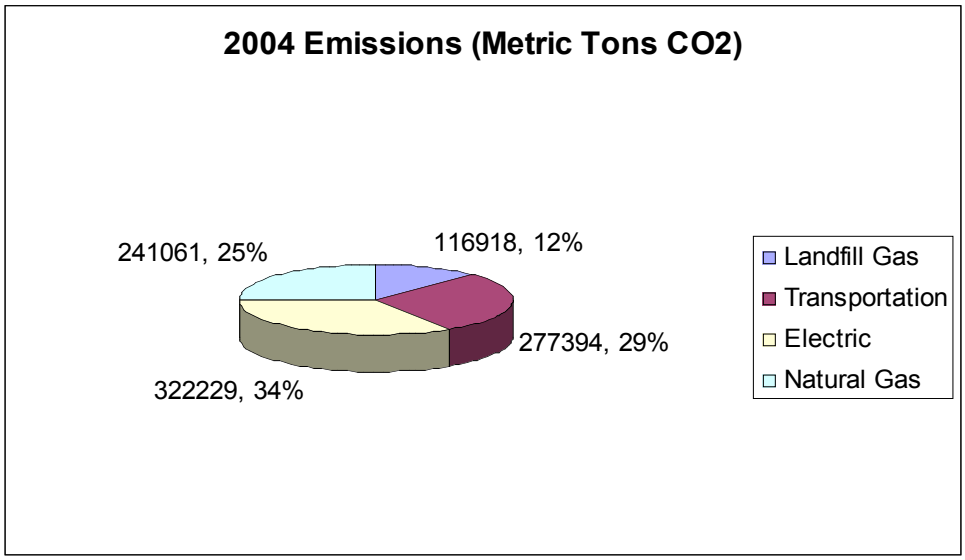
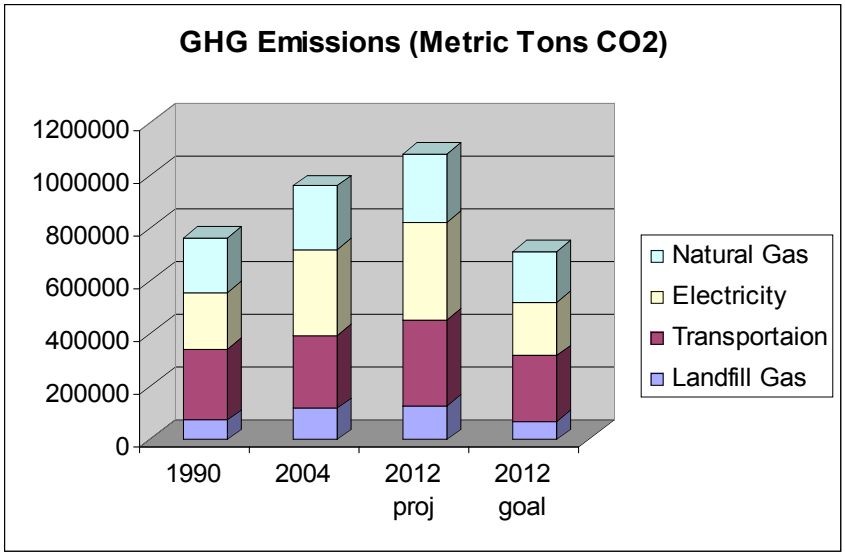


Figure 2.



It is important to note that the amount of greenhouse gas emissions reported here are estimates. It is not possible for this or any other city to measure greenhouse gas emissions with total accuracy given the number of sources. However many other cities are able to make more accurate estimations due to the greater availability of data. This report would not have been possible if the Bloomington Environmental Commission had not already been tracking some of the data included here. Some of the data limitations faced here are out of the hands of Bloomington officials. For example information about the age and type of vehicles driven by everyone in Bloomington is not tracked by the State or otherwise available to more accurately assess GHG emissions from these vehicles. The City of Bloomington will need to work with the State and our energy

providers to maintain a level of data availability for this initiative to be successful. At this point the availability of crucial data on utility usage is limited, and it appears that it will be less available in the future.

Estimation of Greenhouse Gas Emissions from Activities in Bloomington

Electricity

Electricity for the Bloomington area is primarily generated at facilities outside of Monroe county, which combust either coal or natural. Currently approximately 95% of the electricity that is used in Bloomington is derived from coal and 5% from natural gas, with renewable sources making up a negligible fraction (Peter Marvin, Cinergy, personal com.). Total usage for Bloomington was obtained from the Bloomington Environmental Quality Indicator report. Equation 1 demonstrates how emissions were calculated in this category.

Equation 1:

$$\text{Carbon Emissions} = (\text{Mwh} * (\%\text{ from fuel source}) * (EF_{\text{fuel source}})$$

In 2004 usage for three primary sectors in Mwh was:[1]

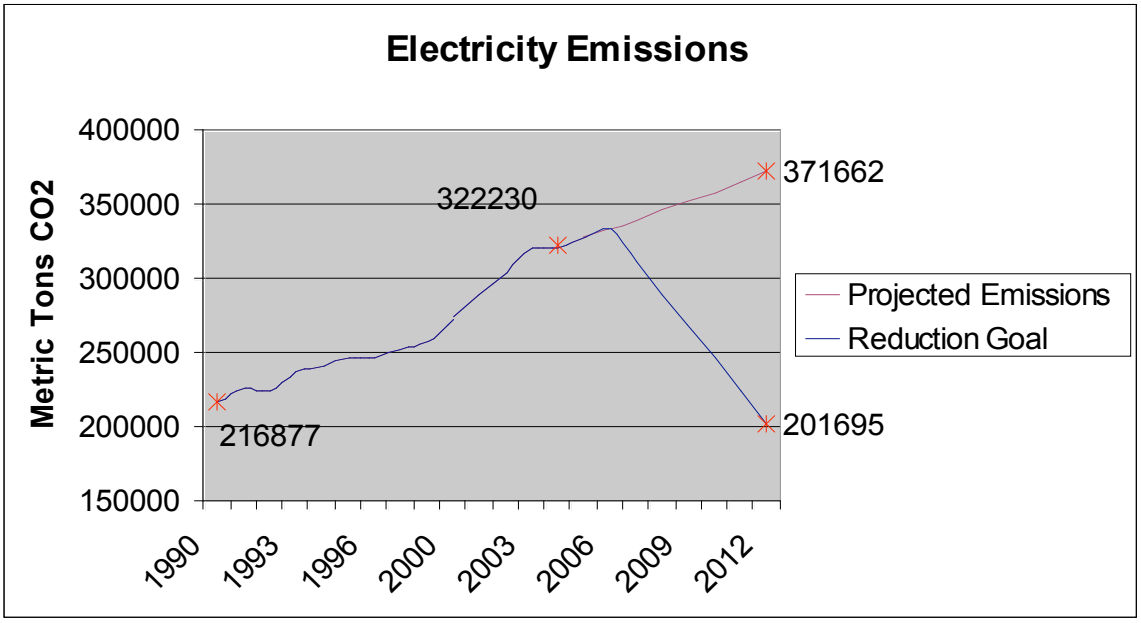
Residential:	349,439
Commercial:	468,818
Industrial:	153,602

The amount of CO_2 released due to electricity use was estimated for each fuel source by using the percentage of electricity generated by either coal or natural gas and then multiplying by the emission factor for its fuel source. Thus in 2004, the number of metric tons of CO_2 released for the three sectors was:

Residential:	115,860
Commercial:	155,441
Industrial:	50,928

for a total of 322,229.6 metric tons of CO2 from electricity generation. Figure 3 shows trends in emissions from 1990 and the projected path to meeting a 7% reduction of 1990 emissions levels for this category.

Figure 3



Transportation

According to the Energy Information Association, transportation-related emissions represent the largest proportion of the greenhouse gasses released by human activities in the United States after overtaking industrial greenhouse gas emissions in 1999. Currently, growth in petroleum- related emissions is far outpacing growth from coal and natural gas- related emissions. The percentage growth in emissions in 2004 was as follows:[3]

Petroleum:	3.7%
Coal:	0.3%
Natural Gas:	0.1%

While the increase in petroleum-related emissions may seem counterintuitive based on the fact that car fuel efficiency is improving, the growth in emissions is largely due to the increase in the number of miles the average person drives each day.

Calculating emissions in this category is more difficult than other categories because of the nature of private transportation. Unlike other forms of private energy consumption such as electricity and natural gas, there is no single source of the fuel consumed where aggregate usage can be measured. Additionally the varieties of different types of motor vehicles with their own emissions characteristics and control technologies make this calculation even more difficult. There are many assumptions behind the calculation of GHG emissions from this category, which inevitably introduces a degree of uncertainty. However, given the data limitations faced, the estimation is believed to be representative of actual emissions. Because there is no direct measurement of the amount of fossil fuel consumed in this activity, emissions are estimated based on the average driving distances.

The finest level of scale VMT (vehicle miles traveled) data that is available is the county level, thus the calculated emissions were adjusted by population to estimate the Bloomington portion. The emission factors obtained from the IPCC vary with the age of the vehicle to represent the emission control technology that was standard for the year in which the vehicle was produced. Table 1 shows the breakdown of the different categories. Using the 2001 National Household Transportation Survey published by the U.S. Department of Transportation, two age classes were defined for 2004 data (see Table 2). The percentage of vehicles that were older than 8 years were placed in the "early 3-way catalyst" class. Those that were younger were placed in the "3-way catalyst" class.

Again, there are many assumptions that affect these calculations. First, it is assumed that the number of vehicles still in operation that were produced before 1983 are responsible for a negligible amount of the total VMT. It is also assumed that there is no difference in the relative number of miles traveled between newer (3-way catalyst models) and older (early 3-way catalyst models) and that there is no difference in the number of miles driven by different types of vehicles (cars, light trucks, and heavy trucks). Although gathered between 2001 and 2002, the data from the National Household Transportation Survey regarding the vehicle age distribution are likely to be similar to the age distribution in 2004. The survey also included percentages for 1990 which were used for the calculations for that year.

Table 1.

EMISSION CONTROL TECHNOLOGY TYPES AND US VEHICLE MODEL YEARS USED TO REPRESENT THEM

Technology	Model Year
Gasoline Passenger Cars and Light Trucks	
Uncontrolled	1964
Non-catalyst controls	1973
Oxidation catalyst	1978
Early three-way catalyst	1983
Three-way catalyst	1996
Heavy-Duty Gasoline Vehicles	
Uncontrolled	1968
Non-catalyst control	1983
Three-way catalyst	1996
Diesel Passenger Cars and Light Trucks	
Uncontrolled	1978
Moderate control	1983
Advanced control	1996
Heavy-Duty Diesel Vehicles	
Uncontrolled	1968
Moderate control	1983
Advanced control	1996
Motorcycles	
Uncontrolled	1973
Non-catalyst controls	1996

(Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual)

Table 2.

Distribution of Vehicles by Vehicle Age and Vehicle Type
1977, 1983, 1990, 1995 NPTS, and 2001 NHTS
(percentage)

Vehicle Age	1977			1983			1990			1995			2001		
	Auto	Truck/ Van	All	Auto	Truck/ Van	All	Auto	Truck/ Van	All	Auto	Truck/ Van	All	Auto	Truck/ Van	All
0 to 2 years	*27.3*	*29.9*	*27.8*	*20.0*	*16.6*	*19.2*	*15.6*	*19.7*	*16.6*	*14.9*	*19.2*	*16.2*	*13.27*	*18.59*	*15.41*
3 to 5 years	*30.4*	*25.6*	*29.6*	*28.0*	*26.6*	*27.6*	*27.7*	*27.2*	*27.5*	*21.7*	*21.6*	*21.5*	*20.37*	*23.47*	*21.51*
6 to 9 years	*26.7*	*21.1*	*25.7*	*27.4*	*25.0*	*26.9*	*26.8*	*20.9*	*25.3*	*30.3*	*25.5*	*28.5*	*25.45*	*22.59*	*24.08*
10 or more years	*15.6*	*23.4*	*16.9*	*24.6*	*31.8*	*26.3*	*29.9*	*32.2*	*30.6*	*33.1*	*33.7*	*33.8*	*40.91*	*35.36*	*39.00*
Total	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***
Average Age	5.5	6.4	5.6	6.7	7.8	6.9	7.6	8.0	7.7	8.2	8.3	8.3	9.0	8.5	8.9

(2001, National Household Transportation Survey)

In 2004, the percentage breakdown by vehicle type was estimated as 73.1% cars, 24.2% light trucks, and 1.4% heavy trucks by the Indiana Bureau of Motor Vehicles (Adam Getz, IBMV personal com.). These percentages are used to represent the share of VMT that each type of vehicle is responsible for. Equation 2 demonstrates the calculation procedure for private transportation emissions.

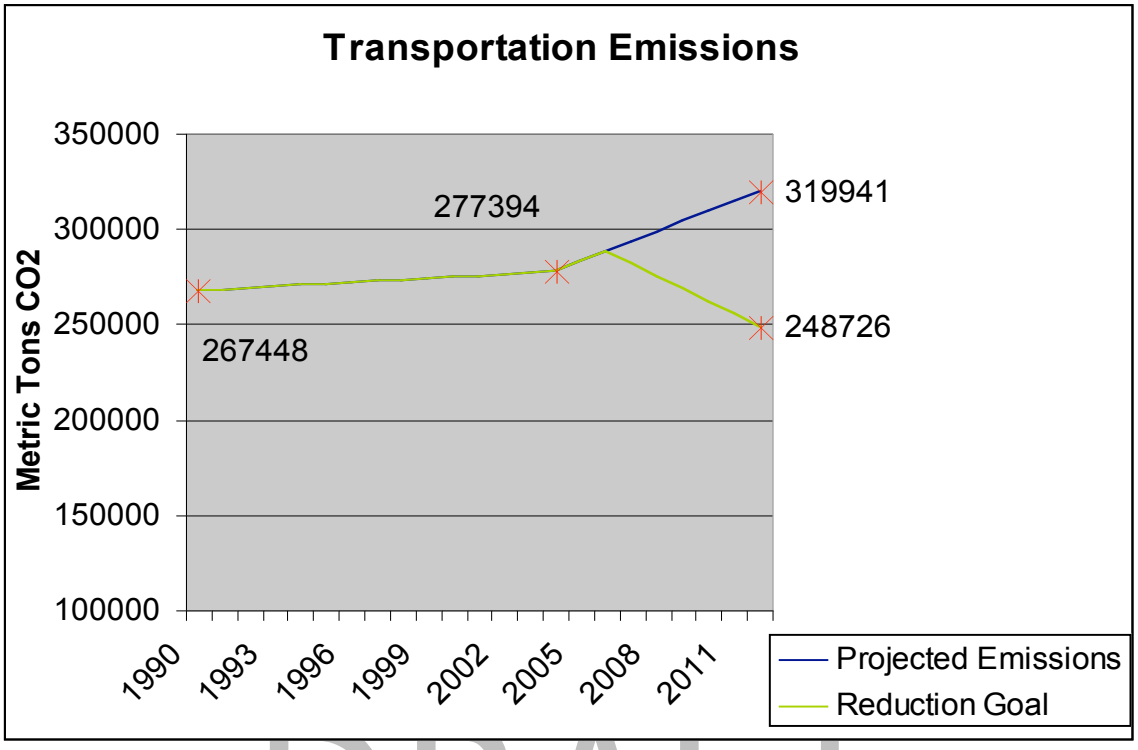
Equation 2:

$$\text{Carbon Emissions} = (\text{VkmT})*(\text{Vehicle Type\%})*(\text{Age Class\%})*EF_{(\text{Age class, Emission Type})}$$

For cars, total vehicle miles traveled (VMT) was converted to kilometers (VkmT), multiplied by the percentage of cars, multiplied by the percentage of cars older than 5 years, multiplied by the emission factor for an *early* 3-way catalyst for CO_2. This was added to a similar calculation using the percentage of cars younger than 8 years and the 3-way catalyst emission factor. An identical procedure was then carried out for methane emissions and methane emissions were converted to carbon equivalents. This procedure was the same for light and heavy trucks, except that the emissions factors used for the heavy truck category are for diesel fuel rather than gasoline.

Final emissions were then adjusted by population to find the amount that resulted from Bloomington residents. This is based on a clearly oversimplified assumption that the average city resident drives the same amount as the average county resident. Also certainly a number of county residents do much of their driving in the city. However there is no way of quantifying those among other factors, so adjusting for population is the best way to estimate at this time. In 2004 the total greenhouse gas emissions from transportation activities in Bloomington was 277,394.08 metric tons of carbon equivalents. Figure 4 shows trends in emissions from 1990 and the projected path to meeting a 7% reduction of 1990 emissions levels for this category.

Figure 4



A more precise inventory for the city operations is possible since there is a record of the amount of fuel used. For example in the year 2004, the Public Works Department purchased fuel, which resulted in emissions as follows:

Gasoline:	170,797 gallons	1,495.42 metric tons of CO_2 released
Diesel Fuel:	119,795 gallons	1,223.68 metric tons of CO_2 released

A total of 2,719.11 metric tons of CO_2 was produced from the operation of city owned vehicles in 2004. Reductions from City of Bloomington owned vehicles can be easily documented when policies to reduce usage are in place.

Some actions taken by the city are already helping to reduce our greenhouse gas emissions. In 2004, Bloomington Transit began purchasing B20 bio-diesel (20% bio-diesel) for some of its operations, switching completely to bio-diesel in 2005. The amount of CO_2 released from the combustion of bio-diesel is essentially the same as from regular diesel fuel. However it is estimated that 73% of the carbon content in bio-diesel is from soybean biomass. The carbon in those soybeans was taken from the atmosphere within the past year and thus releasing it is considered to be emission neutral. Unlike use of fossil fuels, the release of CO_2 from the combustion of biofuel is considered as producing no net addition of carbon to the atmosphere as CO_2. In 2004, Bloomington Transit purchased 236,236 gallons of regular diesel, and 12,796 gallons of bio-diesel. Had regular diesel only been used, 2543.82 tons of CO_2 would have been released. Subtracting the amount of biomass derived carbon from 73% of the 20% bio-diesel blend leaves a total of only 2524.73 tons, a difference of 19.09 tons. Based on 250,000 gallons

as an approximation of the amount of fuel purchased per year, projected reductions in CO_2 emissions for the year 2005 when Bloomington Transit was using bio-diesel throughout the year total over 372 tons. Once total fuel purchase data is available for 2005 an exact total can be computed easily.

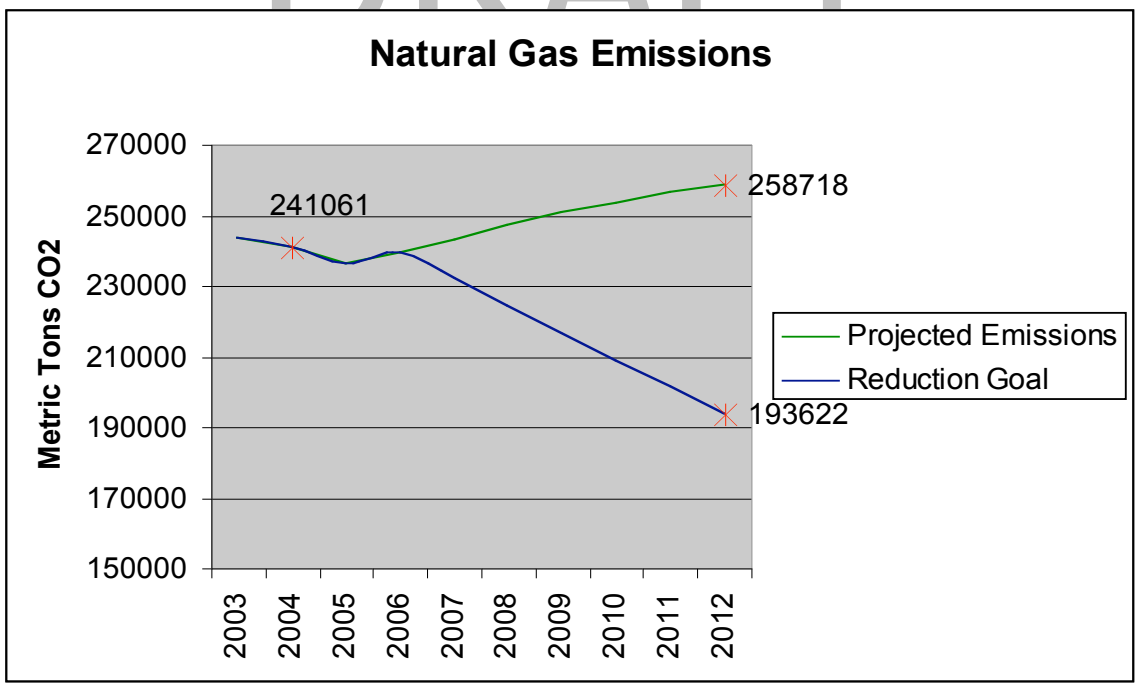
Natural Gas

While cleaner than other fossil fuels from a standpoint of particulate matter, sulfur and nitrogen oxides; natural gas combustion produces carbon dioxide and water as by-products. The estimation of emissions in this category was severely hampered by lack of basic data on natural gas usage in Bloomington. The only years for which data is currently available are 1996, 1997, and 1998. Estimations on usage for both 1990 and current usage was calculated using percent differences of total United States consumption from 1997 to those dates. Projections beyond the year 2004 are based on consumption predictions from the Energy Information Administration in the U.S. Department of Energy[7]. Usage rates that were once provided by Indiana Gas were reported in dekatherms which were converted to gigajoules. The number of gigajoules was then multiplied by the emission factor of 56000g/GJ as demonstrated in equation 3. Figure 5 shows trends in emissions from 1990 and the projected path to meeting a 7% reduction of 1990 emissions levels for this category.

Equation 3.

Carbon Emissions g = (Dekatherms*1.055 GJ/Dth)*56000gCO_2/GJ

Figure 5



As can be seen in Figure 1 carbon dioxide emissions from natural gas represent a substantial contribution (27%) of the total for Bloomington. Usage statistics that were

provided by Indiana Gas when they were the natural gas provider from Bloomington made this calculation possible. Establishing a similar relationship with the current provider, Vectren Corporation, will be necessary for a greenhouse gas reduction plan to commence. Usage rates from the time that Vectren became the natural gas provider will be needed to find what actual usage has been, and continual updates to track emissions reductions will be needed to allow this effort to encompass this major source category.

Solid Waste

Greenhouse gas emissions from solid waste are caused by the breakdown of organic material within the waste stream. There are two processes by which this organic material is degraded, aerobic and anaerobic. The difference is whether the degradation occurs in the presence of oxygen (aerobic) or not (anaerobic). The by- products of aerobic degradation are CO_2 and water. Anaerobic degradation releases methane (CH4) and CO_2. Carbon dioxide generation is considered to be unavoidable since all organic matter will inevitably degrade. As with the biomass derived carbon in biodiesel, CO_2 generated in food scraps and paper products can also be considered to be carbon neutral since the items that make up the degradable portion of the waste stream had recently taken that carbon from the atmosphere. Methane generation is a result of modern landfilling practices where layers of garbage become deprived of oxygen when buried by the next layer. Thus methane produced by landfills is typically considered in GHG calculations as a human- caused source of greenhouse gas, for which steps can be taken to reduce it.

Municipal solid waste composition can vary widely depending on a number of factors including change in seasons, relative amounts of commercial versus residential waste, and rates of participation in recycling programs. The composition data used for methane generation from Bloomington is from the national average published by the EPA in 2003. Accurate data of the composition of the solid waste stream is crucial in producing a reliable estimation of methane production. Obtaining specific figures from Bloomington's solid waste stream will necessitate at least one year of sampling and should include all the waste handling providers that service businesses, apartment complexes, and residential housing in Bloomington.

Degradable organic material in municipal solid waste comes from paper, food waste, yard waste, wood, and textiles. In 2003 the average percentage of the waste stream from these categories was 35.2% paper, 11.7% food scraps, 12.1% yard trimmings and 5.8% wood[5] . Textiles will be omitted because EPA has them grouped with non-degradable products like rubber. To illustrate the need for a more accurate data, we note that Bloomington probably does not send as much yard waste as the national average thanks to the Sanitation Department's separate yard waste collection. However with no data to quantify that, the EPA data is the only estimation available. Not all of the mass of organic materials from the aforementioned categories will be degraded in the landfill. Each of the types of organic waste has a percent degradable organic carbon (DOC) associated with it as illustrated in table 3.

Table 3.

DEFAULT DOC VALUES FOR MAJOR WASTE STREAMS		
	Waste Stream	Per cent DOC (by weight)
A.	Paper and textiles	40
B.	Garden and park waste and other (non-food) organic putrescibles	17
C.	Food waste	15
D.	Wood and straw waste[1]	30

[1] excluding lignin C

Source: Bingemer and Crutzen, 1987.

(Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual)

An overall percent DOC for the waste stream leaving Bloomington can be calculated using equation 4.

Equation 4

Percent DOC =
(.4)*(% paper) + (.17)*(% yard waste) + (.15)*(% food waste) + (.3)*(% wood)

Equation 4 uses the average composition from EPA, yielding a degradable organic carbon (DOC) fraction of 0.196 of the total waste stream. This fraction along with total municipal solid waste generated can be used to estimate the amount of methane generated using Equation 5.

Equation 5

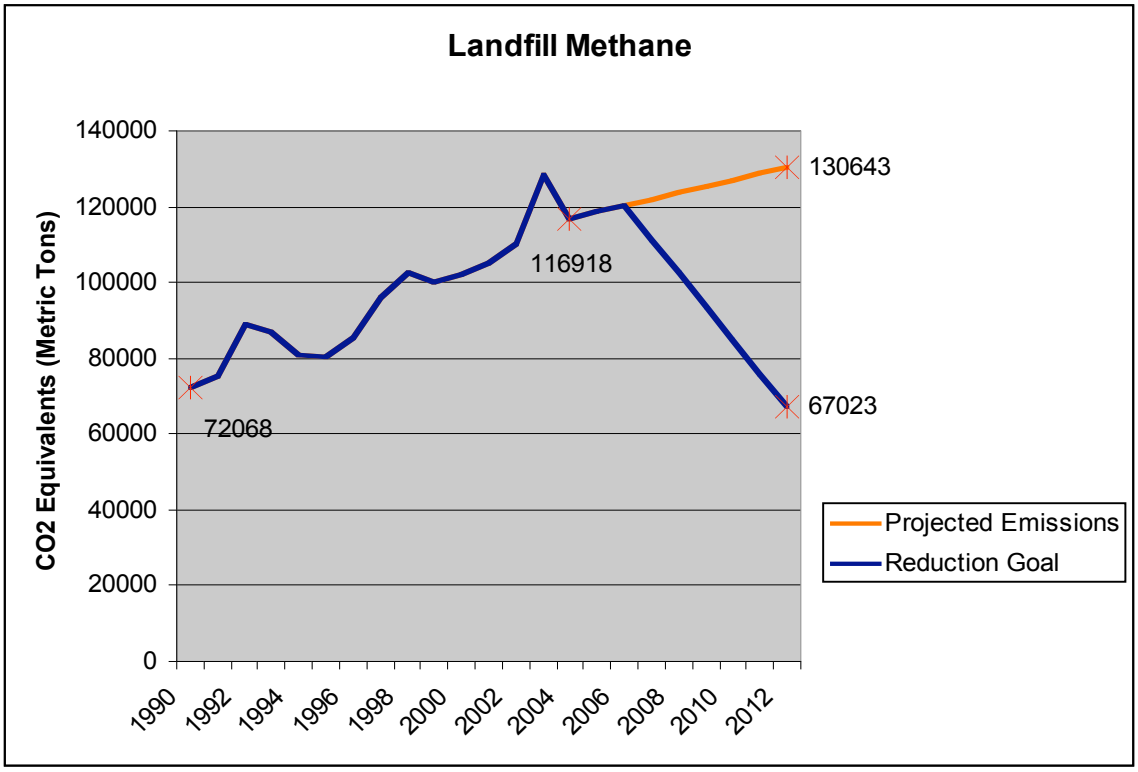
Methane emissions(tons) =
$MSW(tons)*DOC*DOC_F*F*(16/12)$

Equation 5 has been simplified from the version that appears in the IPCC guidelines. Variables that were omitted were ones that would not change the end result of the calculation, such as a factor that accounts for the management of the landfill, which would equal 1 in industrialized countries that use landfill liner systems that exclude oxygen. Other values smaller than 1 are applied to unmanaged waste piles where there is a greater amount of aerobic degradation occurring. Another is a factor that is recognized by the IPCC as being relevant but which has not been quantified, that accounts for the portion of methane that is oxidized in the upper layers of the landfill before it escapes to the atmosphere. Also omitted is a variable that would account for the methane captured for energy generation at the landfill, which is not performed in the portion of the landfill where Bloomington's waste is currently disposed of. Communication with Republic Services in the future to see how they are employing landfill gas capture technology should be undertaken in future inventories. DOC_F is the dissimilated fraction of the organic carbon. This is the percentage of the available carbon that is converted into landfill gas; the remainder goes into microbial biomass or other byproducts. DOC_F has a default value of 0.77. The variable F is the fraction of landfill gas that is methane, and has a default value of 0.5, the remainder being mostly CO2 with small amounts of other gases. Lastly the fraction of (16/12) is simply a weight

conversion of carbon (molecular weight 12 g/mole) to methane (molecular weight 16 g/mole).

In 2004, Monroe County generated 156,988 tons of landfilled garbage.[1] After going through the calculations and adjusting by population to obtain the amount from Bloomington, 5,228 of methane are estimated to have been produced. As stated earlier, methane is a 23 times more potent greenhouse gas than CO_2. The calculated quantity of methane is equivalent to 120,208 tons of CO_2. It is important to note that the methane produced from one year's worth of waste will be released over several years. The calculated amount of methane produced would be representative of actual annual emissions assuming the composition of the waste stream does not vary significantly from year to year. Figure 6 shows trends in emissions from 1990 and the projected path to meeting a 7% reduction of 1990 emissions levels for this category.

Figure 6



Reductions in the waste category can be realized in a number of ways. One common way is to capture the methane produced at a landfill site and burn it for electricity or heat generation on site. Not only does this practice convert the methane to the unavoidable and thus neutral CO_2 that would have been released under aerobic degradation, but it also reduces emissions that would have been generated by fossil fuel use to produce the electricity or heat. Unfortunately such methane capture systems can be expensive and may not be economically feasible for a private waste management provider. Alternatively by reducing the amount of organic matter entering a landfill, methane generation can be limited. Composting of yard waste could be extended to

include food waste and paper products not recycled. If the composting operation utilized an anaerobic digestion process the methane generated could be captured and utilized to obtain offsets from reduced fossil fuel use. Indirect reductions are also possible to achieve through increased recycling participation. Certain products such as aluminum cans use more energy to be produced from virgin materials than from recycled inputs. Such energy use reductions can be calculated from quantities of aluminum that were recycled rather than landfilled.

Recommendations

As was stated in the executive summary, the numbers reported here are estimates. All of the calculations involved in the process have some degree of uncertainty. One of the sources of uncertainty is from using county level data in the transportation and solid waste categories. Given the nature of these categories, it would be useful if the Monroe County government were to join in the effort as it is extremely difficult to accurately separate who is responsible for what portion of the emissions. Having the county involved would also enable a more comprehensive assessment of this community's contribution to anthropogenic climate change. Other categories that are more relevant on the county level such as agriculture and land use change could be included which could represent a net carbon dioxide sink rather than a source depending on the rate of development outside of the city limits. For example, because trees take CO_2 out of the atmosphere, if it is found that there is a net increase in the amount of forest land, the amount of CO_2 taken out can be quantified and counted as an offset from Bloomington's emissions.

In the solid waste category, it is recommended that the city undertake a comprehensive waste audit. This audit should be designed to capture variation in the composition of waste leaving the city over changes in season and from the various groups that are serviced by private waste collection companies. Not only would such an audit allow for a more representative estimation of emissions in that category, it would also give an idea as to real participation in recycling programs, which if better quantified could assist in tallying reductions from expanding the recycling program in Bloomington.

Characterizing private transportation accurately will always be difficult. To do so would require knowledge of the number of each type of vehicle used in Bloomington and what percentage of the vehicle miles traveled (VMT) they represent. However, if the State of Indiana were to require vehicle emissions testing in the future, useful data could be obtained. Alternatively if the State could alter the tax reporting procedure for metered pumps such that the amount of fuel purchased in a city or county could be ascertained, this calculation would be more accurate. The City of Bloomington should call for or support any such efforts in the State in so far as it is able.

The largest contributor to Bloomington's greenhouse gas emissions is from building energy usage in electricity and natural gas. Due to changes in accounting procedures at one provider and difficulty in obtaining any information by another, data in these categories is currently limited and will likely be more so in the future. This information will be necessary for progress on this initiative to be measured. It is recommended that the City strive to develop relationships with these providers to encourage the exchange of information.

Creating an information rich environment within the city will allow this as well as future initiatives by the city be more successful. Continued support for reports such as the Bloomington Environmental Quality Indicator Report (BEQI) and indicator reports being developed by other commissions is encouraged. The information obtained from past BEQI reports was crucial in developing this emission measurement plan, a first step for the City to join the Mayor's Agreement on Climate Change.

Referernces

1 Bloomington Environmental Quality Indicator Report, Bloomington Environmental Commission, 2001 and 2005/6 web based BEQI

2 Intergovernmental Panel on Climate Change, (http://www.ipcc.ch/), last accessed 3/5/06.

3 U.S. Department of Energy, Energy Information Administration, Office of Integrated Analysis and Forecasting; "U.S. Carbon Dioxide Emissions From Energy Sources, 2004 Flash Update" (Powerpoint Presentation); June 2005

4 U.S. EPA, Municipal Solid Waste Basic Facts; (http://www.epa.gov/msw/facts.htm), last accessed 3/5/06.

5 Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual; Available Online (http://www.ipcc-nggip.iges.or.jp/public/gl/invs6.htm), last accessed 3/5/06.

6 U.S. Department of Transportation; Summary of Travel Trends, 2001 National Household Transportation Survey; December 2004.

7 U.S. Department of Energy, Energy Information Administration; "Annual Energy Outlook 2006" Available Online (http://www.eia.doe.gov/oiaf/aeo/index.html). Last accessed 3/5/06.

A framework for developing a greenhouse gas reduction plan for Bloomington, Indiana

A Report by the City of Bloomington Environmental Commission
Bloomington Indiana, March 2006

Prepared by Eric Roberts
Environmental Commission Intern, 2005/2006

Executive Summary

As affirmed in the US Mayor's Climate Protection Agreement, the City of Bloomington is committed to reducing global warming by reducing greenhouse gas emissions. We recognize that human activity is having an adverse impact on the earth's climate—with subsequent predicted negative effects on human welfare in many countries—and we seek through education and policy implementation to reduce these impacts for the benefit of future generations. This document provides many ideas through which our community can reduce greenhouse gas emissions. These ideas provide a palette from which the Bloomington community can choose in developing an implementation plan for the Mayor's Climate Protection Agreement. A summary of the general framework is provided below, followed by more detailed sections which relay specific tasks for reducing Greenhouse Gas Emissions (GGEs). Additional information and resources related to some of these tasks are provided as appendices and notes at the end of this document. We have drawn many of our ideas from cities that already have established plans to reduce greenhouse gas emissions, including Portland, Oregon; Madison, Wisconsin; Berkeley, California; and Ann Arbor, Michigan. To give credit to these cities we have added in italics, where applicable, the first letter of whichever of these four cities inspired each of our suggested points of action.

I. Establish the Conditions for Change

As a basis for positive change, we must research the current state of greenhouse gas emissions, integrate greenhouse gas reduction into all relevant public policy, and educate individuals, businesses, and community groups on the importance of greenhouse gas reduction. Completion of the tasks recommended in this section is not a prerequisite for implementation of subsequent sections of this document. These tasks can be implemented along side those described in II – VI.

II. Increase Energy Efficiency

By using less energy (electricity, heating, cooling), we can reduce the greenhouse gas emissions that result from the use of fossil fuels. The city government, businesses, community groups, and individuals can all play an important role.

III. Reduce the Need for Fossil-Fueled Transportation

One of the most significant sources of greenhouse gas emissions is transportation via individual automobiles. We can greatly reduce these emissions by using alternative transportation modes, making the private cost of driving reflect the full cost it has on society, and investing in alternative fuels. Reducing the need for transportation is also a key tool in reducing GGEs.

IV. Increase Renewable Energy Resources

Along with a reduction of energy use, our community must explore alternative sources of energy that do not have adverse environmental impacts. A goal Bloomington could establish in this area is to require that a specified average percent of the megawatts consumed in Bloomington be derived from new renewable energy resources by a target year in the future.

V. Reduce Waste and Increase Recycling

We can also decrease energy use by reusing and recycling materials rather than discarding them. Bloomington has already made significant strides in recycling, which is a good predictor for success in reaching higher targets. A goal Bloomington could establish in this area is to achieve an overall solid waste recycling rate of 60 percent city-wide by 2009, and establish a new target for 2011.

VI. Reduce Greenhouse Gas Effects through Carbon Offsets

Healthy trees can, in aggregate, offset the effects of greenhouse gas emission by converting carbon dioxide into oxygen. Therefore another important way in which our community can ensure the long-term viability of our climate is to plant trees and protect the forested areas in our city and surrounding region.

Options for reducing greenhouse gas emissions

I. Establish the Conditions for Change

A. Research

1. Compile and update an inventory of greenhouse gas emissions (GGEs) from City operation, and track related solid waste, energy, economic and environmental data. *(P)*
2. Formally acknowledge the global warming impacts of City planning, transportation, and urban redevelopment policies and decisions. *(P)*
3. Review all major policies and programs that are in an early stage of development, to identify ways to reduce GGEs. *(P)*
4. Research technologies and programs that reduce GGEs.
5. Provide tools to local businesses and non-profit entities to estimate their GGEs and guide their GGE reduction. *(P)*
6. Prepare a progress report on the climate protection plan every two years, and propose action items for the following two years. *(P)*
7. Monitor the development of GGE credit mechanisms, and seek to bank credits for the City. *(P)* *(Appendix 3)*

B. Education

1. Educate city employees about sustainability, with a focus on specific operational changes that can be made to reduce GGEs. Require employee education on fuel-efficient driving and reducing energy use at work and at home. *(P)*
2. Inform local elected officials, community leaders, and local and regional media about the causes and impacts of global warming.[1] *(P)*
3. Implement a program to educate community groups and the general public about greenhouse gas effects and their long-term implications, as well as how to reduce GGEs.[2] *(P)*
4. Ensure that teachers have access to effective educational materials about global warming. *(P)*

C. Outreach

1. Publicize public and private projects which seek to reduce GGEs.
2. Form neighborhood Eco-Teams to guide energy efficiency, water conservation, waste reduction, and alternative transportation.[3] *(M)*
3. Establish a hotline for business and household resource-conservation questions. Provide educational information and referrals to resources and programs related to global warming and GGE reduction. Continue to inform residents of the state and local tax incentives to use renewable energy and low-emissions vehicles. *(P)* *(Appendix 1)*

II. Increase Energy Efficiency

A. Actions Within City Government

2007

1. Replace incandescent light bulbs with compact fluorescent bulbs in all city facilities.
2. Explore lighting automation options such as photosensors, motion sensors, and timers, for city facilities
3. Develop and adopt energy and resource-efficient building standards for all new construction and major renovation projects funded by the city.[4] *(P)*
4. Purchase only EnergyStar® appliances and energy-efficient machinery for city use and for low-income housing supported with city funds.[5] *(P)*

2009

1. Require all city construction projects to exceed the energy code by 20 percent on new construction and by 10 percent on retrofits. *(P)*
2. Strategically finance energy-saving projects. *(Appendix 4)*
3. Include a green building requirement for developers who receive tax-increment financing from the city.[6] *(M)*
4. Investigate sliding-scale building permit fees with rebates for high-performance green buildings and higher fees for conventional buildings. *(P)*
5. Improve energy efficiency in city buildings by 10 percent.[7] *(P, M, B, A)*

2011

1. Convert traffic signals to LED technology.[8] *(P, M, B)*
2. Convert street lights to more energy-efficient technology.[9] *(P, M, A)*
3. Meet LEED Gold standards in all new city buildings and major renovations.
4. Establish the position of a City energy plans examiner and a required field inspection of energy systems, with technical consultation available at the planning stage. *(P)*

B. Actions in the Community

2007

1. Work with many of the largest local business, industrial, and institutional energy customers in Bloomington to establish and meet energy-efficiency and greenhouse gas-reduction targets.[10] *(P, M)*
2. Actively promote the implementation of local commercial and industrial energy-conservation programs funded through electricity system benefits charge or utility funds. *(P)*
3. Reduce heating and cooling loads by promoting light-colored roofs, paving materials, and green roofs, planting trees, and increasing vegetative cover. *(P) (Appendix 5.9)*
4. Promote energy-efficient construction and renovation of residential, commercial, industrial, and community buildings.[11] *(P)*

2009

1. Facilitate the installation of energy-conservation measures in single- and multi-family residential units. *(P)*
2. Improve the maintenance of residential heating, ventilation, and air-conditioning equipment by educating consumers. *(P)*
3. Work with the state and other partners to offer financing for the purchase of high-efficiency furnaces, heat pumps, air-conditioning systems, replacement windows, insulation, water heaters, appliances, and other large energy-using systems. *(P)*
4. Improve the efficiency of outdoor lighting in residential, public, and commercial settings.

5. Provide green building design assistance and technical resources to Bloomington developers, designers, and builders. Develop local standards for green buildings and help local buildings meet national energy-efficiency and green building standards such as LEED™ and Energy Star®.[12] *(P) (Appendix 5)*
6. Establish a green building incentives program.[13]
7. Publicly recognize local businesses that have implemented substantial energy efficiency measures.

2011

1. Develop a consortium of local and state support for more stringent federal efficiency standards for furnaces, refrigerators, water heaters, air conditioners, other appliances, and lighting products. *(P)*
2. Strengthen Bloomington's building code and advocate to strengthen the state of Indiana's building code to include all cost-effective energy-efficiency measures.[14] (*P)*
3. Explore requiring weatherization of residential properties at time of sale. Bring properties up to a minimum designated code level.[15] *(P, B, A)*
4. Promote improved operations and maintenance practices in local buildings, include the creation of resource-conservation management positions. *(P)*
5. Work with industry to identify opportunities to improve energy efficiency in process applications, including waste-heat recovery for cogeneration. *(P)*
6. Develop guidelines for the installation of combustion distributed generation systems to facilitate low-cost interconnection and encourage increased efficiencies. *(P)*
7. Support small business conservation programs through new agreements in utility franchises. *(P)*

III. Reduce the Need for Fossil-Fueled Transportation

A. Make alternatives to individual automobile use more attractive

2007

1. Require city departments to pay public transportation fares for guests in any circumstance in which private car parking would normally be validated. *(P)*
2. Implement City policies to encourage bus travel whenever appropriate and to provide employees with bus tickets for business travel. *(P)*
3. Expand City transit-pass subsidy programs; for example, give all city employees a bus pass as a job benefit. *(P)*
4. Support expanded bus lines and increased frequency of service.[16] *(P)*
5. Increase the number of locations that sell Bloomington Transit passes and tickets.
6. Work with Bloomington Transit to improve access to bus service (e.g. park and ride, improved bus shelters). *(P)*
7. Design and distribute maps highlighting alternative modes of transportation and preferred routes for each mode. *(P)*
8. Publicize and participate in campaigns to promote alternatives to single-occupancy vehicle travel (e.g. Internet-based ride-share program, increased information about pleasant walking and biking routes).[17] *(P)*
9. Provide secure, covered bicycle parking at school, in commercial districts, and at other destinations. *(P)*

2009

1. Reduce per-employee vehicle miles traveled in City administrative vehicles by (#) percent by (year) by promoting teleconferencing and the availability of pedestrian, bicycle, bus and ridesharing options for employees on business travel.[18] *(P, M, A)*

2. Promote City telework and flexible hours policies and provide education to department managers to encourage consistent application of these policies. Enable 25 percent of City employees to telework or work compressed schedules to avoid commuting at least one day every two weeks.[19] *(P, M, A)*
3. Implement vehicle-sharing programs for City departments.[20] *(P, B, A)*
4. Develop a contingency plan for fuel emergencies, so that essential public services can operate in the event of an energy crisis.[21] *(A)*
5. Increase drivers license test emphasis on pedestrian/bicycle rights.[22] *(M)*
6. Institute a "bike to work week" to take place each summer.[23] *(M)*

2011

1. Increase subsidy for Bloomington Transit passes through a household levy or business tax. Possibly offer free passes for all city residents.
2. Continue to improve Bloomington's pedestrian and bicycle infrastructure to meet the needs of pedestrians and bicyclists.[24] *(P, A)*
3. Promote telework, compressed workweeks, and other flexible-schedule work options which would reduce commuting. *(P)*
4. Promote vehicle sharing to individuals, businesses, and community groups (e.g. neighborhood car-share programs, sharing business delivery vehicles).[25] *(P)*

<u>B. Make the private cost of driving reflect the full costs to society.</u>

2007

1. Explore increasing the cost of parking on public lots and streets to make it reflect the costs of the infrastructure as well as the long-term effects driving has on the environment.
2. Work with businesses to encourage all employers who offer their employees subsidized parking also to offer a parking "cash out"—an equivalent payment to employees who do not require vehicle parking. *(P)*

2009

1. Support the use of auto insurance premiums based on the number of miles a car is driven. *(P)*
2. Work with financial institutions to promote location-efficient mortgages (LEMs).[26] *(P)*

2011

1. Extend parking pricing to all appropriate commercial areas to reduce single-occupancy vehicle use. *(P)*
2. Investigate a City-wide parking permit and/or state-wide registration fee based on a vehicle's greenhouse gas emissions. Revenue would be used to reduce use of single-occupancy vehicles. *(P)*

<u>C. Increase the use of highly fuel-efficient and alternative-fuel engines</u>

2007

1. Require a fuel efficiency of at least X mpg for all new City car purchases.[27] *(M)*
2. Educate all city employees on fuel-efficient driving practices, such as avoiding unnecessary idling.[28] *(P, M)*
3. Implement EPA's "Best Environmental Practices for Fleet Maintenance."[29] *(P, A)*
4. Use biodiesel (B20 or higher) in City diesel vehicles.[30] *(Appendix 6)*
5. Advocate raising the federal Corporate Average Fuel Economy standards for new automobiles to 45 mpg and for light duty trucks to 35 mpg.[31] *(P, M)*

2009

1. Increase the average fuel efficiency of passenger vehicles in the City motor pool to 35 mpg. *(P)*
2. Implement life-cycle costing for the purchase of energy-using equipment—vehicles and otherwise.
3. Work with the state to provide loans and other financial incentives to promote the purchase of X vehicles with fuel efficiency of at least 45 mpg by business, government, and individuals. *(P)*
4. Encourage the use of low- or no-CO_2 technologies in non-road vehicles and equipment, such as electric forklifts and medium-duty construction equipment. *(P)*
5. Work with vehicle maintenance providers to educate consumers about the potential savings and impact on fuel consumption of properly maintaining vehicles and practicing fuel-efficient driving techniques.[32] *(P)*

2011

1. Support programs to retire and recycle fuel-inefficient vehicles. *(P)*
2. Offer incentives for citizens to drive fuel-efficient vehicles.[33]

D. Encourage Compact Urban Form and Mixed-Use Development

1. Ensure that the city's Unified Development Ordinance promotes infill and brownfield development as well as bicycle and pedestrian-friendly urban and suburban neighborhoods.[34]
2. Promote mixed-use development that places residential units near commercial development and employment opportunities, to reduce the need for transportation.
3. Develop a Transportation System Plan to reduce the number of vehicle miles traveled, increase non-motorized vehicle trips, and support the connection between land use and transportation.[35] *(P)*
4. Implement new parking ratios and support programs that allow for innovative new development to occur with a minimum number of parking spaces.[36] *(P)*

IV. Increase Renewable Energy Resources

2007

1. Purchase 10 percent of City government electricity load from new renewable resources.[37] *(P) (Appendix 1)*
2. Support the use of electricity system benefits funding allocated to renewables to leverage the development of new renewable resources. (??)*(P)*
3. Advocate a higher cap on net metering in Indiana state code.[38] *(Appendix 1.2)*

2009

1. Purchase 50 percent of City government electricity load from new renewable resources. *(P)*
2. Fully develop the generation potential of anaerobic digester gas (methane) produced at the City's wastewater treatment plant.[39] *(P, M)*
3. Install photovoltaic panels on the roof of City Hall.[40]
4. Encourage residents and businesses to purchase at least 10 percent of their electricity from new renewable sources; promote green power as a community ethic.[41] *(P) (Appendix 1)*

5. Include renewable resource incentives or requirements in utility franchise agreements. *(P)*
6. Promote a green-power purchase by aggregating public-sector entities. *(P)*
7. Provide technical assistance to builders and developers to include solar water heaters and PV in rooftop and building-integrated systems. *(P)*
8. Support code revisions that facilitate low-cost interconnection of PV and other renewable electricity systems. *(P)*

2011

1. Purchase 75 percent of City government electricity load from new renewable resources. *(P)*
2. Install solar, geothermal, and other renewable energy applications at appropriate City facilities. *(P)*
3. Explore cost-effective opportunities to invest directly in larger-scale renewable projects such as photovoltaic (PV), wind, geothermal, and landfill gas systems. *(P)*
4. Support the deployment of small-scale renewable energy systems in mobile applications. *(P)*
5. Support legislation requiring 20 percent of all power sold to rate-regulated customers to come from new renewable resources.[42] *(P) (Appendix 2)*

V. Reduce Waste and Increase Recycling

2007

1. Track waste disposal and recycling practices and quantities at all City facilities to obtain baseline rate for future comparison. *(P)*
2. Establish City policies to use recycled antifreeze, recycled latex paint, and paper with at least 30 percent post-consumer recycled-content paper. Establish standards for the purchase of additional recycled-content products.[43] *(P, M)*
3. Improve and expand curbside recycling and other residential recycling services; extend recycling to city apartment complexes.[44]
4. Purchase only printers and copiers with duplexing capacity for City use; evaluate making duplexing the default setting. *(P)*
5. Lobby for an Indiana state bottle/can deposit law.
6. Assist X local businesses in developing and implementing improved waste management practices; continue to expand commercial recycling programs and services. *(P)*
7. Reverse Monroe County's computer and electronic waste recycling incentives (presently residents must pay to recycle computers and TVs). In general, promote the reuse and recovery of electronic devices.[45] *(P)*

2009

1. Achieve a solid waste recovery rate of 60 percent at City facilities. *(P)*
2. Hire a City resource-conservation manager to reduce solid waste and the use of energy, water, and other resources at City facilities. *(P)*
3. Hold City department managers directly responsible for resource-conservation practices in their departments. *(P)*
4. Conduct employee awareness campaigns at the City and at partner businesses and organizations. *(P)*
5. Require City contractors and vendors to document the use of recovered materials in their products and to follow environmentally responsible solid waste management practices. *(P)*
6. Promote the continued development of the local building deconstruction and material salvage industries. *(P)*

7. Implement a commercial food-waste collection program. *(P)*
8. Institute recycling of all types of plastics, not just #1 and #2 bottles; tap into the regional market for various recycled plastics.[46]

2011

1. Institute City recycling of asphalt and other street material and encourage private contractors to do the same. *(P)*
2. Work with the Indiana Department of Environmental Management and other jurisdictions to develop mechanisms to ensure extended product responsibility (EPR).[47] *(P)*
3. Explore residential food waste-collection options. *(P)*
4. Investigate opportunities for waste-recovery technologies. *(P)*

VI. Reduce Greenhouse Gas Effects through Carbon Offsets

A. Support efforts to preserve and grow regional forests

1. Adopt policies to restrict the purchase and use of non-sustainably harvested timber by City and County agencies. *(P)*
2. Support non-profit, private, and government efforts to reforest Indiana timberland. *(P)*

B. Plant new trees and protect the ones we have locally

2007

1. Update the Parks and Recreation Urban Forestry Division's inventory of the urban canopy to determine its current health, and identify needs and priorities for future urban forest management.[48] *(P)*
2. Improve community understanding of the role and value of the urban forest and increase public awareness of, and cultivate donations to, the Bloomington Tree Fund. *(P)*
3. Identify and promote the planting of trees to accrue optimum benefits in the areas of carbon offsets, energy conservation, air quality, stormwater management, and habitat.[49] *(P)*
4. Document and, where possible, quantify the multiple benefits associated with Bloomington's urban canopy. Use this analysis to inform policy decisions, and include this information in adult and child education programs. *(P)*
5. Improve development practices to limit destruction of trees and encourage planting of suitable trees. *(P)*

2009

1. Implement best management practices for City urban landscaped areas and, where appropriate, seek certification. *(P)*
2. Expand the urban forest and improve forest performance by maintaining trees carefully, eradicating vegetation, and promoting trees that will perform well for a long period of time. *(P)*
3. Forge partnerships with community cooperatives to organize tree-planting and maintenance events. *(P)*
4. Secure increased funding for green infrastructure through partnerships and from businesses, residents, and organizations that benefit, either directly or indirectly, from tree planting. *(P)*

2011

1. Plant X acres of trees. *(P)*
2. Expand the function of the Urban Forestry Division to include a Green Roofing Program. *(Appendix 5.8)*

C. Forge community partnerships to secure greenhouse gas emission offsets.

1. Explore investing in carbon offsets and retiring the credits to help meet the City's overall greenhouse gas-reduction goal. *(P)*
2. Encourage residents, businesses, governments, schools, and institutions to invest in greenhouse gas-reducing projects to offset their personal or corporate greenhouse gas emissions. *(P) (Appendix 3)*

Appendix 1 *State and Federal incentives to use renewable energy and low-emissions vehicles*

1.1 Hybrid car incentives: 2005 U.S. Energy Act Sec. 1341, page 1402
(Energy Act pdf: http://www.biodiesel.org/pdf_files/20050729_EnergyConf.pdf)

1.2 Net metering:
Rule: www.dsireusa.org/documents/Incentives/IN05R.pdf
Summary:
http://www.irecusa.org/articles/static/1/1118339755_987096450.html
http://www.dsireusa.org/library/includes/map.cfm?State=IN&CurrentPageId=1
under "Rules, Regulations & Policies" (10 kw max, as of September 2004). However, utilities may limit the aggregate amount of net-metering facility nameplate capacity to 0.1% of the utility's most recent summer peak load.

1.3 Indiana state financial incentives for renewable energy:
http://www.dsireusa.org/library/includes/map2.cfm?State=IN&CurrentPageId=1, including:

up to $50,000 or 30% of project costs for businesses, non-profits, schools, and units of local government to install and study *alternative and renewable non-transportation energy system applications*, including solar, wind, fuel cell, geothermal, hydropower, alcohol fuels, waste-to-energy, and biomass technologies (the Alternative Power & Energy Grant Program);

up to $50,000 for businesses, non-profits, schools, and units of local government to install and study *alternatives to central generation*, including fuel cells, microturbines, cogeneration, photovoltaics (PV), wind, biomass and landfill gas (the Distributed Generation Grant Program);

more information on Distributed Generation ("the use of small-scale power generation technologies located close to the load being served") at
http://www.highroadnow.org/high_road/environmental_sustainability/distributed_generation/index.cfm.

up to $50,000, or 50% of project costs, for businesses, non-profits, schools, and units of local government to apply a *renewable energy technology that is uncommon in Indiana*; projects must include a public education component (the Energy Education and Demonstration Grant Program)
http://www.dsireusa.org/library/includes/map2.cfm?State=IN&CurrentPageId=1

A *set-aside of NO_x allowances for large-scale energy efficiency projects and renewable energy projects* (allowances that can be sold in the national NOx-trading system developed by the EPA):
http://www.iedc.in.gov/Grants/uploads/NOxBudgetTrading.pdf
See "326 IAC 10-4-2 Definitions" and
326 IAC 10-4-9 NO_x allowance allocations" at
http://www.dsireusa.org/documents/Incentives/IN10F.pdf

55,729 tons of NO_x are set aside during each ozone control period, including 1,115 tons for energy efficiency and renewable energy. In recent years, NO_x allowances have traded in a range between $2,500 and $6,000 per ton.

100% **property tax exemption** for Solar Water Heat, Solar Space Heat, Wind, Hydroelectric, Geothermal Electric, and Geothermal Heat Pumps. These exemptions are listed in four separate statutes pertaining to solar, wind, hydropower, and geothermal systems, respectively. The definition of "solar" is restricted to active solar systems used for heating or cooling. More information about
active solar heating: http://www.eere.energy.gov/consumerinfo/factsheets/ac7.html
active solar cooling: http://www.eere.energy.gov/consumerinfo/factsheets/ac2.html

Solar access law:
Covenant restrictions prevent planning and zoning authorities from prohibiting or unreasonably restricting the use of solar energy. Easement provisions allow parties to voluntarily enter into solar-easement contracts which are enforceable by law. Both active and passive solar structures may be protected by solar easements.
http://www.dsireusa.org/documents/Incentives/IN02R.htm
http://www.dsireusa.org/documents/Incentives/IN02Rb.htm and
http://www.dsireusa.org/library/includes/map.cfm?State=IN&CurrentPageId=1

1.4 Federal financial incentives for renewable energy:
http://www.dsireusa.org/library/includes/genericfederal.cfm?currentpageid=1&search=federal&state=US and http://www.eere.energy.gov/consumerinfo/factsheets/la7.html,
including a 10% credit for businesses using solar or geothermal energy, plus other incentives.

Also, the 2005 U.S. Energy Policy Act establishes a 30% tax credit up to $2,000 for the purchase and installation of residential solar electric (photovoltaic) and solar water heating systems. An individual can take both a 30% credit up to the $2,000 cap for a photovoltaics system and a 30% credit up to a separate $2,000 cap for a solar water heating system. A 30% tax credit up to $500 is also available for fuels cells. (Sec. 1335)
http://www.dsireusa.org/library/includes/GenericIncentive.cfm?Incentive_Code=US37F&currentpageid=3 (Energy Act pdf: http://www.biodiesel.org/pdf_files/20050729_EnergyConf.pdf)

Appendix 2 *State-by-state Renewables Portfolio Standards (RPS) and other RPS information*

State	*% Renewable*	*by the year…*
Maine	30	2000
New York	24	2013
Hawaii	20	2020
California	20	2017
Minnesota	19	2015
Rhode Island	16	2019
Montana	15	2015
Nevada	15 (1/3	2013

	solar)	
Washington, D.C.	11	2022
Connecticut	10	2010
Colorado	10	2015
New Mexico	10	2011
Pennsylvania	8	2020
Maryland	7.5	2019
New Jersey	6.5	2008
Massachusetts	4	2009
Texas	2.7	2009
Wisconsin	2.2	2011
Iowa	2	1999
Arizona	1.1 (3/5 solar)	2007

Source: Solar Today (July/August 2005, p. 42)

More on Renewables Portfolio Standards:
http://www.highroadnow.org/high_road/environmental_sustainability/renewable_portfolio_standards/
(including legislation language template, talking points, and background):
www.renew**wi**sconsin.org/reports/UCS_WI_RPSreport.pdf

Appendix 3 *Greenhouse gas emissions credit trading*

3.1 The Chicago Climate Exchange: http://www.chicagoclimatex.com/

3.2 A *set-aside of NO_x allowances for large-scale energy efficiency projects and renewable energy projects* (allowances that can be sold in the national NOx-trading system developed by the EPA)
http://www.iedc.in.gov/Grants/uploads/NOxBudgetTrading.pdf
See "326 IAC 10-4-2 Definitions" and
326 IAC 10-4-9 NO_x allowance allocations" at
http://www.dsireusa.org/documents/Incentives/IN10F.pdf
55,729 tons of NO_x are set aside during each ozone control period, including 1,115 tons for energy efficiency and renewable energy.
In recent years, NO_x allowances have traded in a range between $2,500 and $6,000 per ton.

Appendix 4 *Strategies for financing municipal energy-saving projects*

4.1 Bonding Initiatives
San Francisco http://www.apolloalliance.org/docUploads/apollo-final.pdf
p. 12

4.2 Revolving Funds/ "Energy Bank"
Duluth, MN http://www.apolloalliance.org/docUploads/apollo-final.pdf
p. 12

Madison's "Energy Efficiency Savings Fund" (to capture City energy efficiency savings and use them to implement additional efficiency measures) http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 33

Ann Arbor: www.ci.**ann-arbor**.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20**energy**%20**plan**%20**update**%20**1994**.pdf p. 41

4.3 Pension Fund Investments
California: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 13

4.4 Energy Savings Performance Contracts
Redlands, CA: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 13

4.5 Apply for grant money and/or technical assistance through the Rebuild America program, which is managed by the State Technologies Advancement Collaborative (STAC) http://www.stacenergy.org/
(the program formerly was managed by the U.S. Department of Energy, which still posts information about *Rebuild America* at http://www.rebuild.org).

Appendix 5 *Green Building*

5.1 U.S. Green Building Council

5.1.1 LEED™: http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

5.1.2 US Green Building Council links:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=76&

5.2 The National Development Council:
http://www.nationaldevelopmentcouncil.org/

5.3 Energy Star®: http://www.energystar.gov/

5.4 State Environmental Resource Center's Green Building Policy Issues Package:
http://www.serconline.org/grBldg/index.html

5.5 Green Building Pages: http://www.greenbuildingpages.com/main_nb.html

5.6 BuildingGreen.com: http://www.buildinggreen.com/

5.7 Rocky Mountain Institute green building documents:
http://www.rmi.org/sitepages/pid174.php#GBBL

5.8 Federal incentive for energy-efficient building systems:
2005 U.S. Energy Policy Act p. 1333-1336

(http://www.biodiesel.org/pdf_files/20050729_EnergyConf.pdf)

5.9 *Green Roofs*

5.9.1 Greenroofs.net http://www.greenroofs.net/index.php

5.9.2 Chicago's green roofs
http://egov.cityofchicago.org/city/webportal/portalEntityHomeAction.do?BV_SessionID=@@@@0685161652.1125081783@@@@&BV_EngineID=ccccaddfidkliklcefecelldffhdffn.0&entityName=Environment&entityNameEnumValue=13

Appendix 6 *Biodiesel*

6.1 Estimating the emissions benefits of alternative fuels and cars:
http://www.eere.energy.gov/afdc/resources/emissions.html

6.2 "Blended"= Petroleum / Soybean blend:
(http://www.biodiesel.org/buyingbiodiesel/retailfuelingsites/showstate_bycity.asp?st=IN gives locations of Indiana retail fueling sites, either B2, B5, or B20 blend)

"Neat" = 100% plant-derived (At http://www.bioenergycolorado.com/ pure biodiesel sells for as low as $1.80 per gallon)

6.3 Biodiesel tax incentives in the new Energy Act:
The biodiesel tax incentive offers tax incentives for fueling infrastructure for B20 blends at retail stations, and tax incentives for farmers who wish to build biodiesel plants. The incentive extends through Dec. 31, 2010.
http://www.biodiesel.org/resources/pressreleases/
(Energy Act pdf: http://www.biodiesel.org/pdf_files/20050729_EnergyConf.pdf)

6.4 Converting vehicles to run on neat biodiesel:
http://greasecar.com/conserv.cfm?page=Resources
http://frybrid.com
http://greasel.com
http://www.deepfriedrides.com/ → $2400 for trucks and vans

6.5 Manufacture our own biodiesel fuel, using waste oil from local restaurants.
Example small-scale biodiesel machine: *Fuelmeister* costs $3000-$4000 and makes 40 gallons of biodiesel in 24 hours. Sold at http://www.biodieselsolutions.com/products/fuelmeister.asp and other retailers.

6.6 Form a local biodiesel cooperative, to augment biodiesel purchasing power.
Example: http://tcbiodiesel.com/ (Minneapolis/St. Paul, MN)
http://www.boulderbiodiesel.com/ (Boulder, CO)
http://www.berkeleybiodiesel.org/ (Berkeley, CA)
http://www.tacomabiodiesel.org/ (Tacoma, WA)
http://www.utahbiodiesel.org/index.html (Park City, UT)
http://www.gobiodiesel.org/tiki-index.php (Portland, OR)

6.7 Biodiesel in Indiana

Indiana's first soy biodiesel plant:
www.biodiesel.org/resources/memberreleases/20050830_IntegrityBiofuelsAnnouncement.pdf

Monroe County Community School Corp. now uses B20:
http://www.indianasoybeanboard.com/BloomingtonKids.shtml

Reynolds, IN: converting to all-renewable energy sources:
http://www.indianasoybeanboard.com/biotown.html

Bartholomew County now using B20 in County Highway fleet:
http://www.indianasoybeanboard.com/TaxIncentive.shtml

6.8 More about biodiesel→

http://www.biodiesel.org/ (National Biodiesel Board)
http://www.serconline.org/biodiesel/index.html
(Biodiesel policy issues package by SERC)
http://www.deepfriedrides.com/biodiesel.htm

6.9 Other alternative fuel topic:
Fuel cell buses→

2005 U.S. Energy Act Sec. 743 "Fuel Cell Buses";
Bloomington could propose to be one of the fuel cell demonstration units of local government, as stipulated in the Act.
(Energy Act pdf: http://www.biodiesel.org/pdf_files/20050729_EnergyConf.pdf)

Georgetown University's fuel cell bus program:
http://fuelcellbus.georgetown.edu/index.cfm

Appendix 7 *Renewable Energy*

7.1 Landfill methane

7.1.1 EPA's Landfill Methane Outreach Program: http://www.epa.gov/lmop/
Landfill gas energy project profiles:
http://www.epa.gov/lmop/proj/prof/index.htm
Landfill gas systems (18 in Indiana):
http://www.epa.gov/lmop/proj/xls/opprjslmopdata.xls
Candidate landfill gas systems (Monroe Co. isn't listed…yet):
http://www.epa.gov/lmop/proj/xls/candlfslmopdata.xls

7.1.2 Madison's landfills:
http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 22

7.1.3 Denton, TX landfill methane used to power a biodiesel production facility: http://www.apolloalliance.org/docUploads/apollofinal.pdf p. 8

7.2 Solar Power

7.2.1 Demonstration projects:

Reduce the cost of local businesses' PV installations by setting up the installations as workshops—people pay to learn how to install PV systems (for their own homes), thereby defraying the business' costs.

Deli dollars / local scrip (example: a local business sells to customers a coupon for $9 that they can redeem for $10 worth of product at a later time. The investments are used to help finance the business' PV system installation. A redemption date is stamped on the coupons to stagger the dates in which the business honors the coupons)

http://earthskyexchange.org/history.htm
http://www.feasta.org/documents/shortcircuit/index.html?sc4/share.html

Examples from other communities

http://oldmanriver.com/solar/sunny_side.htm
http://www.izzysicecream.com/solarproject/

Hold a free public "solar tour" of houses in the area that use PV panels or solar heating, with a tech expert on hand to answer questions.

7.2.2 Solar schools:

8 schools in Indiana received from Cinergy a 1.1 kw grid-connected PV system with educational monitoring:

http://www.irecusa.org/sgs.php?PHPSESSID=8fba1c33941065eb1dd1b2d10741f3a4&state=Indiana

Ample precedent has been set for school PV systems:

http://www.irecusa.org/sgs.php

Suggestion: get Bloomington included.

Altair Energy Solar for Schools

http://www.altairenergy.com/WhatWeOffer.asp?Page=SolarSchools&ParentID=2

←this website includes links to other Solar for Schools sites.

Application form for schools to get solar panels

http://www.altairenergy.com/SchoolInformationForm.asp

Solar electricity in schools fact sheet:

http://www.focusonenergy.com/page.jsp?pageId=564

BP America's A+ for Energy program was developed by BP to recognize California teachers for innovation and excellence in teaching energy and/or energy conservation in the classroom (the company funds solar panel installation at schools, with the kids helping out with the whole project). Source: (*Solar Today* July/Aug.'05, p.16-19)
Suggestion: Ask BP to extend their program to the Midwest; ask other large energy companies to establish a similar program that Bloomington schools could apply for.

Sustainable energy curricula for the classroom:

http://risingsunenergy.org/Solar_ed_program.htm
http://www.solarenergy.org/programs/solarschools.html

7.2.3 PV installers:

See the *Midwest Regional Solar Yellow Pages* for a listing (go to http://www.iowadnr.com/energy/solarmidwest/consumer.html, and then click on the *Solar Yellow Pages* pdf; also at this web page are case studies of PV applications in the Midwest).

Also, go to http://FindSolar.com. No Indiana installers are listed at that site, but there are installers listed for Illinois, Missouri, and Ohio, with information about their expertise.

Build a local pool of PV system installers— Write a letter from the City of Bloomington to Ivy Tech http://www.ivytech.edu/ to encourage them to develop a PV installation curriculum with advice from NABCEP http://www.nabcep.org/.

7.3 Renewable Energy Associations (a partial list):

Interstate: http://www.irecusa.org (Interstate Renewable Energy Council)
http://www.ncat.org/energy.html (National Center for Appropriate Technology)
California: http://www.solarliving.org/
Illinois: http://www.illinoisrenew.org/index.html
http://www.illinoissolar.org/
Iowa: http://www.irenew.org/
Michigan: http://www.glrea.org/
Minnesota: http://mres-solar.org/
Montana: http://www.montanagreenpower.com/index.html
http://www.montanagreenpower.com/mrea/
New England: http://www.nesea.org/ (includes green buildings and sustainable transportation)
Texas: http://www.treia.org/
Wisconsin: http://www.the-mrea.org/

7.4 Job creation

Estimated impact of Apollo Alliance goals (a 10-year, $300 billion nationwide program) on Indiana economy/ job creation:
http://www.apolloalliance.org/regional_projects/apollo_in_the_regions/indiana/injobs.cfm

Two Apollo Alliance goals include:
"Putting hundreds of thousands of men and women to work *installing and maintaining solar panels on every new home, office and government building*." and "Employing hundreds of thousands more Americans *retrofitting old buildings to become more energy efficient*."
http://www.apolloalliance.org/about_the_alliance/faqs.cfm

"Distributed generation and energy efficiency can be a major, if not the most important, part of a plan that improves reliability, reduces emissions, and provides

local jobs."—Ed Smeloff, Assistant general manager San Francisco Public Utilities Commission http://www.rmi.org/sitepages/pid1089.php

7.5 Books about Renewable Energy system design or policy

Small is Profitable
http://www.smallisprofitable.org/ (topic: Distributed power generation)
Climate: Making Sense and Making Money
www.rmi.org/images/other/Climate/C97-13_ClimateMSMM.pdf
Article about *Climate…:* http://www.envirolink.org/articles/dec97-1.html

7.6 Inspiration from other countries

Germany's *Environmental Policy: Renewable energy sources in figures—national and international development*
www.umweltministerium.de/files/pdfs/allgemein/application/pdf/erneuerbare_energien_zahlen_en.pdf

Notes

[1] Media example: Rockford, IL's Rock River Times newspaper includes a special "renewable energy" section http://www.rockrivertimes.com/

Hire a person to give presentations to schools and professional associations about the predicted effects of global warming, the City of Bloomington's efforts to reduce fossil fuel emissions, and what people can do on their own to reduce fossil fuel emissions.

[2] Inform citizens of low-cost and no-cost energy-saving measures: http://www.ci.berkeley.ca.us/energy/retrofit.html

Coordinate with the 2005 U.S. Energy Act Sec. 134 "Energy Efficiency Public Information Initiative": http://www.biodiesel.org/pdf_files/20050729_EnergyConf.pdf p. 77-79

The *Stop Global Warming Virtual March* is a "non-partisan online effort to bring all Americans together to acknowledge that global warming is here now... and it is time to take action to stop it." http://www.stopglobalwarming.org/default.asp

[3] Madison's Eco-Teams: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 29, 34, 38

[4] Seattle, WA green building standards http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 6

[5] Energy Star: http://www.energystar.gov/

[6] Madison: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 34

[7] Madison's Memorandum of Understanding (MOU) with the EPA for an Energy Star buildings

partnership: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 33
and an MOU for the local school district:
http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 34

Berkeley's energy-saving retrofits of city-owned buildings:
http://www.ci.berkeley.ca.us/energy/municipalsavings.html

Ann Arbor's computer tracking of energy consumption in City-owned facilities: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 45

8 Berkeley: http://www.ci.berkeley.ca.us/energy/municipalsavings.html

Madison: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 7, 27, and 35

Passaic, NJ and St. Paul, MN: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 11

9 Madison's conversion to high-pressure sodium streetlights:
http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 7, 27

Ann Arbor's Streetlight Replacement Program: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 48

10 Enlist local businesses in the EPA / DOE's ClimateWise program:
http://es.epa.gov/techinfo/facts/climate2.html

Madison's ClimateWise program goal and commercial sector green building program goal, with CO_2 reduction estimates:
http://www.ci.madison.us/Environment/ccp_2002.pdf p. 7

11 Ann Arbor School System's energy retrofit:
www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 44

12 King County, WA: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 5

13 Arlington County, VA's "green building incentives" for the private sector:
http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 6

Chicago's Green Building Agenda:
http://www.usgbc.org/News/usgbcinthenews_details.asp?ID=1621&CMSPageID=159

14 Require new buildings to meet the most recent International Energy Conservation Code (IECC) standards.

Phoenix, AZ's new Building Construction Code: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 7

Madison, WI: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 34

15 Berkeley's Residential Energy Conservation Ordinance requires that minimum energy conservation standards be met when residential structures are sold: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 13

Ann Arbor's Weatherization Ordinance for rental units: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 27

16 Presently, the Bloomington Transit Corporation provides public transportation around the city to citizens and students, while the IU Campus Bus System serves as a means of alternative transportation for those traveling around campus. Students who show a valid student ID are able to use both transit systems free of charge. Bloomington Transit also provides transportation for the disabled through the BT Access program. Transfers from the Monroe County rural bus program to the city bus are free of charge.

17 Portland, Oregon's internet-based carpool matching program: http://www.carpoolmatchnw.org/

18 Ann Arbor's bicycle programs: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 11

Madison's Employees Bike at Work Program: http://www.cityofmadison.com/Environment/BikesAtWork.htm

19 Madison: promote flex-time work hours so that not everyone begins and ends work at once, to avoid traffic congestion and idling: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 37

20 Ann Arbor's City Car Pool Program: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 39

Berkeley's City Car-Sharing program: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 9

21 Ann Arbor: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 37

22 Madison: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 39

[23] Madison: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 39

[24] Ann Arbor's bicycle programs: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 7

City of Bloomington Alternative Transportation & Greenways System Plan proposes a network of bicycle and pedestrian facilities for Bloomington.

City of Bloomington Growth Policies Plan includes a policy to "Enhance Bicycle and Pedestrian Transportation Facilities" (pdf p. 26), as well as a "Master Thoroughfare Plan" (pdf p. 90-105) that defines construction standards for the bicycle and pedestrian facilities defined in the *City of Bloomington Alternative Transportation & Greenways System Plan*.

City of Bloomington Greenway Corridor Project will convert an old railway into a pedestrian/bicycle trail.

[25] Details about and examples of car sharing-programs: http://eartheasy.com/live_car_sharing.htm http://www.smartcommunities.ncat.org/transprt/maxchoic.shtml#Van

[26] Location-Efficient Mortgages (LEMs): http://www.apolloalliance.org/docUploads/apollo-final.pdf p.9 and http://www.locationefficiency.com/

[27] Madison: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 36

[28] USEPA Anti-Idling program resources (including free video, posters, and more): http://www.epa.gov/cleanschoolbus/antiidling.htm

USEPA tips to save gas: http://www.epa.gov/otaq/consumer/17-tips.htm

Madison: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 36

[29] Ann Arbor's Vehicle Fleet Management Program: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p.49-50

Austin, TX's greener fleet resolution: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 9

[30] Bloomington Transit (35 busses), the IU Campus Bus System (27 busses), Monroe County Community School Corporation (107 busses), the Monroe County Highway Department and Van Buren Township Fire Department (50 vehicles) all use soy-biodiesel for their fleet vehicles.

[31] Madison: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 39

[32] Launch an anti-idling campaign focused especially upon educating both bus drivers and parents picking their children up from school. USEPA Anti-Idling program resources (including free video, posters, and more): http://www.epa.gov/cleanschoolbus/antiidling.htm

[33] Austin, TX's parking meter credit for hybrid cars: http://www.apolloalliance.org/docUploads/apollo-final.pdf

[34] Strategies for successful infill development: http://www.nemw.org/infillbook.htm

City of Bloomington Growth Policies Plan recommends several infill development policies (pdf p. 17, 18, 23, 28, 29, 41, 42, 47, 51, 69, 82, 87)

[35] Portland, OR's long-term Smart Growth policy: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 10 and http://www.metro-region.org/

[36] *City of Bloomington Growth Policies Plan* shares this goal (pdf p. 7, 39)

[37] Ann Arbor's solar-heated public pool: www.ci.ann-arbor.mi.us/CityAdministration/EnvironmentalCoordination/Energy/a2%20energy%20plan%20update%201994.pdf p. 19

[38] California's Million Solar Roofs bill calls for an increase from 0.5% to 5.0%.

[39] Madison's digester gas reuse: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 28-29

[40] Also consider using solar-powered (photovoltaic) streetlights and other outdoor lighting.

[41] Duluth, MN's 2.4 kWh *photovoltaic* array on the roof of the city's main public library, and Chesapeake, VA school's savings with a *geothermal* system: http://www.apolloalliance.org/docUploads/apollo-final.pdf p. 8

[42] 19 states plus Washington, D.C. have adopted Renewables Portfolio Standards, which establish a requirement for retail electric suppliers to supply a minimum percentage or amount of their retail load with renewable energy.

[43] Madison's recycled-plastic park benches and curb blocks: http://www.ci.madison.wi.us/Environment/ccp_2002.pdf p. 27

[44] Models for city recycling legislation: http://www.highroadnow.org/envirometro/recycling/index.cfm

[45] Computer Take-Back Campaign: http://www.computertakeback.com/

Electronic Waste Recycling: A Toolkit for Legislators:
http://www.computertakeback.com/docUploads/LegislatorToolkit.pdf

Electronic Equipment Recycling and Recovery links:
http://www.plasticsresource.com/s_plasticsresource/sec_electronics.asp?TRACKID=&CID=272&DID=823

46 Recycled Plastics Markets Database (enter a Bloomington zip code and a type of plastic to locate nearby buyers):
http://www.plasticsresource.com/s_plasticsresource/rmd_default.asp?TRACKID=&CID=86&DID=760

PlasticsResource.com's Community Recycling Resources:
http://www.plasticsresource.com/s_plasticsresource/sec.asp?TRACKID=&CID=151&DID=256

47 EPR explanation: http://www.grrn.org/resources/what_is_epr.html

48 City of Bloomington Parks & Recreation "Street Trees & Landscaping":
http://bloomington.in.gov/parks/landscaping.php

49 City of Bloomington Environmental Commission's *Toward a Comprehensive Greenspace Plan* (2003) recommends expanded greenspace planning and acquisition. These greenspace preservation and expansion efforts could be coordinated in conjunction with urban tree planting.