

*Town of Hamden, Connecticut
Cities for Climate Protection Campaign*

Local Action Plan

to Reduce Greenhouse Gas Emissions



August 2004

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The Town of Hamden and
ICLEI—Local Governments for Sustainability*



Acknowledgements

Many thanks to the Tremaine Foundation for their generous support of ICLEI and the Cities for Climate Protection campaign. Thanks also to all the people in the Town of Hamden who have been so generous of their time, knowledge, and advice, all of which were invaluable to the completion of this Action Plan. Thank you in particular to all the members of the Climate Change Task Force. Thanks also to Jackie Downing, Dave Mitchell, Gus Gertz, Ken Copeland, and Judi Kozak in the Town Government, and to Kath Schomaker, Madeleine Weil, and Nancy Dudchik. Very special thanks to Mayor Carl Amento and Matt Wiggin for all their help in the inspiration and preparation of this document.

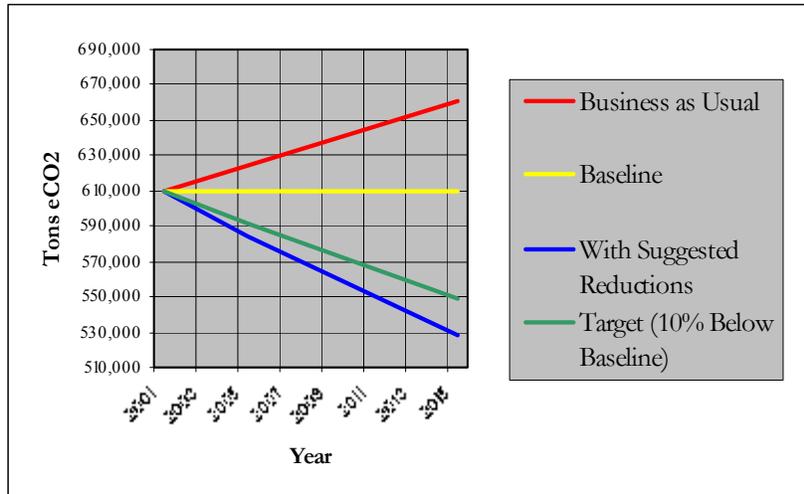
Local Action Plan, Town of Hamden, Connecticut

1.0 Executive Summary	4
2.0 Climate Change and Hamden	6
3.0 Summary of the Greenhouse Gas Emissions Inventory	11
4.0 Emissions Reduction Measures	13
4.1 Assumptions and Methodology	13
4.2 Community-Residential & Commercial	13
4.2.1 UI Community Energy Initiative	13
4.2.2 Energy Efficiency Education	14
4.2.3 Create Building Standards	15
4.2.4 Shade Tree Planting	16
4.3 Community-Transportation	16
4.3.1 Encourage Pedestrian-Friendly Zones	16
4.3.2 Further Improve Traffic Flow	17
4.3.3 Install Bike Racks and Stripe Bike Lanes	18
4.3.4 CTTransit Hybrid Buses	18
4.3.5 Shuttle Buses for “Magic Mile”	19
4.3.6 Federal Fuel Economy Standard Increase	19
4.4 Community-Waste	20
4.4.1 Unit Pricing	20
4.4.2 Composting Program for Household Organic Wastes	21
4.4.3 Create More User-Friendly Recycling Brochures	22
4.4.4 Recycle Plastics 3-6	22
4.4.5 Existing Recycling Program	22
4.5 Government-Buildings	23
4.5.1 Performance Contracting	23
4.5.2 LEED Silver for All New Buildings	24
4.5.3 LEED Silver for New Middle School	24
4.5.4 Control Thermostats in Government Offices	25
4.5.5 Solar Water Heating for the High School Pool	25
4.6 Government-Vehicle Fleet	26
4.6.1 Buy Hybrid Cars for Public Works	26
4.6.2 Buy More Fuel-Efficient Light Trucks for Public Works	27
4.6.3 Buy More Fuel-Efficient Cruisers for Police	27
4.6.4 More Bikes, Motorcycles, and Horses	28
4.6.5 Buy B-20 Biodiesel	28
4.6.6 Stop Idling	29
4.7 Government-Employee Commute	30
4.8 Government-Streetlights	30
4.9 Government-Waste	31
4.10 Government-Other	31
4.10.1 Green Purchasing	31
4.10.2 Green Energy	32
4.10.3 Open Space Acquisition and Tree Nursery	32
4.10.4 Adopt State Climate Change Initiatives	33
5.0 Future Actions and Implementation	34
6.0 Appendices and Notes	35

1.0 Executive Summary

Global warming is not just an excuse to make a disaster movie. It poses a serious threat to economies and health all over the world. In May 2003 the Town of Hamden passed a resolution to participate in the Cities for Climate Protection (CCP) campaign, a program of ICLEI-Local Governments for Sustainability. In so doing Hamden joined over 500 CCP participants worldwide (nearly 150 in the U.S.) in affirming its commitment to preserving the health and safety of its citizens and of the planet by reducing emissions of the greenhouse gases that cause global warming

Figure 1. Combined Emission Trends for Community and Government



This Local Action Plan is the third Milestone of the CCP process. The first Milestone, an Inventory of Hamden's greenhouse gas emissions, was conducted in the summer of 2003 by Adam Newcomer.* The second Milestone is to choose a reduction target. While this has been unofficially set at ten percent below 2001 levels, the target has yet to be officially adopted.

This report consists chiefly of a set of recommended actions for the government of Hamden to take, both to curb emissions from sources directly under its control, such as town buildings and vehicles, as well as to encourage certain behaviors among the residents of Hamden. The actions recommended in this Plan will not only help to reduce Hamden's contribution to the threat of global warming, but will also reduce associated emissions of conventional pollutants, such as ozone, particulates, and air toxics, which cause health problems like asthma (See Table 1).

Table 1. Annual Air Pollutant Reductions from Measures in Local Action Plan

Criteria Pollutant	NOx	SOx	CO	VOC	PM-10
Reduction (Tons)	35	22	311	30	23

The year 2001 was chosen as the baseline year for the emissions inventory. The recommended actions in this plan, in total, will have the effect of bringing emission levels in the target year (2015) to a level ten percent below emissions in the baseline year. This is an effective reduction of about 20 percent below 2001 emissions, as can be seen in Figure 1.

While there are many reduction measures recommended in this report, some of these measures inevitably must have higher priority than others. Table 1 is a short list of those actions that are

* Please see Adam Newcomer's "Greenhouse Gas Emissions Inventory and Forecast," available from the Town of Hamden and ICLEI. Some emissions figures used in this action plan have changed relative to what they were in the inventory, due to recently available information.

the most highly recommended for immediate action, either because of high reductions per cost, or because technical or financial resources to aide their implementation may currently be available.

For detailed information about all measures included in this plan, please follow the page number reference in the table of contents. You may also hyperlink to specific measures, if viewing electronically, by clicking on the measure title in Table 2 below and in the Table of Contents.

Table 2. Selected Top-Priority Reduction Measures

Location	Measure	Tons eCO2 reduced	Annual Savings	Estimated Annual Cost to Town	Page
Government	Energy performance contract	2,438	\$385,034	\$249,746 (15-year Bond)	23
Government	Replace Public Works vehicles with hybrids/efficient models	255	\$33,881	Hybrids cost ~\$2000 more than corresponding cars.	26
Government	Stop idling of vehicles	46	\$5,929	\$0	29
Government	LEED Silver for new Middle School	273	\$74,904	\$5,894 (20-year Bond)	24
Government	Control thermostats in government buildings	534	\$86,860	\$0 (Approx. \$4,343 startup cost)	25
Community	Work with UI to expand efficiency education	11,380	\$2,713,260*	\$2,000	14
Community	Unit Pricing for Garbage	18,071	\$336,392	Unknown--administration and enforcement	20
Community	Recycle plastics #3-6	78	\$795	Pending Bid	22
Community	Encourage pedestrian-friendly zones	6,506	\$1,213,333*	Unknown—administr. (and construction?)	16

* Savings to residents

2.0 Climate Change and Hamden

Introduction

On 5 May 2003 the Legislative Council passed a resolution committing the Town of Hamden, Connecticut, to the Cities for Climate Protection (CCP) campaign. With this step, Hamden has joined over 550 local governments worldwide who are committed to reducing their environmental impact. CCP is a global campaign that enlists cities to prepare and enact plans that reduce energy consumption, decrease emissions that lead to global warming, and improve the overall quality of life in the community.

Organized by ICLEI-Local Governments for Sustainability, the CCP campaign helps municipalities address the global environmental problem of climate change at the local level. ICLEI's CCP campaign focuses on identifying sources and quantities of greenhouse gas (GHG) emissions (otherwise known as global warming pollution) resulting mostly from the burning of fossil fuels. Cities then implement actions to reduce those emissions at the municipal level.

Local governments play a key role in climate change efforts because they directly influence and control many of the activities that produce GHG emissions. Decisions about land use and development, investment in public transit, energy efficient building codes, waste reduction, and recycling programs all affect local air quality and living standards as well as the global climate.

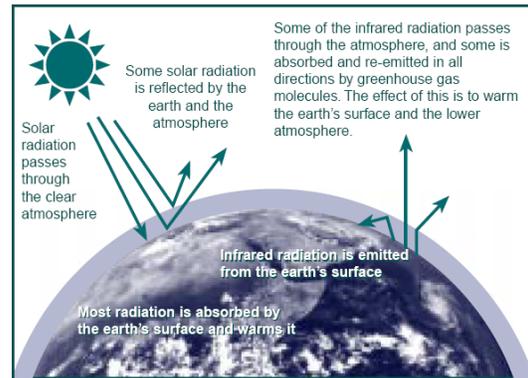
Hamden's participation in CCP is a reflection of its commitment to energy efficiency and sustainability, but action to reduce GHG emissions has additional benefits: it will lead to cleaner air and improved health. This is because GHGs and conventional pollutants are emitted by the same sources. When cars burn gasoline, they emit more than the GHG carbon dioxide. They also emit nitrogen oxides and volatile organic compounds (which cause ozone pollution, a.k.a. smog), carbon monoxide, particulate matter, and carcinogens like butadiene, benzene, and formaldehyde.¹ Curbing fossil fuel emissions that lead to respiratory and other problems can improve health while saving money. Improved economic vitality can be achieved through energy efficiency strategies and measures. Using energy wisely is fiscally prudent, even if the benefits of climate protection are not considered. Some actions that mitigate global warming can also create more livable communities. For example, encouraging more pedestrian-oriented development results in more trees, less traffic, and fewer car trips—and less pollution.²

The Enhanced Greenhouse Effect and Global Warming

Certain gases in the earth's atmosphere act like a greenhouse roof, trapping in heat that would normally escape into space. Life as we know it would not be possible without the greenhouse effect. As a naturally occurring process, it is responsible for keeping the earth's average surface temperature at 60° F—without this natural warming, the average surface temperature of the planet would be well below freezing at -0.4° F.^{3 4} Approximately half of the sun's incoming energy reaches the surface of the earth while the rest is reflected back into space or is absorbed by the atmosphere. Most of the energy that reaches the surface is absorbed by the ground and then later reemitted as heat. Some of this heat escapes back into space, but the rest is trapped in the atmosphere by gases such as water vapor, carbon dioxide and methane (see Figure 2).⁵ These greenhouse gases create a natural 'blanket' that traps heat and keeps the earth warm.

Problems arise, however, when this naturally occurring greenhouse effect is enhanced by human-generated emissions of greenhouse gases. In the past, the earth maintained a nearly constant temperature by emitting heat into space at the same rate that it absorbed it from the sun. In recent years, however, an excess of greenhouse gasses accumulating in the atmosphere has upset this natural balance. Human activity, particularly the burning of fossil fuels such as oil, coal and natural gas, has led to this unprecedented build-up of GHGs. Instead of emitting and absorbing heat at the same rate, the earth is now heating up due to this unnatural accumulation of GHGs creating what is known as the enhanced greenhouse effect.

Figure 2. How the Greenhouse Effect Works
The Greenhouse Effect



Source: U.S. Department of State (1992)

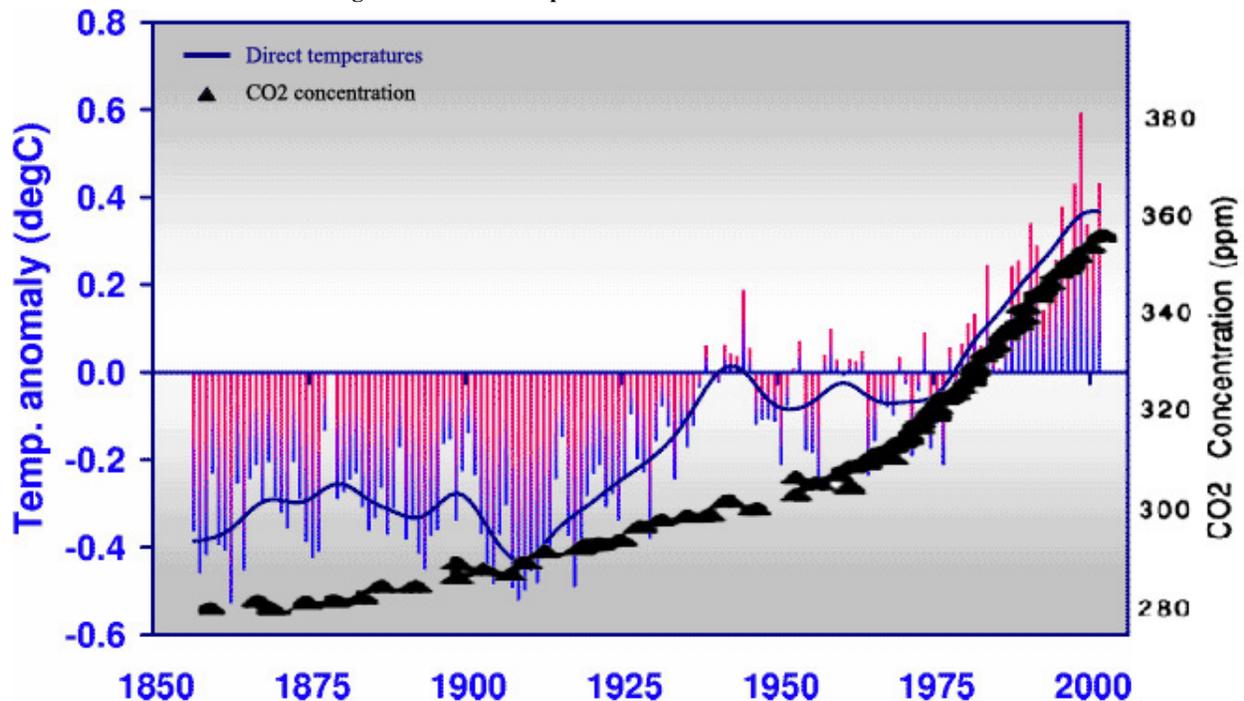
The average surface temperature of the earth has risen in step with the concentration of GHGs, particularly carbon dioxide, in the atmosphere (see Figure 3).⁶ Carbon dioxide concentration has risen dramatically in the recent past, primarily due to the increased combustion of fossil fuels. Since the beginning of the industrial revolution, human activities have been adding significantly to the natural background levels of greenhouse gases, and atmospheric concentrations have increased at a rate greater than at any other time in history.⁷

Global Warming and Climate Change

Although there is some uncertainty about exactly how and when the earth's climate will respond to increased concentrations of greenhouse gases in the atmosphere, observations indicate that detectable changes are already under way.

Global warming could produce profound changes in earth's climate. The Intergovernmental Panel on Climate Change, which was established by the United Nations to study climate change, has identified the following likely changes: 1) increased incidence of extreme weather events like hurricanes and storms, 2) more coastal flooding and a rise in overall sea levels due to melting of polar ice sheets, 3) increased stress on ecosystems which could lead to desertification and/or loss of biodiversity, 4) an increase in the earth's average temperature and precipitation levels. There is also the possibility of other dramatic climate events that may not easily be predicted. The changes that take place will unquestionably have societal effects. Agriculture and food production, fisheries stocks, air quality and ozone levels, and human health are all likely to be affected. The consequences of global warming and climate change are far reaching and can affect all countries, states, and cities regardless of wealth.⁸

Figure 3. Global Temperatures and Carbon Dioxide Trends



Local climate change

Climate change will have direct consequences for Connecticut and the New England region. The New England Regional Assessment (NERA) is a document prepared for the U.S. Global Change Research Program. It provides an assessment of the current and potential future effects of climate change on New England.⁹

The NERA report found that the New England climate has warmed over the past century due to human activities. The region as a whole has warmed by 0.7° F between 1895 and 1999. Connecticut has warmed by 1.4° F over the past 100 years, with wintertime warming greater than summertime warming. Additionally, regional precipitation has increased about 4 percent over the same period of time.¹⁰

The two models used by NERA project significant warming and an increase in precipitation over the next century. Precipitation in the next century is projected to increase between 10 to 30 percent. Annual minimum temperatures in the next century are projected to increase between 6° F and 10° F. For perspective, during the last ice age, when glaciers covered most of North America, the earth's temperature was only about 9° F cooler than today.¹¹ This shows how a small change in the average temperature can have large effects.

NERA and others forecast that the effect of these few degrees of temperature increase would be profound. Future warming trends would affect human health, forests, and water resources in the New England region. Human health would be affected by poor air quality, extreme weather events, and an increase in mosquito-borne diseases usually associated with warmer climates (e.g. West Nile Virus,¹² Lyme disease and malaria¹³). Increased temperatures will lead to a change in forest composition through species migration.¹⁴ The destruction of sugar maples is of particular

concern. Fresh water quantity and quality will be affected by increased sea levels, and the number of 90 plus degree-days will increase.

Connecticut Climate Change Facts

- Average temperatures have risen 1.4° F in the last 100 years.
- Average temperatures are predicted to increase 6-10° F over the next 100 years. During the last ice age, temperatures changed by only 9° F.
- More 90+ degree-days are likely to occur.
- Air quality and smog will worsen leading to increased health problems.

Regional air quality may worsen due to increased temperatures. If the climate becomes hotter and wetter and automobile and power plant emissions remain the same or increase, regional air quality and acid rain problems will become worse. Higher temperatures during summer months are more favorable for ground level ozone production, which can lead to increased smog. Research has linked fine particles associated with smog to asthma and other respiratory illnesses.¹⁵ Sulfur dioxide, emitted by power plants and vehicles, combines with water vapor to produce acid rain.

As is also predicted for other parts of the world, extreme weather events may increase locally. Snowstorms, hurricanes, heavy and high rains, ice storms, and other extreme weather are predicted to increase as the overall global temperature increases. NERA concludes that continued increases in atmospheric greenhouse gases will lead to additional climate change in the future.

What is Hamden doing about global warming?

The Town of Hamden has joined local business and political leaders, along with other communities, in recognizing the need for action and the danger posed by global climate change. In 2003, the Legislative Council voted to participate in the Cities for Climate Protection (CCP) campaign organized by ICLEI.

In so doing, Hamden joins the growing ranks of those in all levels of government who are making a commitment to act to stop global warming. At the local level, nearly 150 communities in the U.S. are participating in the CCP campaign including the Connecticut cities of New Haven, Bridgeport, Fairfield, Windham, Hartford, Weston, and Stamford. At the state and regional level, Connecticut, along with eight other states, has committed to reducing greenhouse gas emissions. The six New England states, along with five eastern provinces of Canada have jointly set a short-term target for reducing emissions by 5 percent by 2005.¹⁶

ICLEI's CCP is a results-oriented campaign that offers a framework for local governments to develop a strategic agenda to reduce global warming and air pollution emissions, while improving local air quality and urban livability.

The CCP process consists of Five Milestones as follows:

Milestone 1: *Conduct an energy and emissions inventory and forecast*

The inventory profiles energy use and GHG emissions for a base year (2001), and estimates growth in emissions for a target year (2015), for municipal operations and the community as a whole.

Milestone 2: *Establish an emissions reduction target.*

The Town will adopt both a target and a timetable for its achievement. Many CCP participants are striving to adopt the “Toronto Target” to reduce GHG emissions by 20 percent from 1990 levels by the year 2005 or 2010. The actual target depends on many factors, including local economics. Based on the information, assembled for this report, the Hamden community should aim for at least a ten percent reduction below 2001 levels. Within the government, a higher goal is achievable—30 percent below 2001 levels should be manageable.

Milestone 3: *Develop and obtain approval for the Local Action Plan.*

A strategy to reduce GHG emissions is created by the Local Action Plan, which synthesizes the previous analysis, provides a rationale for the target and timetable, and outlines the policies and measures the local government will pursue to achieve the target. The Local Action Plan ideally incorporates public awareness and education campaigns, as well as direct GHG reduction measures.

Milestone 4: *Implement policies and measures.*

This step begins implementation of individual measures to reduce GHG emissions. Various initiatives may require the effort and coordination of municipal departments, the Legislative Council, state and regional entities, local businesses and community members.

Milestone 5: *Monitor and verify results.*

Monitoring and verification of progress on the implementation of actions to reduce GHG emissions is an ongoing process that begins once measures are implemented.

This document completes Milestone Three for Hamden, the creation of a Local Action Plan. The next step for Hamden will be to officially set a reduction target (see Milestone 2, above) and to implement those measures outlined here in accordance with the emissions reduction target.

3.0 Summary of the Greenhouse Gas Emissions Inventory

The results of the Inventory conducted in 2003 by Adam Newcomer show that Hamden has many opportunities to increase the energy efficiency of its government operations, simultaneously reducing the emission of greenhouse gases while saving the town money on its energy bills. In addition, there are many opportunities to achieve emission reductions and cost savings in the community at large.

The Inventory used 2001 as the baseline year against which future changes in greenhouse gas emissions will be compared. Emissions were projected out to the year 2015, using established forecasts of economic development and population growth for the region. Tables 3 and 4 show the results of the inventory.

Table 3. Town of Hamden Governmental Emissions (tons eCO2)

Year	Buildings	Vehicle Fleet	Employee Commute	Streetlights	Water/ Sewer	Waste	Total
2001	9,296	4,197	5,433	1,420	46	220	20,612
2015	10,170	4,189	5,610	1,562	51	186	21,768
Change%	9.40	-0.19	3.25	1.0	10.8	-15.45	5.61

Source: Town of Hamden and ICLEI

Table 4. Town of Hamden Community Emissions by Sector (tons eCO2)

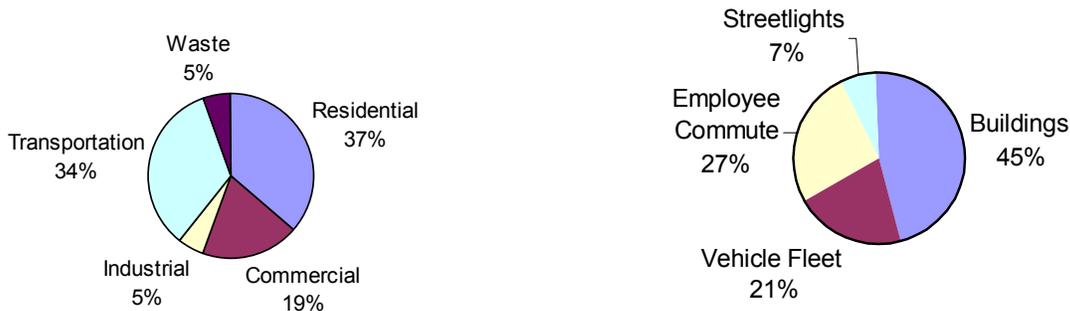
Year	Residential	Commercial	Industrial	Transportation	Waste	Total
2001	223,450	116,025	32,226	208,957	32,566	613,223
2015	239,817	141,775	37,589	234,307	16,987	670,475
Change%	7.32	22.19	7.33	12.13	-47.83	8.85

Source: Town of Hamden and ICLEI

Looking at the 2001 emissions broken down by source gives us a better idea of which areas could be the most productive to focus an emissions reduction plan on (Figure 4). In the governmental emissions category, the main sources of emissions are buildings, fleet, and employee commute, while in the greater community, residential energy usage and transportation make up the majority of emissions, with commercial emissions also contributing a significant amount. There is little industry located in Hamden, and it consequently makes up a small percentage of the emissions.

Figure 4. Community and Governmental Emissions By Source

2001 Community emissions by source 2001 Governmental emissions by source



Source: Adam Newcomer, Hamden CCP Summary, 2003

This Local Action Plan (LAP) will build on the results of the Inventory, quantifying reduction measures already undertaken by the Town of Hamden, and outlining additional measures that can be taken in the future to reduce greenhouse gases. This is a wonderful opportunity for Hamden to lead by example by doing its part to reduce the disastrous emission of greenhouse gases into the atmosphere.

4.0 Emissions Reduction Measures

Assumptions and Methodology

Unless otherwise specified, all savings and costs are to the Hamden Government. Emissions were calculated using the Clean Air and Climate Protection Software developed by ICLEI and STAPPA/ALAPCO. By entering energy-use data into the software, one can come up with the resulting emissions of carbon dioxide and other pollutants, as well as cost, based on a unit price. Tons of carbon dioxide equivalent (eCO₂) and annual savings in the following measures were obtained from the software. Annual cost savings reflect only savings in fuel or electricity usage. There may be additional savings from lower maintenance costs or avoided costs that are not included in the figure. Annual costs to the government and capital costs had to be estimated from gathered data. “Annual Tons eCO₂ Reduced” refers to projected savings in the target year, 2015.

Detailed assumptions and methodology for individual measures may be found in Appendix A.

COMMUNITY—RESIDENTIAL & COMMERCIAL

UI Community-Based Energy Initiative

Annual Tons eCO ₂ Reduced	Annual Savings (to Customers)	Annual Costs to Government	Capital Costs	Status
2,991	\$598,699	\$0	\$0	Completed

In 2001 and 2002 Hamden entered into a partnership with the United Illuminating Company to increase energy efficiency in the residential, commercial, and government sectors. The Community-Based Energy Initiative was a combination of a number of separate UI energy conservation programs, which saved a total of 5,921,396 kWh:

- **UI Helps** (provides assistance to low- and fixed-income residents): About 2100 households were participants, for a total savings of about 417,000 kWh per year, about \$50,000.
- **Small Business Energy Advantage**: 21 projects with a savings of 585,500 kWh per year.
- **Energy Blueprint** (construction, renovation, or expansion of commercial properties): 33 participants save 3,042,473 kWh per year, with UI giving incentives of \$327,029.
- **Energy Opportunities** (retrofits for commercial and industrial properties): 23 participants save 1,211,992 kWh per year with UI giving incentives of \$135,500.
- **Cool Choice, Cool Zone, and Residential Opportunities** (programs to encourage the use of efficient air conditioning systems): 241,796 kWh per year are saved by this initiative, in which 191 customers participated. UI gave a total of \$93,788 in initiatives.
- **Municipal Services Program**: This was a grant of \$113,430 for switching the traffic signals and walk signs to LED bulbs, which accounted for a savings of 519,402 kWh per year. This action saves the town about \$67,000 per year.¹⁷

Hamden’s partnership with UI under the Community Energy Initiative was highly successful in creating large energy and monetary savings. However, the program reached only a small fraction of Hamden’s population and business community. Enormous energy savings could be realized if even half of all the businesses and households could be induced to take advantage of all the incentives offered by UI to increase energy efficiency. This reduction in electricity use

would save residents lots of money and also greatly reduce the amount of global warming and conventional pollution Hamden emits (please see Energy Efficiency Education measure below).

The Mayor recently obtained a commitment from UI for \$10,000 for the 2004-05 Fiscal Year to fund a staff member in the Mayor’s Office to be the advocate and point person to build on the success of the original initiative by continuing to promote energy conservation initiatives in the business and residential communities, as well as moving forward with other Local Action Plan recommendations, such as performance contracting (see p. 23), LEED buildings (p. 24), green purchasing (p. 31), and greening the town fleet (pp. 26-29).

Visit UI’s website, <http://www.uinet.com>, for more information on these programs.

Likely Lead Agency: Mayor’s Office

Energy Efficiency Education

Annual Tons eCO2 Reduced	Annual Savings (to Residents)	Annual Costs to Government	Capital Costs	Status
11,380	\$2,713,260	Small	\$0	Recommended

About 2100 low-income Hamden households (about ten percent of total households) have had about 200 kWh (each) of energy conservation measures installed through the UI Helps portion of the Community Energy Initiative. There remain 90 percent of total Hamden households that have not had financial assistance from UI to perform similar energy conservation measures. 200 kWh is an easily achievable amount, through such measures as installing compact fluorescent bulbs, water heater blankets, window and door sealing, and the like. Through education, an estimated half of the remaining 90 percent (45 percent of all households—about 9450) could be encouraged to reduce 400 kWh each. Although they would receive no monetary assistance from UI, such measures are usually an easy sell, because they pay for themselves quickly. This will result in an additional savings of 3,780,000 kWh per year. Please see Appendix E for further suggestions of actual measures that can be undertaken by residents.

If another 400 residents took part in UI’s programs to replace/repair air conditioners at reduced cost, an additional 506,400 kWh could be saved.

Hamden’s businesses have even more opportunities than homeowners to save money through conservation measures at little outlay cost to themselves.

70 percent of Hamden’s approximately 1400 businesses are small (5 or fewer employees). UI’s Small Business Energy Advantage program gives a free energy evaluation, makes suggestions, and offers cash incentives and interest-free financing (up to 24 months) for retrofits and upgrades made in certain areas such as lighting and refrigeration. So far since 2001, 21 Hamden businesses have taken part in this program, for a total savings of 585,000 kWh. That amounts to a yearly savings of about \$3065 each at current rates. The Hamden Government, Hamden Chamber of Commerce, and UI should make a strong effort to make as many businesses as possible aware of this program. Testimonials from businesses that already participated might help other businesses see this as a viable money-saving move.

There are 420 businesses that are not small (including industry in this category). 23 businesses have already participated in the Energy Opportunities program at 52,695 kWh of savings per participant. If another 100 businesses did so that would be an additional 5,269,500 kWh saved, or about \$5,800 each annually. The Energy Opportunities program provides help for businesses to perform retrofits to increase energy efficiency.

If another 100 took part in Energy Blueprint, which helps businesses expanding, relocating, or renovating, savings would be about 9,219,600 kWh, or about \$10,140 apiece annually. 33 businesses have already taken part under the Community Energy Initiative.

Such a comprehensive education program in addition to what has already been done would require coordination between the government, UI, and the Chamber of Commerce. Costs to the town are hard to calculate, but a mailing through the chamber of commerce costs \$75, plus printing costs. Some informative pamphlets (such as seen in Appendix E) could be sent to Hamden residents along with a sewer or tax bill, to save on mailing costs.

Likely Lead Agency: Mayor's Office

More Stringent Building Standards for Homes and Businesses

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
Unknown	Unknown	Unknown	Unknown	Investigate Feasibility

As of 1 September 2004 Connecticut will adopt the 2003 International Energy Conservation Commission Code (IECC) for residential and commercial buildings. 2003 IECC specifies minimum construction standards for all buildings, which will guarantee a certain level of energy efficiency.¹⁸ Hamden enforces the current code, and plans to enforce the new one in September. This is excellent, as these codes have multiple side benefits besides reducing energy bills and usage and creating more comfortable buildings. They improve the building stock in general, promote good construction practices, and create a level playing field among builders.¹⁹ However, the potential efficiency of buildings is far higher than that imposed by IECC.

Hamden should investigate the feasibility of codifying more stringent standards than those employed under 2003 IECC. The code could be expanded to include not only new construction, but also renovations where no square-footage is added. Or to require all buildings to meet code at time of sale or resale (buyer and seller would negotiate as to who would pay for upgrade). Not only do more efficient buildings reduce greenhouse gas emissions, they also save money for businesses and homeowners, and higher-quality standards result in higher-quality, long-lasting buildings.

Likely Lead Agency: Building Department

Shade Tree Planting

Annual Tons eCO2 Reduced	Annual Savings (to Residents)	Annual Costs to Government	Capital Costs	Status
3,338	\$795,800	Unknown	Unknown	Recommended

Hamden should launch a campaign to educate residents about the energy savings that can be achieved through proper landscaping. For example, it should encourage people to plant deciduous trees around their houses, especially on the south and west sides. These trees would provide shade in the summer and allow the sun to warm the house in the winter. It would also enhance the beauty of the neighborhood. If the idea of a tree nursery (see below) comes to fruition, Hamden should consider selling residents trees and shrubs at a discount for this purpose.

According to the U.S. DOE,²⁰ savings of up to 25 percent are possible on heating and cooling bills through the strategic planting of trees. A comprehensive planting scheme with an eye towards energy savings can save up to 50 percent (this includes shrubs, vines, grasses, and the use of windblocks to deflect winter winds). The DOE estimates the savings from planting a tree can be paid back in 8 years.

Likely Lead Agency: Clean & Green Commission and Parks & Recreation Department

COMMUNITY—TRANSPORTATION

Encourage Pedestrian-Friendly Zones

Annual Tons eCO2 Reduced	Annual Savings (to Residents)	Annual Costs to Government	Capital Costs	Status
6,497	\$1,213,333	Unknown	Unknown	In Progress

One of the tragedies of the past century in this country is the extent to which we have become dependent on automobiles for our daily lives. The pattern of development in most of the country since World War Two has been increasingly spread out, consisting of single-use zones, which has led to “sprawl.” Zoning laws often make it impossible to build anything except a strip mall, an office park, or a pod-like subdivision, all surrounded by acres of paved parking. This type of growth has certainly degraded our built environment, and many people believe that it has degraded our civility and civic life as well.²¹ It eats up our open spaces and farmland and has made the daily use of an automobile mandatory for most Americans. All these cars spew more and more greenhouse gases and conventional pollutants into the air yearly. Highway fuel use in the U.S. has gone up 76 percent since 1970, in spite of an increase in fuel efficiency, because there are so many more cars on the road now.²² In 1975 the number of registered vehicles surpassed the number of licensed drivers, and since 1996 the number of vehicles has been greater even than the driving-age population. The trend is only getting worse.²³

However, an alternative pattern of development is gaining adherents throughout the country. It is sometimes called the New Urbanism, Traditional Neighborhood Design, or Smart Growth, and it promotes urban infill, and denser, mixed-use development built to a human scale, with an emphasis on walkability and a more humane architecture. The recent Connecticut act enabling the designation of “village districts” with this more old-fashioned type of development is related to New Urbanist ideas. The Hamden Planning and Zoning Department, in fact, is embarking on

an ambitious planning process that will engage communities at the grassroots level to create pedestrian-friendly, less auto-dependent neighborhoods through changes in zoning regulations.

It is important also that the Town apply this type of vision to the neighborhoods outside of the proposed “village districts.” For example, through promoting multi-story mixed-use development (that is, e.g., apartments over shops) with lots of street trees in areas that traditionally have been dominated by fast food and automobile focused development. The town should advocate for development that enables people to walk to accomplish many of the errands they now have to get in a car for: going to the bank, getting ice-cream or a newspaper, going to the dentist—even going to work.

Hamden is already heading in the right direction, but it should have a more explicit goal to specifically promote non-dependence on automobiles. The quantification of this measure assumes that about one quarter of the residents of Hamden (14,000) would be able to cut out three five-mile trips per week because desirable destinations are within walking distance.

For some really neat simulations of urban redevelopment projects visit <http://www.urban-advantage.com/> and <http://www.sierraclub.org/sprawl/community/transformations/index.asp>.

Likely Lead Agency: Planning and Zoning Department

Further Improve Traffic Flow

Annual Tons eCO2 Reduced	Annual Savings (to Drivers)	Annual Costs to Government	Capital Costs	Status
1,822	\$340,180	\$0	\$0	In Progress

Since Lee Davies came to be Hamden’s Traffic Director in 1969, he has worked extensively on reducing the amount of time drivers spend waiting at stoplights. Careful coordination of traffic lights on the Dixwell Avenue corridor has reduced the trip time from the New Haven border to the end from 23 minutes to 11 minutes. This is a remarkable savings in gasoline as well as in time and aggravation, amounting to about 21,888 tons eCO2. Mr. Davies estimates that he can further reduce this trip by 1 minute, which would be an additional savings of 1,824 tons eCO2, or about \$340,180 worth of gasoline, presuming that the time saved had previously been spent idling. The EPA estimates about a gallon of gasoline burned per hour of idling.²⁴ Of course these savings are incremental, and not likely to be noticed by individual drivers. Collectively, however, this is a significant greenhouse gas reduction source.

Likely Lead Agency: Traffic Department

Install Bike Racks and Stripe Bike Lanes

Annual Tons eCO2 Reduced	Annual Savings (to Bikers)	Annual Costs to Government	Capital Costs	Status
238	\$44,444	Very Small	Paint and Racks	Recommended

With the partial completion of the Farmington Canal Greenway (a stretch of approximately 2 miles to the New Haven border has yet to be completed), the ease of bicycle transportation in Hamden was greatly increased. While the Greenway is extremely popular for recreational biking, jogging, rollerblading, et cetera, it is unclear how much it is used for transportation-oriented biking. Presumably it will be more useful for this purpose when the section into New Haven is completed. However, a north-south route on the east side of the town would be useful for access to East Rock Park, Yale University, and downtown New Haven. One possibility currently under discussion is to put bike lanes on the Hartford Turnpike, or on Ridge Road. If roads were chosen which already have sufficient shoulder room, creating the lanes would be as simple as applying paint for the stripes. Similarly, placing bike racks in public locations would not be very expensive. Hamden should also encourage retail businesses to add bike racks outside their stores.

Cursory analysis shows that the creation of bike lanes, provision of bike racks, and completion of the Farmington Canal Greenway into New Haven could encourage 500 people to cut out a 5-mile car trip 5 times a week for 32 weeks per year. This would lead to a reduction of 238 tons eCO₂, and a savings of \$44,444 to bikers in gasoline costs.

Likely Lead Agency: Traffic Department

CTTransit Hybrid Buses

Annual Tons eCO2 Reduced	Annual Savings (to CTTransit)	Annual Costs to Government	Capital Costs	Status
420	\$57,128	\$0	\$0	Recommended

CTTransit currently is testing two diesel-hybrid buses on routes in Hartford and Stamford. According to a press release dated June 9, 2004, the buses have been getting 30-35 percent better fuel economy than the older buses in the fleet, 10-15 percent better than the newest all-diesel buses, and have lower maintenance costs.²⁵ The average fuel economy of the current fleet in New Haven is about 4 mpg, according to inventory sources. Some of the buses were recently replaced with the more efficient new diesel buses, so hybrids' improvement over the current fleet would be about 25 percent better, or 5 mpg.

It seems likely that by 2015 CTTransit will have replaced many or all of its buses with the new technology, since it offers significant reductions in fuel and maintenance costs, and air quality is a big concern in this area. It is also likely that future models of hybrid buses will offer even better fuel economy, so savings might well be greater than calculated here. Hamden should write a letter to CTTransit encouraging them to adopt the hybrid buses throughout their fleet.

Likely Lead Agency: Mayor's Office and Traffic Department

Shuttle Buses for “Magic Mile”

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
-1	N/A	Unknown	Unknown	Investigate Feasibility

Hamden’s popular shopping strip on the upper part of the north-south section of Dixwell Avenue, known as the “Magic Mile.” This shopping district is mostly of the strip-mall type, making it difficult to walk between shopping centers, as possible throughways have no/limited sidewalks and are blocked by planting strips, numerous curb cuts, and other barriers. Thus shoppers are required to drive from store to store. The Mayor has suggested that this might be an appropriate venue for a shuttle bus service to make a loop covering the major shopping destinations along this mile to mile-and-a-half strip. The addition of this service would make it possible for shoppers to go easily from store to store without getting in their cars. If the bus used for the service were an ultra-efficient hybrid, this would be an even better measure. Ideally such a shuttle would be a joint venture between Hamden and the businesses that would be positively impacted by the service.

Hamden should investigate changing the zoning regulations in this area to better facilitate the development of a more pedestrian-friendly and less auto-dependent shopping district. For example, having storefronts close to the street, perhaps with parking behind instead of in front, would create a more welcoming atmosphere for pedestrians. Hamden should encourage regulatory changes to make this kind of development possible.

Likely Lead Agency: Economic Development Department and Traffic Department

Federal Fuel Economy Standard Increase

Annual Tons eCO2 Reduced	Annual Savings (to Drivers)	Annual Costs to Government	Capital Costs	Status
76,401	\$39,000,000	\$0	\$0	Recommended

Currently the Corporate Average Fuel Economy (CAFÉ) standard for cars is 27.5 mpg, and for light trucks 20.7 mpg. However, the actual fuel economy of cars on the road is about 18 mpg.²⁶ There is a proposed increase in CAFE standards currently under consideration by congress. The new legislation would increase CAFE standards for cars to 40 mpg and SUVs to 27.5 mpg by 2015. If the same relationship holds true as now, this would mean an actual fuel efficiency of 27.8 mpg in 2015 (assuming the same mix of vehicles). This improvement would have a huge effect, not only on Hamden’s emissions, but also on those of the whole country: this is a very important measure to promote.

Hamden’s duty to fulfill to help this measure along consists of the mayor and council writing letters to Hamden’s Representative and Senators encouraging them to strongly support this measure. The town could also encourage a letter writing campaign among Hamden’s residents.

Likely Lead Agency: Mayor’s Office

COMMUNITY—WASTE

Unit Pricing

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
18071	\$336,392	Administrative	Depends on system	Recommended

Unit pricing is a system of garbage disposal in which residents pay for only as much as they throw away, rather than being charged a flat rate through their property taxes. This is inherently a fairer system than the current one.

Figure 5. The Conflicting Message Source: Lexington, MA Solid Waste Action Team

Two Messages from the Town

Message #1:

For the sake of your health, the environment, and our Town budget,

PLEASE PLEASE PLEASE

Reduce waste and recycle more!

Message #2:

Special offer:

Throw away as much as you want -

NO EXTRA CHARGE!

Are these messages consistent?

(PAYT-4)

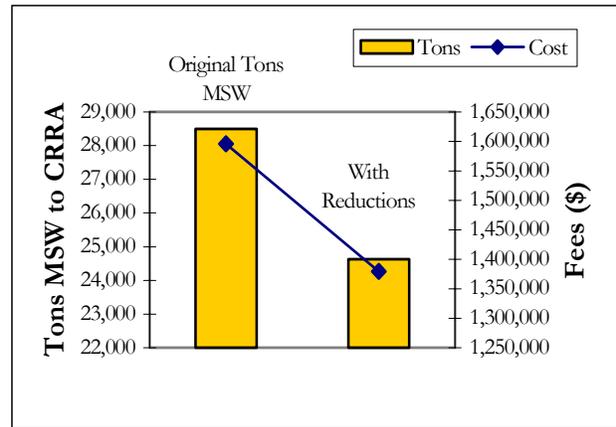
Unit pricing has a number of distinct advantages over flat-rate garbage collection. It is based on an economic incentive, and so is self-enforcing. To lower their disposal fees, people will increase recycling and composting, and also avoid generating waste in the first place (source reduction), for example by turning off junk mail or reusing shopping bags. The resulting drop in Municipal Solid Waste (MSW) means that the town pays less for disposal.

Thousands of communities across the country have unit pricing, including Stonington, Mansfield, Killingly, and several other communities in Connecticut. Cities that have instituted this system have seen an average 16% decrease in the amount of MSW going to landfill/incinerator.²⁷

Specific suggestions for a Hamden unit pricing system are as follows:

- Precede the switch to unit pricing with a thorough education campaign:
 - Make clear to residents that garbage collection is not “free.” They currently pay a flat fee through property taxes.
 - Those who throw away less are effectively penalized under the current system.
 - Reeducate residents and businesses about recycling and brush composting.
 - Let them know about reusable grocery bags and ways to turn off junk mail, and other source reduction measures.
 - Consider making composting bins available at reduced cost again.
- Do not charge directly for recycling or brush pickup.
- Charge by weight, not number of bags, in order to discourage cheating through garbage compaction, or specify a maximum weight per bag

Figure 6. Waste and Cost Reduction from Unit Pricing



Before the institution of unit pricing there is often concern that it will lead to increased illegal diversion of waste, or “midnight dumping” in other people’s bins or in public spaces. This is one of the highest *perceived* concerns with unit pricing, although in practice it is not a great problem. It is also important to note that some midnight dumping will occur, whatever system is in place. According to the EPA, research conducted at Duke University into communities with unit pricing found that 48 percent had no increase in illegal diversion, six percent found a decrease, and 19 percent had an increase, with 27 percent having no information. The combination of unit pricing with appropriate penalties and enforcement for illegal diversion will reduce the chance of an increase in midnight dumping.²⁸

For detailed information and case studies on implementing Unit Pricing, visit the EPA’s website on Unit Pricing: <http://www.epa.gov/epaoswer/non-hw/payt/> .

Likely Lead Agency: Public Works Department and Solid Waste & Recycling Commission

Composting Program for Household Organic Wastes

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
408	\$80,976	Unknown	Unknown	Recommended

This would best be combined with a unit pricing system, outlined above. Individuals should be encouraged to start their own compost piles. The town could reinstate the sale of discounted compost bins to residents (possibly with assistance from the DEP). For those individuals who have no interest in home composting, but still want to reduce their trash fees, the town could implement a curbside collection program for separated compostable waste. About 55 percent of food waste will likely be composted per family,²⁹ and food waste accounts for about 7 percent of MSW.³⁰ If necessary, residents could be charged an additional small fee to have their compostable waste picked up curbside.

- Be sure to make the fee for compost less than the fee for garbage, to discourage people who don’t want to compost from simply throwing food waste in the garbage.
- Material could be composted at the same site as current brush composting program.

Likely Lead Agency: Public Works Department and Solid Waste & Recycling Commission

Create New More User-Friendly Recycling Brochures

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
Unknown	Unknown	Printing and Mailing	Small to None	Recommended

The NYC Department of Sanitation has given permission for Hamden to use the drawings featured in their easy-to-understand recycling flyer to create a new brochure for Hamden. The flyer features cute cartoon graphic representations of each type of item to be recycled and which items should go together. (i.e., separation of metal/glass/plastic versus paper and cardboard).

Although Hamden’s current brochure adequately conveys the necessary information, a more engaging and schematic brochure might be able to make the recycling process more accessible. Alternatively, a contest could be held among middle- or high-school students to create an appropriate and engaging brochure.

To see NYC’s recycling flyer, visit http://www.nyc.gov/html/dos/pdf/bw_pub/rchecklist_english.pdf

Likely Lead Agency: Solid Waste and Recycling Commission and Mayor’s Office

Recycle Plastics 3-6

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
50	\$511	Pending Bid	\$0	In Progress

The possibility of expanding the recycling program to include plastics three through six is under consideration. Currently only numbers one and two are recycled. It is not feasible to recycle number seven plastic, as this category is “other,” and encompasses dozens of different types of plastic polymer, each in small quantities and unmixable with each other.³¹

Lead Agency: Public Works Department and Mayor’s Office

Existing Recycling Program

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
49,591	\$782,208	\$440,000*	Unknown	Completed (pre 2001)

Hamden has a good recycling program, which has been in place since about 1990. Curbside pickup covers glass and metal food and beverage containers, plastics #1 and #2, mixed paper (including office paper and paperboard), newspaper, corrugated cardboard, and textiles. There is also curbside pickup of bulky waste and of yard waste and brush (excluding grass clippings) for composting. Recyclables, scrap metal, bulky waste, and brush are accepted at the Transfer Station. Hazardous waste is accepted at HazWaste Central in New Haven. Approximately 25 percent of the waste stream was diverted to the recycling program as of 2001. Nearly all municipal solid waste (MSW) in Connecticut is incinerated in waste-to-energy plants.

* \$440,000 is the annual cost for current (expired) recycling contract.

A Request for Proposal (RFP) for recycling collection is pending responses, and a study of Transfer Station operations has been completed with recommendations to be considered for implementation by the Town government. In both cases, improvements to increase recycling volume should be implemented. Increased educational and promotional programs should also be considered to increase recycling.

Likely Lead Agency: Solid Waste & Recycling Commission and Mayor's Office

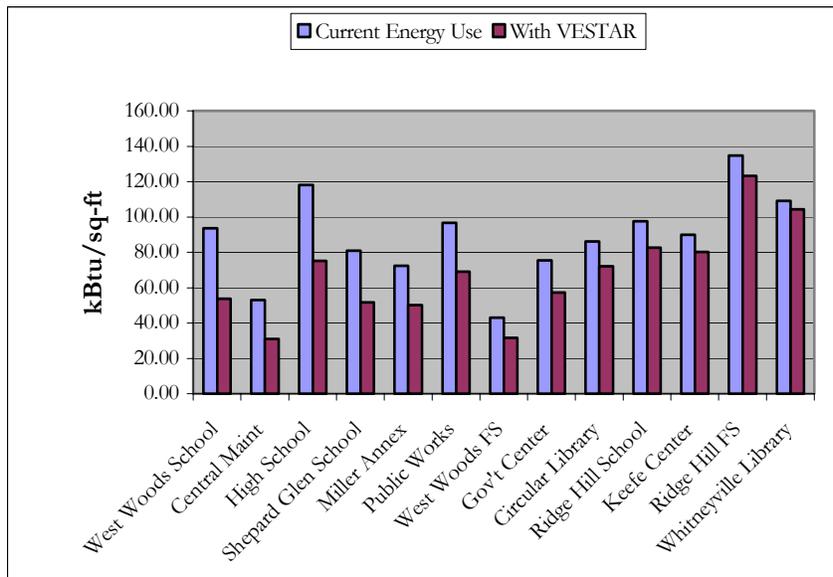
GOVERNMENT—BUILDINGS

Performance Contracting

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government (15 yr. Bond)	Capital Costs	Status
2,438	\$385,034	\$249,746	N/A	In Progress

The Town of Hamden is currently in the process of negotiating an Energy Performance Contract with VESTAR. This contract is a way to institute a comprehensive program of energy-saving measures in Town and Board of Education buildings. VESTAR performs all the retrofits and installations, identifies appropriate grants, and provides annual guaranteed energy savings, assuring the town that the payback schedule for the improvements will be met.

Figure 7. Municipal Building Energy Use Before and After VESTAR



The neighboring communities of New Haven and Fairfield have saved a lot of money and been extremely satisfied with its Energy Performance Contract. Although the VESTAR contract has been through several revisions, the current total cost of the project is \$3.6 million, with a guaranteed annual savings of \$385,034 (these two cost figures include an estimate of a few elements not included in the current contract, but are essentially

accurate—the most recent VESTAR update was not available at the time of completion of this report). In actuality, the savings would likely be greater, because this figure does not include expected grants from United Illuminating, and does not factor in utility price increases. If utility costs increase from current rates (which is likely), savings will be even greater.

Lead Agency: Mayor's Office

LEED Silver for All New Buildings

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
551	\$151,149	\$0	\$0	Recommended

Leadership in Energy and Environmental Design is a building certification system that specifies the use of certain techniques and materials in order to make a building more energy-efficient and environmentally friendly. LEED awards points for various measures, and the total number of points a project accrues determines its LEED status. The basic level is LEED certified. Other levels (in ascending order) are LEED Silver, Gold, and Platinum. LEED Silver is the usual goal of buildings incorporating LEED. Nowadays, an experienced firm can achieve LEED Silver at no greater cost than a “normal” building. LEED Silver is becoming widely used as the basic building standard for many municipalities and corporations because of the energy- and water-efficiency benefits and healthier indoor environment it provides, and its creation of facilities with less impact on the environment. The City of Seattle (among others) has made it a requirement for all city buildings over 5,000 square feet to be LEED Silver certified. Appendix D is an excerpt of Seattle’s Sustainable Building Policy referring to LEED standards.³²

Hamden should pass a resolution stating that all future Town buildings should be LEED certified to a minimum level of Silver. Hamden plans to build a new Fire Station and a new Police Station in the next five years, both of which should incorporate LEED standards

Likely Lead Agency: Mayor’s Office

LEED Silver for New Middle School

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government (20-yr. Bond)	Capital Costs	Status
252	\$69,176	\$5,500	N/A	In Progress

At the urging of the Mayor and others, the desire from the beginning of the planning process has been to build a LEED certified new Middle School. The plans for the new Middle School currently provide 29 LEED points, enough for basic LEED certification. It was difficult to determine the projected energy savings. The current plans award the building four points for optimizing energy performance, a 30 percent reduction in energy use for a new building. This is 30 percent below ASHRAE/IESNA Standard 90.1-1999, but it was not possible, in the time available, to determine what this would mean for this hypothetical school in terms of energy consumption. Therefore the 2015 projected energy use of the current Middle School building was determined, and a 30 percent reduction off of this baseline was used.

Although incorporating some LEED points is commendable, this project could have been a great deal more ambitious at little to no extra cost. It is not yet too late. Those responsible should examine possibilities that the engineering firm might not have looked closely enough at, such as more water conservation/runoff prevention techniques (like greywater systems for watering plantings). Another possibly fruitful area to investigate is the installation of some form of solar energy. Hamden might be able to obtain a grant for a solar-electric panel. Alternatively, solar hot water systems can easily pay for themselves, even without grants. Hamden should investigate the feasibility of a solar hot water system for the Middle School.

Lead Agency: Mayor’s Office

Control Thermostats in Government Offices

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
323	\$43,389	\$0	\$6,860	Recommended

The savings that can be reaped from control of thermostats in buildings is significant. By turning thermostats down 10-15° F (up in the summer) while offices are not in use, and keeping daytime temperature slightly lower in the winter and higher in the summer, large cost savings on heating and cooling can be achieved. Savings are typically one percent of the heating and cooling bill per degree for an eight-hour period.

For those buildings getting an energy management system under the VESTAR contract, programming these changes would be very easy. For those buildings not getting an energy management system, the most effective way to do this would be to buy programmable electronic thermostats. These usually cost between \$50 and \$150 each and take about fifteen minutes to install. Significant savings could be achieved for very little cost.

In addition, the government should consider restricting access to these thermostats, since different people often have different temperature preferences, and much energy can be wasted in temperature wars between employees. It is better to keep buildings warmer in the summer and cooler in the winter. People should not have to wear sweaters indoors in summer, or short sleeves in winter.

Likely Lead Agency: Mayor's Office and Public Works Department

Solar Water Heating for the High School Pool

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
1,013	\$136,000	0	Unknown	Investigate Feasibility

While solar electricity generation is not currently price-competitive with conventional sources of electricity, solar heating of water can actually reap cost savings, since different technology is used for the two applications. Exactly how much such a system would cost or save was unable to be determined during the writing of this report, due to lack of information from knowledgeable sources. However, a Connecticut company that has a long history of building and installing such systems is Sunsearch, Inc. (www.sunsearchinc.com, 800-338-0258). Everett Barber Jr. is the president, and could be a useful resource.

Likely Lead Agency: Mayor's Office and Board of Education

GOVERNMENT—VEHICLE FLEET

Many cities have reaped great savings in fuel costs by improving the composition and use of their vehicle fleets with an eye to conservation. Much improvement could be made in efficiency by discontinuing the use of the Ford Crown Victorias that currently make up a large proportion of the fleet. In addition, a policy should be implemented that expresses the principle of “right-sizing.” This simply means that every person using a fleet vehicle should use the smallest and most fuel-efficient one suitable for his or her purpose. A comprehensive “Green Fleets” policy should be implemented, incorporating right-sizing, purchasing policies, and policies mandating efficient use of fleet vehicles.³³

Buy Hybrid Cars for Public Works

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
255	\$33,881	\$0	Depends	Recommended

Currently, Public Works cars are Ford Crown Victorias that exceeded their useful life as police vehicles, and were passed down for lighter use by PW. Sometimes they have been employed as personal-use vehicles by town officials in between their lives as police vehicles and PW vehicles. This is a very inefficient situation. By the time the PD is done with the Crown Vics, they have 100,000-150,000 miles on their odometers, and even more wear on their engines, because police cars spend a great deal of time idling.

Employing these vehicles beyond their police car function is wasteful of energy. If Public Works purchased new or lightly-used hybrid electric vehicles (HEVs), such as the Toyota Prius or the Honda Civic Hybrid, for use instead of the Crown Victorias, the fuel savings would be significant (for details on HEV cost-effectiveness, see Appendix F). Current models of HEVs get up to 60 miles per gallon in city driving, as opposed to about 9 for a used Crown Vic. By starting with a new car, the maintenance costs would be lower and the cars would last many years. Although the price would not be hugely different (maybe a couple thousand) a higher resale value could be gotten for the Crown Victorias used by the Police if they were sold before being run completely into the ground.

Hybrids currently cost about \$2,000 more than their counterparts. It is likely that the State will bid on hybrid vehicles every year from now on, so they could be obtained at significantly reduced cost. If the purchase of HEVs is not something the town can consider right now, another possibility would be to obtain fuel-efficient small cars, such as the Ford Focus, to replace the Crown Vics currently operated by Public Works.

Likely Lead Agency: Public Works Department and Purchasing Department

Buy More Fuel-Efficient Light Trucks for Public Works

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
163	\$22,586	\$0	Unknown	Recommended

As the pickup trucks and SUVs in the Public Works fleet come up for retirement, they should be replaced with the most fuel-efficient vehicles in their class. The cargo-capacity needs for these vehicles should be carefully evaluated, and the smallest class-size possible should be picked. For example, the Fire Department recently purchased two Ford Expedition SUVs. It is not clear that this was the smallest or most efficient SUV capable of fulfilling the duties assigned to these vehicles. A Ford Escape or Explorer might have been more cost-effective. Currently the two most efficient pickup trucks are the Ford Ranger Pickup 2WD and the Mazda B2300 2WD (both 24 city/29 hwy mpg for manual transmission). The most efficient SUV on the market is the Toyota RAV4 2WD (24 city/30 hwy mpg for manual transmission).³⁴ The 2005 Ford Escape Hybrid SUV is expected to have fuel economy of 35-40 mpg in city driving.³⁵

Likely Lead Agency: Public Works Department and Purchasing Department

Buy more Fuel-Efficient Cruisers for Police

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
356	\$48,201	\$0	Unknown	Recommended

While replacing the Crown Victorias currently used for patrol is not currently practical, cars used for other purposes, such as detective work and community policing could effectively be replaced with more fuel-efficient models. The long-term goal of this measure is to replace all police cars, including patrol cars, as acceptable fuel-efficient replacements become available.

For short-term action, the police department should identify those police car uses that generally do not require the heavy-duty qualities that have made the Crown Victoria the first choice for patrol cars. For example, detective cars and community police officers do not give chase, and do not require the same horsepower as patrol cars. The town of Medford, Oregon has recently purchased Saturn L-series cars for its Community Police and School Police sections. The Saturns get about 20 miles per gallon, as opposed to the 9 mpg with Crown Vics. These Saturns are bought under a lease return system—that is, they are not brand new when purchased, but are still under warranty. Maintenance costs in Medford are about \$900 per car annually, as opposed to \$1800 for the Fords. The New York City Police and other police departments also use the Chevy Impala, which achieves better fuel mileage than the Ford.³⁶

Likely Lead Agency: Police Department and Purchasing Department

More Police Bikes, Motorcycles, and Horses

Annual Tons eCO2 Reduced	Annual Savings (Fuel Costs)	Annual Costs to Government	Capital Costs	Status
129	\$16,819	\$12,000 (horses)	\$90,000 (bike & motor)	Recommended

The Police Department is interested in expanding its police bicycle and motorcycle programs, as well as possibly starting a mounted (horse) unit. Any or all of these changes would have a positive impact on greenhouse gas emissions, presuming that they replace rather than supplement time officers spend in cars. The police department estimates that it could see a use for four additional bikes and four additional motorcycles and for two horses by 2015. It is important to coordinate this measure with the previous one in order to reduce the total number of cars that the PD must purchase and maintain. The anticipated savings are as follows: motorcycles—52 tons eCO2 and \$6,777 in fuel; bicycles—46 tons and \$6,025; horses—31 tons and \$4017.

The annual savings of \$16,819 (above) are only for avoided fuel costs. Not included are savings from lower maintenance and capital costs—it is cheaper to buy and maintain bicycles and motorcycles than Crown Victorias. The costs of bike and equipment for one police officer are about \$2,500, whereas the cost for one Crown Victoria plus necessary police equipment is \$28,000-30,000. The cost for motorcycle and gear is about \$20,000 per officer. Clearly, using more bikes and motorcycles instead of cars would save the police on capital costs as well as on fuel, aside from environmental considerations.

A Police Mounted Unit might be appropriately developed in tandem or as a supplement to the new Town Center Green. An area with few roads or paths could be more easily patrolled on horseback than by any other means. The feasibility of building a stable at the Town Center Green should be investigated. The town might be able to defray the costs of stabling and feeding its own horses by boarding others', and/or by having recreational horseback riding for a fee.

Police mounted units generally rely on donated animals, so there would be no capital costs for the horses themselves. A Hamden employee, Madelyn Vanacore, owns a horse in Hamden, and estimates total costs at \$4,000-\$6,000 per year per horse. This does not include tack and specialized police equipment.

Likely Lead Agency: Police Department and Purchasing Department

Buy B-20 Biodiesel

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
483	\$0	\$61,344	\$0	Recommended

Biodiesel is a fuel made from crops and other renewable resources. It can be combined with regular diesel fuel in any percentage—20 percent (B-20) is most common. B-20 can be used in regular diesel engines with no modification.

The great advantages of biodiesel are: 1) significantly lower greenhouse gas emissions, 2) significantly lower emissions of carbon monoxide, particulates, sulfur dioxide, and toxics than regular diesel (ten to 20 percent lower with B-20),³⁷ 3) increased lubricity, resulting in less engine wear, 4) made from a renewable resource (reduces dependence on foreign oil).

On the minus side, biodiesel is currently more expensive than regular diesel (about 25 cents per gallon for B-20).³⁸ However, this price differential is likely to decrease, both because the price of B-20 will come down, and because the price of petroleum will go up. Another disadvantage is a small increase (one to two percent) in emissions of nitrogen oxides.

Although this measure may not be practical for Hamden at the moment, it is something to consider when the price of biodiesel is more comparable with regular diesel. The advantages in greenhouse emissions and in local air quality are significant.

Likely Lead Agency: Purchasing Department

Stop Idling

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
46	\$5,929	\$0	\$0	Recommended

There is an unfortunate habit among some drivers of town fleet vehicles of leaving their car or truck with the engine running, often with air-conditioning going, and the vehicle left either locked or unlocked. This is a shameful and needless waste of gasoline and money, as well as a theft risk. It should be strictly enforced that employees not leave the engine idling on vehicles for more than one minute. Starting the ignition uses about the same amount of fuel as running the engine for one minute, leaving the engine idling for longer than a minute is a clear waste of fuel. “Idling is sometimes necessary in traffic jams, but while waiting at drive-in windows, it is more economical to cut the engine if the wait is longer than 30 seconds. Starting up your car again actually uses less gasoline.... In colder climates it is not necessary to warm-up a vehicle for more than one minute. It is more energy efficient to start the engine, take time to attend to driving preparations such as seat belts, side view and rear view mirrors, and traffic before beginning to drive. Your car will have reached optimum performance temperatures with a few miles of even and slow driving, without wasting gas through excessive idling.”³⁹

Likely Lead Agency: Public Works Department (but also government-wide)

GOVERNMENT—EMPLOYEE COMMUTE

Encourage Carpooling, Biking, and Walking

Annual Tons eCO2 Reduced	Annual Savings (to Employees)	Annual Costs to Government	Capital Costs	Status
700	\$130,000	\$0	Unknown	Recommended

Government employees should be encouraged to bike, walk, or carpool to work. This could be attempted through simple education. However, it is likely to be more effective with the use of a positive or negative incentive. One idea is to drastically reduce the number of parking places in the parking lot, assign spaces, and/or give employees the option of the parking space or a cash payment.

This may be easier to do when the renovation of Government Center is finished and the other departments move over from Town Hall. At that point there will not be an excess of parking spaces (as currently), and there may even be a shortage. Hamden should investigate the possibility of assigning parking places.

Likely Lead Agency: Mayor's Office

GOVERNMENT—STREETLIGHTS

The government has already saved money and energy by replacing all the traffic signals and walk signs with efficient LED (light-emitting diode) bulbs. Although this measure cannot go towards Hamden's reduction goal (it was enacted before 2001), it is commendable. The other hypothetical energy-saving measure in this category would be to improve the efficiency of Hamden's streetlights. New Haven was able to do this because it owns its own streetlights. However, Hamden's lights are owned by UI, who has an interest in balancing their load by encouraging a lot of electricity use at night. Hamden should investigate the feasibility of purchasing its own streetlights.

LED traffic signal replacement

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
213	\$66,790	\$0	Not Available	Completed (pre 2001)

Starting in 1999, the town refitted all the traffic signals and walk signs in the municipality with highly efficient LED (light-emitting diode) lamps. The energy, and consequentially, monetary savings from this measure have been considerable—nearly \$67,000 per year in electricity bills. The signals are also brighter and easier to see than incandescents.

Table 5. Traffic Signal LED Retrofit

	Cost per year	kWh per year	eCO2 (tons) per year
Incandescent	\$87,936	711,250	281
LED	\$21,146	171,036	68
Reduction	(76%) \$66,790	540,214	213

Source: Town of Hamden and ICLEI

GOVERNMENT—WASTE

Improve Recycling in Government Offices and Schools

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
Unknown	Unknown	\$0	New bins	Recommended

Currently, recycling is not as easy as it should be in government offices and Hamden schools. In Government Center for example, although there are office paper recycling bins at each desk (which is excellent!) there are no bins for metal/plastic/glass or for newspaper, which must be recycled separately from office paper (although there is a can and bottle collection bin to help an animal shelter).

The town should make sure that there are sufficient bins for all Town offices, schools, and facilities (e.g. the tennis courts currently lack recycling bins). The most effective types of recycling bins are often those that have an appropriately shaped hole in the lid, to discourage misuse (e.g., a round hole for cans and bottle, a long slot for paper). The most popular and widely available brand of these types of bins is the Rubbermaid Slim Jim® system. At the same time, there should be employee education, making it clear that all Town employees are required to recycle as much as possible.

Likely Lead Agency: Mayor's Office and Solid Waste & Recycling Commission

GOVERNMENT—OTHER

Green Purchasing

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
Unknown	Depends	Depends	\$0	Recommended

Hamden should implement a green purchasing policy (see Appendix C for a model), specifying the purchase of energy-efficient appliances and sustainable and recycled products. The town has already replaced many of its computers, printers, and copiers with Energy Star models, which is excellent.

However, there is much more to Green Purchasing than just energy-efficient copiers and recycled paper. Products like recycled-content asphalt, concrete, paint, and plastic lumber are available, as well as many types of office and automotive products.* The State Department of Administrative Services has an Environmentally Preferable Purchasing Program that helps municipal governments with their green purchasing goals.⁴⁰ The Town might also consider becoming an Energy Star Partner, which would facilitate energy-efficient purchasing (http://www.energystar.gov/index.cfm?c=join.join_index).

Likely Lead Agency: Purchasing Department

* See the King County, WA, Environmental Purchasing Program Website for specific information on these types of products, as well as comments on product experience from those who actually install and maintain them, <http://www.metrokc.gov/procure/green/prodexp.htm>. For information about office and automotive products, see <http://www.metrokc.gov/procure/green/offauto.htm>.

Green Energy

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
1,427	\$0	\$51,051	\$0	Recommended

New Haven has committed to getting 20 percent of municipal power by 2010 from renewable “green power” resources, a goal that is in line with a similar commitment made by Governor Rowland. Hamden should consider committing to 20 percent renewable electricity by 2015. With the final stage of electricity restructuring in 2007, all Connecticut residents should be able to check a box on their electric bill to have some or all of their electricity come from renewable resources. While choosing renewable electricity (usually a mix of wind, solar, landfill gas, and biomass energy) will incur a small premium at first, it is quite possible that the price will be comparable with fossil fuel energy by the year 2010 or 2015.

Likely Lead Agency: Purchasing Department

Open Space Acquisition and Tree Nursery

Annual Tons eCO2 Reduced	Annual Savings	Annual Costs to Government	Capital Costs	Status
Unknown	Unknown	Unknown	Unknown	Recommended

The Town of Hamden has excellent open space resources and a commitment to increasing them as much as possible. The Town has purchased and dedicated to open space conservation over 200 acres of land during the past two years, and is committed to increasing open space conservation. The new Plan of Conservation and Development suggests that the priorities for new open space acquisition be to 1) link existing open spaces with greenways, 2) preserve natural drainage areas, 3) protect existing and potential public drinking supplies, 4) protect threatened habitats and significant features, and 5) preserve agricultural land. The preservation of open space is an important greenhouse gas reduction measure; the guidelines for the acquisition of open space in Hamden (outlined above) seem sound.

An idea that has come up many times in recent years is to establish a tree nursery in Brooksvale Park or another location. This nursery would provide trees at reduced cost for use as street trees and for other public plantings. The town would often like to plant larger, more mature trees, but these are much more expensive than saplings. At the nursery, inexpensive saplings could be bought and allowed to grow to a more useful height at little expense to the town. This is an excellent idea—planting trees in public areas, especially along sidewalks, has numerous benefits. Growing trees offset greenhouse gas emissions by extracting carbon dioxide from the air. They also absorb conventional air pollutants, to make the local air cleaner, and reduce stormwater runoff. Finally, the presence of trees along the street makes for a more pleasant environment and encourages people to walk, while slowing traffic and creating a barrier between pedestrians and cars. The Connecticut DEP has in the past had a number of grants for urban forestry—the Task Force should determine what grants may be available when Hamden decides to take action on this measure.

Likely Lead Agency: Parks and Recreation Department

Adopt State Climate Change Initiatives

In January 2004 stakeholders made recommendations of 55 greenhouse gas reduction measures that Connecticut could take to help the State achieve the reduction targets set by the New England Governors/Eastern Canadian Premiers 2001 Climate Change Agreement.⁴¹ Of these 55, the Governor’s Steering Committee approved 38. Amy Shatzkin, an ICLEI intern working in Berkeley, identified 15 of those 38 actions as ones that will affect municipalities. She quantified reductions at the state level from those actions. Hamden’s share of those reductions is based on population (See Table 5). These measures would further reduce Hamden’s greenhouse gas emissions by about 20,430 tons eCO₂ in the year 2015.* Not included in this total are four state measures that are substantially duplicated by measures already listed elsewhere in this Local Action Plan.

Table 6. Greenhouse Gas Reductions from State Climate Change Initiatives

New Measures	Tons eCO₂	Measures Included Elsewhere in LAP	Tons eCO₂
LEV II (California auto emissions standards)	2,666	Energy Benchmarking for Municipal Buildings	2,582
Appliance Standards	2,582	Increase Recycling, Source Reduction to 40%	15,709
Appliance Swapping Program	301	Transit, Smart Growth, and VMT Management	3,711
Heat Pump Water Heater Replacement Program	201	Urban Tree Planting Program	23
Bulk Purchasing of Appliances	577		
Mandate Upgrades to Building Energy Codes	2,156		
Expand Weatherization Program	100		
Energy Star Homes Program Expansion	518		
Training of Building Operators	543		
Remove Barriers to 3rd Party Load Management	426		
Green Power Option	10,361		
<i>Total</i>	<i>20,430</i>	<i>Total</i>	<i>22,026</i>

Likely Lead Agency: Mayor’s Office

* For further information about these measures, please see the “Connecticut Climate Change Stakeholder Dialogue: Recommendations to the Governor’s Steering Committee,” Published by the Center for Clean Air Policy, and available at: <http://www.ccap.org/Connecticut.htm>

5.0 Future Actions and Implementation

While it is to be hoped that all of the measures and recommendations in this Local Action Plan will be implemented in due course as Milestone 4 of the CCP process, it is the better part of valor to ensure that there exists within Hamden an advocate for the timely implementation of the plan. The Mayor has appointed an Energy Use and Climate Change Task Force to ensure that these measures become a priority for Hamden and are not lost to inaction. The Task Force will meet quarterly, in September, December, March, and June. As of the publication of this report the members of the Energy Use and Climate Change Task Force were as follows:

Carl Amento	Mayor of Hamden
Kelly Anthony	Clean & Green Commission/Hamden Greens
Tom Brown	Head of Public Works
Joe Celotto	Head of Finance
Leslie Creane	Planning & Zoning
Lee Davies	Head of Traffic
Bruce Driska	Planning & Zoning
Scott Jackson	Head of Community Development
Dale Kroop	Head of Economic Development
Mary Lesser	Solid Waste & Recycling Commission
Vincent Lavorgna	Parks & Recreation/Brooksvale Ranger
Martin Mador	Natural Resources & Open Space Commission
Stephen Mayer	Solid Waste & Recycling Commission
Valerie Pettie-Cooper	Legislative Council (Environment & Conserv.)
Amy Ruhlman	Solid Waste & Recycling Commission
Aris Stalis	Natural Resources & Open Space Commission
Rich Stoecker	Head of Planning & Zoning

Although the members may change in the future, there should be at least one representative from each of the following bodies: Mayor's Office, Legislative Council, Community/Economic Development Department, Finance Department, Parks & Recreation Department, Planning & Zoning Department, Public Works Department, Recycling Coordinator, Traffic Department, Clean & Green Commission, Natural Resources & Open Space Commission, and Solid Waste & Recycling Commission. Other interested persons are also welcome to join.

The Task Force is empowered to prioritize the measures suggested in this report and to adapt them as the situation requires. It is also encouraged to come up with new reduction measures. The main work of the task force should be to advocate for the implementation of greenhouse gas reduction measures in Hamden.

APPENDIX A—Assumptions and Methodology for Individual Measures

UI Community Energy Initiative

The number of kWh and dollars saved were given to me by UI employees Roy Haller (Small Business Initiative) and Tom Turco (all other programs). The only one I modified was the UI helps program, which Mr. Turco clearly miswrote: he wrote, “A total of 21,000 Hamden households were visited by UI personnel.... Total savings amounted to \$500,000 per household, or approximately 417,000 kWh.” There are only about 21,000 households in Hamden total, so that cannot be the number of low-income households visited by UI. I assumed he misplaced a decimal, and put the number of low-income households at 2,100, or about 10% of all households. In addition, \$500,000 must be approximate total savings, not per household savings. However, the total kWh saved is indeed 417,000 kWh, consistent with the program-wide total I was given (the total for all sub-programs of the community energy initiative).

Energy Efficiency Education

If in the "UI Helps" measure about 10% of Hamden households (2100 households) have had some energy conservation measures installed (in this case paid for by UI), there remain 90% of households that may or may not have done similar energy conservation measures on their own. I assumed that even if they have done some such measures, more remains to be done. The 2100 households helped by UI saved a total of 417,000 kWh or about 200 kWh per household. The measures included were pretty modest, (compact fluorescent bulbs, water heater blankets). So if half of the remaining 90% (that is, 45%) of Hamden households installed measures that resulted in 400 kWh per year of savings per household that would be $400 \text{ kWh} \times 9,450 \text{ households} = 3,780,000 \text{ kWh/year}$.

In addition, the Cool Choice, Cool Zone, and Residential Opportunities program (I think only Cool Choice still exists) saved 191 Hamden customers 241,796 kWh. Average savings of 1266 kWh per customer. If another 400 customers took advantage of this program, there would be additional energy savings of 506,400 kWh. Total savings from these measures = 4,286,400 kWh

Shade Tree Planting

According to the U.S. DOE (<http://www.eere.energy.gov/consumerinfo/pdfs/landscape.pdf>) savings of up to 25% are possible on heating and cooling bills through the strategic planting of a tree or trees. The DOE estimates the savings from planting a tree can be paid back in 8 years.

EPA estimates that in New England 45% of home energy bills are due to heating and cooling (<http://www.epa.gov/region1/eco/energy/heatingefficiency.html>). This would mean that approximately 25% of 45%, or 11.25% of total energy costs could be saved by tree planting and landscaping. According to inventory projections, 11.37 tons eCO₂ will be emitted per household in 2015. There will be approximately 21,735 households. 11.25% of 11.37 is 1.28 tons. If 12% of the 21,735 households in Hamden (2608 households), were to plant trees in this manner, the savings in CO₂ would be $2608 \times 1.28 \text{ tons} = 3338 \text{ tons}$. Savings were calculated on the premise that the energy savings all came from electricity, although this is not entirely accurate (savings would also come from fuel oil and natural gas). Electricity price: \$0.10/kWh.

Encourage Pedestrian-Friendly Zones

I assumed that about 1/4 of the residents of Hamden (14,000) would be able to cut out three 5-mile trips per week because desirable destinations are within walking distance. That makes 156 trips per year $\times 5 \text{ miles} \times 14,000 \text{ people} = 10,920,000 \text{ VMT}$ avoided per year. I assumed \$2 per gallon of gasoline.

Further Improve Traffic Flow

Lee Davies says he could save another minute on the Dixwell Avenue corridor, which would translate to about 466 hours saved per day, for the average number of cars on that route. I will assume that all this time is time saved idling at stoplights. According to the EPA, about a gallon of fuel is burned per hour idling (<http://www.epa.gov/smartway/documents/drivertraining.pdf>). $466 \text{ gallons per day} \times 365 \text{ days} = 170,090 \text{ gallons per year}$. \$2/gallon gasoline.

Install Bike Racks and Stripe Bike Lanes

I assumed that the creation of bike lanes, provision of bike racks, and completion of the Farmington Canal Greenway into New Haven will encourage 500 people to cut out a 5 mile car trip 5 times a week (that is, they will commute by bike) for 32 weeks per year. This will account for a 400,000 VMT reduction per year. \$2/gallon gasoline.

CTTransit Hybrid Buses

The two diesel-hybrid buses have been getting 30-35% better fuel economy than the old fleet diesel buses, and about 15% better than the new diesel buses, and have lower maintenance costs. The average fuel economy of the current fleet is about 4 mpg, according to Steve Warren, head of Maintenance at CTTransit. Some of the New Haven fleet has been replaced with the new buses so let us assume that the hybrid buses are about 25% better than the current fleet. That would give a hybrid fleet about 5 mpg.

Shuttle Buses for “Magic Mile”

I assumed that the entire loop is 3 miles (to be on the safe side and to include distance traveled in parking lots). If the bus travels at 20 miles per hour, it will take 9 minutes to complete the loop. If it makes 10 stops of one minute each, the total loop time will be 19 minutes. With two buses, service would be every 10 minutes, approximately. If this service runs 9 am-8 pm 7 days a week, that is a total of 77 hours per week, and the two trolleys run six loops per hour of 3 miles each. That is a total of 1386 miles per week. I assumed that each trolley trip has an average of 5 passengers, that's 6930 passenger-miles not traveled in a carper week, or 360,360 miles per year. Car fuel is gasoline at \$2/gallon. Bus fuel is ultra-low-sulfur diesel at \$1.43 per gallon (this is the current Town price, from Judi Kozak).

The fact that this measure represents a net increase of 1 ton eCO2 per year is based on my assumptions. If the number of average passengers were higher, or the hours of operation fewer (depending on the balance of these elements), this would result in a net carbon reduction.

Federal Fuel Economy Standard Increase

	CAFE cars	CAFE light trucks	CAFE weighted avg.	Actual avg. mpg	I took the current CAFE standards (2003 row in table), and weighted them for the current proportion of sales: 52%
2003	27.5 mpg	20.7 mpg	24.2 mpg	18.0 mpg	
2015	40 mpg	27.5 mpg	34.0 mpg	27.8 mpg	

cars/48% light trucks

(<http://yosemite.epa.gov/opa/admpress.nsf/0/db2699ad82c5cf5f85256e8400646a1c?OpenDocument>). The 18 mpg for actual fuel economy of cars on the road is based on the CACP software used for the completion of this report—the average “passenger vehicle” gets 18 mpg. So I assumed that that 6.2 mpg discrepancy between CAFE and actual mpg also would hold true if the CAFE standard increased. The proposed increase is set forth in a Senate bill currently under consideration (S. 794, April 7, 2003). I assume the same ratio of cars to light trucks in 2015. \$2/gallon gasoline.

Unit Pricing

According to the EPA, (<http://www.epa.gov/epaoswer/non-hw/payt/sera.pdf>), the average reduction in amount of waste going to landfill/incinerator due to introduction of unit pricing is 16%. This consists of 5-6% reduction due to increased recycling, 4-5% due to increased yard waste composting, and the balance due to source reduction. According to inventory projections, there will be 37,548 tons of waste incinerated in 2015. \$56/ton is the MSW disposal fee, according to Ken Copeland.

Composting Program for Household Organic Wastes

Amount of MSW to be incinerated in 2015 is 37,548 tons, according to inventory projections. Approximately 7% of this is food waste (from <http://www.p2pays.org/ref/02/0162203.pdf> North Carolina waste study). Of this about 55% is compostable (Brookline’s Local Action Plan). That makes about 1,446 tons of compostable material that could be diverted. \$56/ton for MSW.

Create More User-Friendly Recycling Brochures

The town now has permission to use the NYC recycling flyer drawings, which we have on a pdf. However, the 2 programs do not match completely, so someone would have to work, perhaps in Photoshop®, to regroup the drawings so they would work for Hamden. The only other costs would be printing and distribution.

Recycle Plastics 3-6

	Type of plastic	% of Plastic Waste
#1	Polyethylene Terephthalate (PETE)	9%
#2	High-Density Polyethylene (HDPE)	21%
#3	Polyvinyl Chloride (PVC)	6%
#4	Low-Density Polyethylene (LDPE)	25%
#5	Polypropylene (PP)	13%
#6	Polystyrene (PS)	10%
#7	Other	16%

Percentages based on data from the North Carolina department of Pollution Prevention. Plastics account for about 7% of generated waste.

(<http://www.p2pays.org/ref/02/0162203.pdf>). We can assume that currently no plastics #3-6 are recycled in Hamden. So these plastics would account for $(6+25+13+10) = 54\%$ of 7% or 0.0378%

of the total MSW. 0.0378% of 37,548 tons (2015 projected waste) is 14.19 tons. \$56/ton for MSW.

Existing Recycling Program

The projection from the inventory is that, under the current recycling program, 13,968 tons of waste will be recycled in 2015. Current recycling contract annual cost was \$440,000 (for 2003-2004). This will likely change, as will the cost of incineration per ton for MSW, currently \$56.

VESTAR

The projected eCO₂ reduction is calculated from the energy savings information provided in the April 8, 2004 VESTAR Detailed Technical Evaluation (DTE) in kWh of electricity, gallons of fuel oil, and CCF of natural gas. These figures were then increased by 9.4% to account for the increase in emissions from buildings predicted in the inventory. These energy use figures were then entered into the CACP software, which gave the eCO₂ reductions. The cost and savings information came from the April 8 DTE. However, I subtracted from these figures four schools that are being dropped from the contract: Alice Peck, Dunbar Hill, Church Street, and Helen Street. I also added \$200,000 in costs and \$20,000 per year in savings for an energy management system for Government Center that was not included in the April 8 DTE. These two estimates were arrived at by examining costs and savings from energy management systems for other buildings.

A note about Alice Peck School: while I did not include any of the dollar costs or savings from this school, I did include the carbon dioxide reductions. The reason for this is that Alice Peck will now be operating at a much reduced schedule, therefore not using as much energy as previously: this reduction in energy use had to be accounted for in some way.

LEED Silver for All New Buildings

I assumed that the new police and fire stations would achieve 40% better energy efficiency than a hypothetical non-LEED building of the same purpose and size. The new police station will be about 57,500 sq. ft., and the fire station similar. The Energy Information Administration (EIA) has commercial building energy use tables (<http://www.eia.doe.gov/emeu/cbecs/cbec-eu4.pdf>) that give average energy use per square foot based on numerous building features, such as size, age, use, number of workers, heating system, etc. I assigned the new police and fire stations to appropriate categories as far as I was able, and averaged the results from all categories to get overall energy use per square foot for a building of this type. I then determined what a 40% reduction of these amounts would be. The annual savings for the hypothetical police station are about 2253.1 Million Btu annually. The fire station would save about 2232.7 Million Btu. These figures are necessarily inexact, but are in the right ballpark, I believe.

LEED Silver for New Middle School

The plans for the middle school give it 4 LEED points for Optimizing Energy Performance, which amounts to a savings of 30% for new buildings compared to "the energy cost budget for regulated energy components described in the requirements of ASHRAE/IESNA Standard 90.1-1999, as demonstrated by a whole building simulation using the Energy Cost Budget Method described in Section 11." Craig Razza at Kohler-Ronan (design firm) said that while this baseline will eventually be determined, it requires the use of a complicated computer model, and he was unable to get me that information before the completion of this report. Instead I calculated the reduction based on 30% greater efficiency than the current middle school. The energy usage for the current middle school in 2015 was projected as 6842 million Btu, and 30% of that is 2053, the reduced amount. In actuality savings will be higher, since the ASHRAE baseline is probably more energy-efficient than the current middle school. Savings were calculated based on all the Btu of reduction coming in the form of electricity, at a rate of \$0.115/kWh, the approximate current Town rate.

The plans for the new middle school have incorporated LEED measures for a total of 29 LEED points (out of a possible 69 for the measures being implemented). 26 points is the minimum for basic LEED certification. 33 points

is the minimum for LEED Silver status. \$333,376 is the amount the LEED features will cost over and above the normal costs of building a new school. However, 66% of this amount is paid for by the state, leaving the extra amount the town is liable for at \$113,348. Fiscal and LEED points data from Ryszard Szyzpek at Tai Soo Kim Partners, Arch. The building cost will be bonded over a 20-year period, making for an annual cost to the town of \$5,894, including an interest rate of 4%.

Control Thermostats in Government Offices

I assumed that 45% of government building energy costs go to heating and cooling. (http://www.energystar.gov/index.cfm?c=products.pr_pie). Although this percentage is for homes, I assume a similar amount for municipal buildings (if anything, I would guess the percentage is higher). Roy Haller at UI claims that you save 3% (of heating and cooling costs) for each degree F higher in the summer or lower in the winter the thermostat is kept. If we keep it 2 degrees lower in the winter and 2 higher in summer, that would be a reasonable temperature for a working environment. The DOE says that by turning the thermostat up or down 10-15% (about 10 degr.) for 8 hours a day, you can save about 10% on your heating and cooling bill. (<http://www.eere.energy.gov/consumerinfo/pdfs/thermo.pdf>), or about a 1% savings for each degree for each eight hour period. So if we use the programmable thermostat to keep it 15 degrees lower (higher) for 12 hours per day, and 2 degrees lower (higher) for 12 hours per day, that's 1.5% savings per degree for each 12 hour period. That's $15(1.5) + 2(1.5) = 25.5\%$ savings on heating and cooling for the entire day.

I calculated these savings for all buildings that will not be given an EMS under the VESTAR contract, and took original energy use from the VESTAR DTE from June 27,2003 (because that version had energy baseline info for more buildings than later versions). I used a price of \$0.115/kWh, \$0.083/CCF gas, and \$.897/gallon fuel oil.

I will assume a cost of \$100 per thermostat, and 5 thermostats per building, for 13 buildings. Home Depot estimates 15 minutes for skilled installation (http://www.homedepot.com/HDUS/EN_US/energy/en_project_therm_01.html) Installation time is therefore 16.25 hours total, at a rate of \$21.70 per hours (Thanks to Irene Keniry in Finance), that is \$352.63, but let's say an even \$360. Total = $6500 + 360 = \$6860$

Solar Water Heating for the High School Pool

According to Michael Sullivan, who maintains the pool at the high school, the volume is 198,000 gallons, but he calculates pool chemicals and so forth for an even 200,000 gallons. The temperature is kept pretty constant at 80-81 degrees. For swim meets, the temperature is required to be between 78 and 82 degrees. Occasionally it is brought slightly warmer for Special Ed events. But let us say 80.5 degrees on average. The pool is 25 meters long, and about 20 meters wide. Water is heated by natural gas. Costs for heating the pool estimated by Michael Sullivan and colleague at about \$136,000 per year, based on prior experience. I was unable to obtain energy bills for the pool.

Buy Hybrid Cars for PW

I took fuel consumption figures from Inventory. Public works fleet uses 67,317 gal. of gas per year. About 43% of gas-burning fleet is used Ford Crown Victorias that have already served as police cruisers. A Crown Vic gets about 9 mi/gal. 43% of 67,317 gal. is 28,946 gallons. To calculate the gallons used by the replacement compact cars, I multiplied number of gallons by 9 to get the approximate number of miles traveled per year (260,514). Then I divided this number by 60 mpg (the efficiency of the hybrids). The price of gasoline for the old cars is projected to be \$1.37 for the coming year (mid-grade). The low-grade gas for the hybrids would be \$1.33. Gasoline price info from Judi Kozak.

Buy More Fuel-Efficient Light Trucks for PW

Pickups, SUV's, and Minivans make up about 57% of the PW fleet. 57% of 67,317 gals of gasoline is 38,371 gals. Current efficiency is estimated by the software as 14.1 mpg. Multiply that by 38,371 to get the number of miles = 541,031. Divide by the new fuel efficiency to get 22,543 gallons gasoline for the replacement vehicles. Replacement vehicles are assumed to be Ford Ranger pickups, which get 24 mpg city, or Toyota RAV4 SUV's, same mileage.

Buy More Fuel-Efficient Cruisers for Police

Assume 9 mpg for Crown Victorias that make up bulk of police fleet. From inventory calculations, PD Crown Vics consume 77% of the police gasoline purchased, or 61,571 gallons/year. There are about 42 Crown Vics, so that's about 1466 gallons/year/vehicle. That is about 13,194 miles/vehicle/year at 9 miles per gallon. Assume replacement vehicles will get 19.6 miles per gallon (typical for full-size auto).

Price of gas is calculated thus: Current gas price purchased by Hamden government is 1.03 plus gross receipts tax (GRT) which through my research I have determined to be about 10 cents

(http://www.icpa.org/consumer_motor.htm). Judi Kozak, Purchasing Director, says that this year the price of gasoline bought by contract is likely to rise by 24 cents. This brings the total new price of gas, including tax, to \$1.37, so this is what I will use to calculate current consumption.

If we bought new cars that did not have to burn mid-grade fuel, but rather burned regular unleaded, the price would drop by about 4 cents per gallon. So the price for the replacement fleet would be about \$1.33.

More Bikes, Motorcycles, and Horses

There are 3 motorcycles currently on duty, eight hours each, year round. PD thinks it could use 4 more, replacing the use of 4 cars. From inventory calculations, PD Crown Vics consume 77% of the gasoline purchased, or 61,571 gallons/year. There are about 42 Crown Vics, so that's about 1466 gallons/year/vehicle. That is about 13,194 miles/vehicle/year at 9 miles per gallon. Actually it is about half that many miles, because according to Gus Gertz, Police cars spend at least half their time idling. So let's say 6,000 miles that will be driven by a motorcycle instead, since the motorcycles will not idle any appreciable amount of time. That is a total of 24,000 miles for all four motorcycles, replacing the use of four police cars driving 42,776 miles. The fuel efficiency of the motorcycles is assumed to be 24.4 mpg. Price of gas for cars is \$1.37 (mid-grade), for motorcycles \$1.33 (low-grade).

Buy B-20 Biodiesel

Prices for B-20 biodiesel blend (20% biodiesel, 80% regular diesel) are about 25 cents per gallon higher than for regular diesel. This information was gathered from the March 23, 2004 "Alternative Fuel Price Report" of the US DOE. Number of gallons of diesel fuel used by Hamden (including schoolbuses) for all purposes is about 230,000.

Pollutant	Reductions w/ B100	Reductions w/ B20
Carbon Monoxide (CO)	-40-50%	-10-12%
Hydrocarbons	-56-70%	-11-15%
Particulate Matter	-40-55%	-10-18%
Toxics	-60-90%	-12-20%
Oxides of Nitrogen	+ 5%	+ 1.2%

Source US EPA/ US DOE (<http://www.cleanair.org/dieseldifference/fuels/>)

Stop Idling

I estimated that each PW gas vehicle spends about 10 minutes per day idling. According to the EPA, about a gallon of fuel is burned per hour idling (<http://www.epa.gov/smartway/documents/drivertraining.pdf>). That is 0.167 gallon per vehicle per day and with about 71 gasoline-powered vehicles that amounts to 11.9 gallons per day wasted, or 4328 gallons per year.

Encourage Carpooling, Biking, and Walking

Total emissions from employee commute in 2015, according to the Inventory, will be 5,610 tons eCO₂. I assumed that an education campaign, perhaps combined with a shortage of spaces, might induce 1/8 of employees to walk, bike, or carpool. One-eighth is 701 tons eCO₂.

Green Energy

Inventory gives figures for cost and eCO₂ emissions by fuel source for the government. For electricity there were 6524 tons eCO₂ emitted, equivalent to \$1,522,572 in costs. I assumed most of this goes to buildings and factor in a 9.4% increase in these emissions by 2015, the carbon emitted by government electricity in 2015 will be 7137 tons. This is equivalent to about 17,017,000 kWh. 20% of this is 3,403,400 kWh, the amount that would be replaced by green power. 11.5 cents/kWh is the rate given me by Larry Mai at UI. I assume 1.5 cents per kWh extra for green electricity.

State Climate Change Initiatives

Hamden's population: 56913; CT population: 3,405,565. Hamden vehicle miles traveled: 301; CT VMT:28,795

APPENDIX B—Reduction Target Resolution

**TOWN OF HAMDEN
LEGISLATIVE COUNCIL**

**RESOLUTION ADOPTING GREENHOUSE GAS
REDUCTION TARGET AND TIMETABLE**

PRESENTED BY _____

WHEREAS, serious and disruptive changes to the Earth’s climate are being caused in large part by increased atmospheric levels of carbon dioxide (CO₂) and other greenhouse gases emitted during fossil fuel consumption and other human activities;

WHEREAS, the international scientific community and responsible scientific bodies here in the United States, including the Environmental Protection Agency, the National Oceanographic and Atmospheric Administration, and the National Academy of Sciences now agree that the evidence of human impact on climate change is compelling;

WHEREAS, in 2001 the New England Governors/Eastern Canadian Premiers adopted a Climate Change Agreement incorporating reduction targets;

WHEREAS, in 2003, a group of Connecticut stakeholders adopted 55 recommendations for greenhouse gas reductions, forwarding them to the Governor’s Steering Committee on Climate Change, which then selected and delivered 38 of the recommendations to the Governor for further action and adoption;

WHEREAS, on May 5, 2003, the Hamden Legislative Council adopted a resolution committing the Town of Hamden to the Cities for Climate Protection (CCP) campaign, organized by the International Council on Local Environmental Initiatives (ICLEI)—Local Governments for Sustainability—in order to address the global environmental problem of climate change at the local level;

WHEREAS, 550 local governments worldwide; more than 140 cities, towns, and counties in the United States; and eight municipalities in Connecticut have developed, or are in the process of developing, climate action plans that identify specific greenhouse gas emission reduction targets to be achieved in a cost-effective manner through a combination of energy conservation measures, energy use policies, and technological innovations;

WHEREAS, in 2003, and ICLEI intern completed an energy-use and greenhouse-gas-emissions inventory for a base year, 2001, and estimated growth in emissions for a target year, 2015, for municipal operations and the community as a whole;

WHEREAS, in 2004, and ICLEI intern has created a Local Action Plan containing a strategy to reduce greenhouse gas emissions, synthesizing the baseline analysis, providing a rationale for the target and timetable, and outlining the policies and measures the local government will pursue to achieve the target; and

WHEREAS, the Mayor has appointed an Energy Use and Climate Change Task Force to advocate for the implementation for the greenhouse gas reduction measures recommended in the Local Action Plan by developing specific recommendations for achieving measurable, cost-effective reductions on a realistic timeline that will promote energy efficiency, sustainability, cleaner air, improved health, and a more livable community.

NOW, THEREFORE, BE IT RESOLVED THAT:

1. The Town of Hamden commits to reducing its emissions of CO2 and other greenhouse gases to 2001 levels by 2010 and to reducing such emissions to ten percent below 2001 levels by the year 2015—targets consistent with those established by other cities and towns that have adopted, or are in the process of adopting, similar action plans.
2. The Mayor and Legislative Council charge the Energy Use and Climate Change Task Force to work to refine the Local Action Plan by developing specific recommendations to implement measures in energy use, purchase, energy efficiency and conservation, transportation, building design, and other related areas, that, taken together, can achieve these emissions reduction targets.
3. The Mayor and Legislative Council request that Town employees with decision-making and managerial responsibilities collaborate actively with members of the Task Force to ensure that the recommendations submitted to the Mayor and the Council for implementation are both practical and cost-effective.

Adopted by the Legislative Council at its meeting held on _____.

APPROVED AS TO FORM:

Susan Gruen
Town Attorney

Al Gorman, President
Legislative Council

Carl Amento
Mayor

Evelyn Parise, Clerk
Legislative Council

DATE: _____

APPENDIX C—Model Green Purchasing Policy

[This model purchasing policy is taken from the King County, WA (Seattle) Environmental Purchasing Program Website, <http://www.metrokc.gov/procure/green/modelpolicy.htm>]

Purpose

This chapter shall be known as the "(Organization) Environmental Purchasing Policy." Its purpose is to ensure that agencies purchase recycled and other environmentally preferable products whenever they meet price and performance requirements.

Definitions

- A. "Environmentally Preferable Products" means products that have a lesser impact on human health and the environment when compared with competing products. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product.
 - B. "Recycled Products" are products manufactured with waste material that has been recovered or diverted from solid waste.
 - C. "Practicable" means sufficient in performance and available at a reasonable cost.
-

Policies

- A. (Organization) agencies shall purchase recycled and other environmentally preferable products whenever practicable.
 - B. (Organization) agencies shall require contractors and consultants to use recycled and other environmentally preferable products whenever practicable.
-

Responsibilities of (Lead) Agency

The (lead) agency shall be responsible for coordinating the implementation of this policy. This agency shall:

- A. Assign appropriate personnel to fulfill the requirements of this policy.
- B. Research opportunities for procurement of recycled and other environmentally preferable products and communicate these to purchasing decision makers for evaluation and purchase.
- C. Collaborate with specifying agencies to prepare or revise bid documents and contract language where necessary to implement this chapter.
- D. Collect data on purchases by (organization) of recycled and other environmentally preferable products.

- E. Prepare and submit an annual report to the (appropriate administrative unit) by (appropriate date) of each year, describing the progress of agencies in implementation of the Environmental Purchasing Policy, including the following elements:
- i. Quantities, costs, and types of recycled and other environmentally preferable products purchased;
 - ii. A summary of savings achieved through the purchase of recycled and other environmentally preferable products;
 - iii. A summary of program promotional efforts;
 - iv. Recommendations for changes in procurement policy
- F. Promote the use of recycled and other environmentally preferable products by publicizing its environmental purchasing policy and its implementation.
-

Responsibilities of All Agencies

Each (organization) agency shall:

- A. Assign appropriate personnel to evaluate opportunities for the purchase of recycled and other environmentally preferable products communicated by the (Lead) Agency or independently developed;
 - B. Purchase recycled and other environmentally preferable products whenever practicable and require this of their contractors;
 - C. Report evaluation results and purchases of recycled and other environmentally preferable products to the (Lead) Agency by (appropriate date) each year.
-

Exemptions

Nothing in this policy shall be construed as requiring the purchase of products that do not perform adequately or are not available at a reasonable price.

APPENDIX D—Seattle’s LEED Requirement

Seattle’s Sustainable Building Policy

WHY THE LEED RATING SYSTEM™?

The City of Seattle’s Sustainable Building policy is tied to a green building rating system known as LEED™, developed by the US Green Building Council (USGBC). The USGBC was formed in 1993 to “accelerate the adoption of green building practices, technologies, policies, and standards.” Their philosophy: the resources required in building, operating, and replenishing the current level of infrastructure is enormous, yet resources available for such activity are diminishing. To remain competitive and to continue to expand and produce profits in the future, the building industry must address the economic and environmental consequences of its actions. Council membership consists of more than 500 organizations including: product manufacturers; environmental leaders such as the Natural Resources

Defense Council and the Audubon Society; building and design professionals and associations such as the American Institute of Architects; and retailers and building owners. The City of Seattle joined the USGBC in 1999.

The USGBC developed the Leadership in Energy and Environmental Design™ (LEED™) rating system to promote market transformation. LEED™ is a self-certifying system designed for rating new and existing commercial, institutional, and high-rise residential buildings. Different levels of green building certification are awarded based on the total credits earned in each of several categories: site, energy, material resources, indoor environmental quality and water. The system is designed to be comprehensive in scope, yet simple in operation. Use of a national standard helps to establish minimum performance levels, creates a common dialogue for discussion, and allows Seattle to measure its sustainable building performance relative to other jurisdictions using LEED™. In addition, technical rulings, training, networking and marketing support are provided by the USGBC. In 2000, a regional chapter of the USGBC, the Cascadia Chapter, was formed. The regional chapter includes Washington, Idaho, Montana, and Oregon. Chapter members support the activities of the USGBC and the implementation of LEED™ as a market transformation tool.

The Seattle Sustainable Building Policy states:

It shall be the policy of the City of Seattle to finance, plan, design, construct, manage, renovate, maintain, and decommission its facilities and buildings to be sustainable. This applies to new construction and major remodels in which the total project square footage meets the criteria given. The US Green Building Council’s LEED (Leadership in Energy and Environmental Design) rating system and accompanying Reference Guide shall be used as a design and measurement tool to determine what constitutes sustainable building by national standards. All facilities and buildings over 5,000 gross square feet of occupied space shall meet a minimum LEED Silver rating.

Desired performance:

Since the adoption of the City’s Sustainable Building Policy in February 2000, the USGBC has modified the definition of a “Silver” rating for LEED™, from 39-45 points (60-69%) to 33-38 points (50-59%) out of 65 possible core points. The intent of the Policy is a certain performance level for City buildings, using LEED™ as the yardstick. For the purposes of City Policy, it is assumed that the performance level minimum is still Silver. Project managers and design teams are encouraged to go beyond this level.

The project target of occupied space was chosen to focus on projects in which the human benefits of building sustainably could be realized. In addition, the LEED™ rating system was developed for application to commercial, institutional, and high rise residential projects. The City of Seattle constructs many projects that do not meet the given criteria. These projects include buildings or remodels smaller than 5000 square feet, unoccupied buildings, and parks, roadways, and other infrastructure. Project managers and design teams are encouraged to apply the portions of the LEED™ rating system which make sense for their project, and to seek out other project goals that increase the environmental, social, and economic benefits of the project.

Seattle's Sustainable Building Policy

LEED RATING SYSTEM™ SEATTLE CIP SUPPLEMENTS

The purpose of the Seattle Supplements to LEED™ is to provide assistance in applying LEED™ to City CIP projects, and integration of the LEED™ system with local building codes, practices, and City policies. In addition, resource information is provided to connect City capital project managers with program staff and information. The Seattle Supplements will be updated as additional resources are identified. Please feel free to provide feedback or suggestions regarding changes or additions to the CIP Supplements. Please call Thor Peterson, Seattle Public Utilities Sustainable Building Program, with any comments or questions: (206) 615-0731 or thor.peterson@ci.seattle.wa.us.

A few minor modifications to the LEED™ system are required for use with City projects. These are noted in these Supplements. The additional requirements are:

- ☐ All projects shall comply with the **City Landscape and Grounds Management Guidelines**.
- ☐ All projects shall achieve a **minimum of two credits** in the Energy section from Energy Credit 1.

In addition, there are several other City policies and programs that relate to sustainable building, included for your reference. These are:

- ☐ The City's Resolution regarding use of sustainably certified wood (Resolution 30015),
- ☐ The City's Policy regarding purchasing of recycled content materials (SMC section 3.18.904), and
- ☐ The Copernicus Project, the City's plan to redesign the way goods and services are procured (see a description of Copernicus in the Appendices to this document).

Source: <http://www.cityofseattle.net/sustainablebuilding/Leeds/docs/LEEDSupplements.PDF>

Everyone wants to save money on energy bills. But did you know that you can reduce your contributions to global warming and air pollution at the same time?

About Global Warming

Scientists agree that global warming is already happening due to human causes, mostly the emission of CO₂.

CO₂ is emitted by cars, power plants, furnaces, and anything that burns oil, coal, gas, or wood. These same sources also emit pollutants that cause smog and asthma.

A 6-10° F increase in temperature is expected in New England over the next 100 years.

This will be accompanied by an increase in severe weather (e.g. hurricanes, blizzards), air pollution, and insect-dependent diseases such as West Nile virus.

The Town of Hamden is committed to doing its part to help stop global warming and save money by increasing the energy efficiency of the local government. For more information on what the government is doing, contact the Mayor's Office, (203) 287-7100.

Visit these websites for more information on ways to save energy and live with less impact on the environment:

Cities for Climate Protection

Learn about the movement going on all over the country and the world

www.iclei.org/us/ccp

Eartheasy

More great tips for saving energy and living sustainably

www.eartheasy.com

Center for a New American Dream

Ideas on simplifying, saying no to the rat race, and going easy on the earth

www.newdream.org

US Dept. of Energy-Office of Energy Efficiency

The official scoop on energy efficiency

<http://www.eere.energy.gov/consumer/info/tips/>

Energy Star

Energy efficient products, resources, and rebates

www.energystar.gov

United Illuminating

Lots of ideas and some financial incentives from your local electricity provider

www.uinet.com

Clean Air-Cool Planet

Information and resources to combat global warming and air pollution

www.cleanair-coolplanet.org

Rideworks

Carpools, vanpools, and public transit in the New Haven area

www.rideworks.com

Home Energy-Saving TIPS

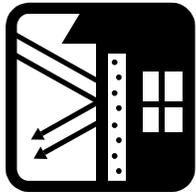


- Save Money
- Reduce Pollution
- Cool the Planet

TIPS TO SAVE ENERGY

HOME HEATING

- Insulate your house well, especially your attic floor. This keeps your house cool in summer, too.
- Check for drafts at windows and doors. Seal with silicone caulk on the outside of the house (prevents dampness inside walls).
- Draw the drapes at night. This will prevent heat from escaping.
- Use the “reverse” function on your ceiling fan to re-circulate warm air. Turn down your thermostat to compensate for more warmth.
- Tankless water heaters can save up to 50% of water-heating costs. Pays for itself in 3-7 years.
- Insulate your hot water tank (kits ~\$15), and insulate water pipes with foam sleeves.



These home heating and cooling tips are from www.eartheasy.com. For even more ideas and further details, visit their website.

HOME COOLING

- Paint the house a light color, and use light-colored reflective shingles on the roof.
- Shade! Trees, shrubs, drapes, blinds, and shutters, will all help keep it cool inside.
- Install roof vents to ventilate. Inexpensive to install.
- Use compact fluorescent light bulbs. These put out 90% less heat, use 75% less electricity, and last up to 10 times longer.
- Many of the tips from home heating also work to keep your home cool in the summer.



APPLIANCES & LIGHTING

- Compact fluorescent bulbs cost more upfront, but they save you money in the long run!
- Buy Energy Star appliances. Look for rebates at www.myenergystar.com.
- Clothes dryers are energy hogs. Line dry as many items as you can.
- Make sure the seal around the fridge door is tight, vacuum the coils in back, and place fridge away from heat sources.



VEHICLES

- Try to walk, bike, or take public transportation as much as possible.
- Consolidate trips—plan ahead and save gas.
- Maintain your car regularly and keep your tires inflated to the optimum pressure.
- Consider buying a hybrid vehicle. They get up to three times better gas mileage than a regular car.
- Don't leave your car idling for more than two minutes. It burns more gasoline than restarting it.



RECYCLING & GARBAGE

- It takes much less energy to recycle items than to make them from virgin materials. Recycle everything you can.
- Buy recycled products to keep the cycle going.
- Consider starting a compost pile in your yard, and reap the benefits of free fertilizer.
- When taking items to the Transfer Station, be sure to place them in their appropriate bins



Everyone wants to save money on energy bills. But did you know that you can reduce your contributions to global warming and air pollution at the same time?

About Global Warming

Scientists agree that global warming is already happening due to human causes, mostly the emission of CO₂.

CO₂ is emitted by cars, power plants, furnaces, and anything that burns oil, coal, gas, or wood. These same sources also emit pollutants that cause smog and asthma.

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The Town of Hamden is committed to doing its part to help stop global warming and save money by increasing the energy efficiency of the local government. For more information on what the government is doing, contact the Mayor's Office, (203) 287-7100.

Visit these websites for more information on ways to save energy and operate with less impact on the environment:

United Illuminating

Many financial incentives for business energy conservation available—lots of money to save
www.uinet.com

Cities for Climate Protection

Learn about the movement going on all over the country and the world
www.iclci.org/us/ccp

US Dept. of Energy-Office of Energy Efficiency

The official scoop on energy efficiency
<http://www.eere.energy.gov/consumerinfo/tips/>

Energy Star

Energy efficient products, resources, and rebates
www.energystar.gov

Rideworks

Carpools, vanpools, and public transit in the New Haven area
www.rideworks.com

Eartheasy

More great tips for saving energy and living sustainably
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Center for a New American Dream

Ideas on simplifying, saying no to the rat race, and going easy on the earth
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Clean Air-Cool Planet

Information and resources to combat global warming and air pollution
www.cleanair-coolplanet.org

Energy-Saving TIPS for Businesses

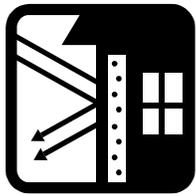


- Save Money
- Reduce Pollution
- Cool the Planet

TIPS TO SAVE ENERGY

HEATING & COOLING

- Make sure the building is well insulated, and that windows are at least double-paned.
- Identify air leaks and caulk them from the outside.
- Get a programmable thermostat, set to change temperature outside of business hours. Can save 15% on heating & cooling costs.
- Maintain and clean the HVAC system regularly.
- Consider a solar hot water or heating system—can actually save you money.
- Insulate your hot water tank and insulate water pipes with foam sleeves.
- Make sure ducts are sealed and insulated.



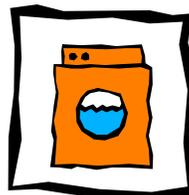
Many of these tips are from the
Department of Energy:
[http://www.eere.energy.gov/consumerinfo/tips/
/business_links.html](http://www.eere.energy.gov/consumerinfo/tips/business_links.html)

- Use white paint or reflective shingles on the roof to deflect heat, and paint the building a light color.
- Shade the building with deciduous trees, bushes, vines, and awnings.
- Your hot water may be hotter than you need. 120°F is usually sufficient (dishwashing may require higher temperature).
- Isolate unused spaces—no need to heat them!
- Keep exterior doors closed when using air conditioning or heating.



EQUIPMENT & LIGHTING

- Buy compact fluorescent light bulbs.
- Avoid unnecessary or excessive lighting at night. Use fixtures that direct light downwards.
- Turn off equipment when not in use.
- Make it policy to buy only Energy Star .
- Computer screen savers are not a low energy mode—make sure the computer automatically goes to “standby” mode.
- Install occupancy sensors for lights where appropriate, or automatic light controls.



VEHICLES & COMMUTING

- Buy the most fuel-efficient vehicles for company use. Consider a hybrid vehicle.
- Encourage your employees to walk, bike, ride public transit, or carpool to work.
- Consider offering incentives or “buyback” of parking spaces to encourage carpooling.
- Maintain your vehicles regularly and keep tires inflated to the optimum pressure.
- Make a no-idling policy. Idling for more than one minute wastes gasoline.
- Consider using alternative fuels, such as biodiesel or natural gas.



RECYCLING & PURCHASING

- It takes much less energy to recycle items than to make them from virgin materials. Recycle everything you can.
- All businesses in CT must recycle mixed paper, cardboard, glass, and metal.
- Buy recycled products to keep the cycle going.
- Consider buying some of your electricity from renewable sources such as wind or landfill gas.



Harnessing the Power of

ADVANCED FLEET VEHICLES

A Hybrid Electric Vehicle Fact Sheet for Government Officials ♦ February 2004

Written and produced by the Center for a New American Dream in collaboration with the National Association of Counties



Hybrid electric vehicles (hybrids) are exciting new additions to the car market for government fleet purchases. Powered by both an internal combustion engine and a battery-operated electric motor, hybrids can achieve up to twice the fuel economy of a conventional car and produce 30 to 50 percent fewer greenhouse gas emissions. In addition to reducing our dependence on oil and improving the environment, hybrids can offer cost savings over the lifetime of vehicle ownership.

For governments wanting to improve air quality and set an example of environmental stewardship for their community, hybrids are an attractive option. And because nearly 20 percent of all new car registrations are fleet vehicles, fleets not only have the potential to shape the future of the vehicle market, but also to make advanced technologies more widely available and affordable for both institutional purchasers and everyday consumers.

What Are Hybrids?

Hybrid electric vehicles combine the best features of conventional and electric cars to improve environmental performance without sacrificing convenience. They get their driving power from both an internal combustion engine and a battery-powered electric motor, which results in greater fuel efficiency and cleaner emissions than most conventional cars. And unlike other alternative fuel vehicles, hybrids use standard gasoline pumps for refueling.

The Bottom Line for Government Officials

Although the retail price of hybrids exceeds their conventional counterparts by about \$4,000, hybrids can save money when the total cost of vehicle ownership is taken into account.¹ Higher resale values, excellent warranties, lower projected maintenance costs (because the combustion engine receives less wear), and lower fuel costs (as much as 50 percent lower depending on terrain and other driving conditions) can offset hybrid vehicles' higher initial purchase price.

King County, Washington, for example, assessed the economic life cycle of the Chevy Malibu versus the Toyota Prius, based on certain assumptions (see Figure 1), and showed that hybrids can be a viable, even profitable, alternative to conventional vehicles. King County projects a \$2,660 savings per vehicle with the Toyota Prius. Using

The 2005 Ford Hybrid Escape (above), a compact sport utility vehicle that uses advanced hybrid technology. Photo provided by Ford Motor Company.

Why Choose a Hybrid?

Several technological features distinguish hybrids from conventional vehicles.

- Unlike all-electric cars, hybrids do not need to be plugged in to recharge the battery. The battery recovers and stores energy normally lost as heat during braking through a process called *regenerative braking*. The battery is also recharged by the engine when it produces more power than is needed to drive the wheels.

- Because of the extra power the electric motor provides, gasoline engines in hybrids can be built smaller without compromising the vehicle's peppiness. By allowing the engine to operate more efficiently, *engine downsizing* increases the environmental performance of hybrids and their fuel economy.

- Vehicles with *idle-off capability* can turn their gasoline engines off when stopped. This reduces emissions, which are dirtier while idling, and improves fuel efficiency. Idling off makes hybrids a particularly efficient (and quiet) option in city, stop-and-go traffic.

- Some hybrids have *electric-only drive*, powering the car with the battery alone at speeds up to 10 or 15 miles per hour. This provides significant fuel savings and emissions reductions because combustion engines operate least efficiently at low speeds.

this cost methodology, the City of Houston, Texas anticipates saving about \$5,900 by replacing 1997 Dodge Neons with 2002 Toyota Priuses. King County and Houston's experiences suggest that it takes 3-4 years to

Figure 1: King County, Washington

	2003 Chevy Malibu	Adj. For Life Cycle ¹	2003 Toyota Prius	Difference
Initial Purchase Price	\$14,901	\$17,434	\$21,280	(\$3,846)
Projected Residual Value ²	(\$2,117)	(\$2,477)	(\$4,111)	\$1,634
Net Purchase Price	\$12,784	\$14,957	\$17,169	(\$2,212)
Fuel Miles Per Gallon	24	24	44	20
Est. Fuel Cost ^{2,3}	\$5,003	\$5,854	\$3,211	\$2,643
Est. Maintenance & Repair Cost ²	\$4,013	\$4,695	\$2,466	\$2,229
Total Cost of Ownership	\$21,800	\$25,506	\$22,846	\$2,660

Source: Calculations made by Windell Mitchell, Fleet Manager for King County, Washington

- Notes
1. The Prius is assumed to have a life cycle of 100,000 miles and approximately 8 years while the Malibu is assumed to have a life cycle of 85,000 miles and approximately 7 years. Since the Toyota Prius will be driven 17% more during its life cycle than the Chevy Malibu, all of the cost figures for the Chevy Malibu were adjusted 17% upward.
 2. Projected Residual Value, Estimated Fuel Cost, and Estimated Repair & Maintenance Cost calculated using a 3% discount factor.
 3. Fuel cost estimated at \$1.61 per gallon.



recover the increase in net purchase price, yielding roughly a 30 percent return on the initial investment in hybrid technology over the economic life cycle of the vehicle.ⁱⁱ

King County and Houston are examples of two distinct local governments, and their results may not directly apply to every municipal fleet nationwide. The more dominant the following conditions are, the more economically favorable hybrids will be:

- High mileage demands
- Higher gasoline prices
- Majority of city driving
- Moderate climate
- Flat terrain

However, hybrids can save your fleet money even if these conditions aren't present.

What Are the Additional Benefits?

Choosing a hybrid over a conventional car for your fleet can help improve environmental quality, public health, national security, and the economy. Hybrids attain up to twice the fuel economy of their conventional counterparts, burning less gasoline and therefore emitting fewer greenhouse gases that contribute to global warming. Decreasing oil consumption can reduce our dependence on foreign oil and minimize the economy's vulnerability to price increases and supply disruptions. Also, most hybrids produce fewer pollutants than conventional cars. This

translates into cleaner air, less smog, and less acid rain as well as gains in public health. As illustrated in Figure 2, switching from the 2004 Chevrolet Malibu to the 2004 Toyota Prius reduces smog-forming pollutants and particulates by 50 to 90 percent, and decreases emissions of carbon dioxide by 49 percent. Correspondingly, the Prius would require 49 percent less gasoline to operate, and would save over 200 gallons of gasoline annually compared to the Malibu.

How are Hybrids Used in Government Fleets?

A growing number of local and state governments are purchasing hybrids for their fleets. Hybrids are used in agencies' general motor pools, and also can be assigned to specific drivers.ⁱⁱⁱ New York City, for instance, has purchased over 650 Toyota Prius vehicles for use in a range of municipal agencies, such as the Departments of Parks and Recreation, Health, Buildings, and Transportation. In Martin County, Florida, the Sheriff's Office uses 11 Priuses and 8 hybrid Civics for detective work, parking enforcement, and other non-emergency tasks. Due to the hybrids' great gas mileage in city traffic, the county estimates that it saves an average of \$103 a



The Second Generation Prius (above left) and Honda Civic Hybrid (above), two popular hybrid choices. Photos provided by Toyota and Honda Motor Companies.

month in gasoline, compared with the performance of the Crown Victoria — the typical police fleet vehicle — which gets only about 11 mpg. The Sheriff's Department still uses larger cars to chase speeders and transport prisoners, but has identified many uses where the additional engine power is simply not needed.^{iv} Marion and Alachua Counties, also in Florida, both operate several Prius vehicles for crime watch personnel and other light patrol uses. In Santa Clara County, California, the county's 80 hybrid cars are used in many county departments, most commonly in the social services department by social workers and in the district attorney's office by process servers.^v

King County, Washington saw hybrids as a good way to meet their alternative fuel program goals in a cost-effective and convenient manner. With leadership from King County Executive Ron Sims and the director of Fleet Management, Windell Mitchell, the county purchased 60 Toyota Priuses between 2001 and 2003. In a customer survey, King County employees expressed considerable satisfaction with these vehicles (4.6 on a 5-point scale). The most common concerns about compact vehicle size, trunk space, and power (the battery would drain if vehicle was not driven every couple of weeks) have been corrected in the new mid-sized 2004 Prius. Employees in King County have so enjoyed driving the hybrid vehicles that many request these cars while on the job, and many have chosen to purchase hybrids for personal use. "Buying hybrids is a win-win for King County," stated Mitchell. "They have a positive effect on reducing costs and also reducing emissions."

What Hybrid Models are Available for Purchase?

A few models of hybrids are currently on the market, and the range of available hybrids will increase significantly over the next few years. After the success of Toyota and Honda, other manufacturers are beginning to produce hybrids and expand into other classes of vehicles such as sport utility vehicles (SUVs) and pick-up trucks. For example, the Ford Motor Company will introduce a 2005 Ford Escape Hybrid Compact SUV in late 2004, and Honda recently announced plans to introduce an Accord Hybrid in the 2005 model year. Toyota will be introducing a new hybrid Highlander SUV in about a year, and the new 2004 Prius is far roomier and more powerful than its previous model. Figure 3 highlights the models currently available as well as some models that will be made available in the immediate future.



Wyatt Earp of the Marion County, Florida Sheriff's Office with a Prius from his fleet.

Figure 2: Comparison of Annual Emissions and Fuel Consumption of Mid-size Sedans¹

	2004 Chevrolet Malibu	2004 Toyota Prius	Savings	Percent Reduction
EPA Emission Standard	Tier 2 Bin 8	SULEV II		
Non-Methane Organic Gases (grams) ²	1,527	122	1,405	92%
Carbon Monoxide (grams) ²	51,303	12,215	39,088	76%
Nitrogen Oxides (grams) ²	2,443	244	2,199	90%
Particulate Matter (grams) ²	244	122	122	50%
Carbon Dioxide (lbs) ³	10,470	5,330	5,140	49%
EPA Fuel Economy (city/hwy) ⁴	24/34	60/51		
EPA Fuel Economy (combined) ⁵	28	55	27	
Fuel Consumed Annually (gallons)	436	222	214	49%

Notes

1. Based on 12,215 annual mileage.

2. Data obtained from Smog Forming Pollutants Chart, EPA Green Vehicle Guide: www.epa.gov/autoemissions/0-10chart.htm

3. Calculated using (12,215 miles / Combined MPG) x (24 pounds CO₂/gallon). Includes upstream CO₂ emissions and end-user CO₂ emissions. David Friedman, Senior Engineer, Union of Concerned Scientists. Personal communication 7/25/2003.

4. Fuel economy rating for automatic/continuously variable transmission.

5. Assumes 55% city driving and 45% highway driving.

Emission Standard Key: Vehicles meeting the Federal Tier 2 Bin 8 standard produce: 4.2 g/mi of CO, 0.02 g/mi of particulate matter, 0.2 g/mi of NO_x, and 0.125 g/mi of non-methane organic gases. Vehicles meeting California's SULEV II (Super Ultra Low Emissions Vehicle) standard produce: 1.0 g/mi of CO, 0.01 g/mi of particulate matter, 0.02 g/mi of NO_x, and 0.01 g/mi of non-methane organic gases.

Figure 3: Current and Future Hybrid Models¹

	Toyota Prius Gen 2	Honda Civic Hybrid	Honda Insight	Honda Accord	Ford Escape	Toyota Highlander ²	GM Silverado/Sierra
Model Year	2004	2004	2004	2005	2005	2005	2004
EPA Class Size	mid-size sedan	compact sedan	two-seater	mid-size sedan	compact SUV	mid-size SUV	full-size pickup
EPA Emission Standard ³ (Nat'l/Select)	Tier 2 Bin 3/ SULEV II	Tier 2 Bin 5/ SULEV II	Tier 2 Bin 5/ SULEV II	N/A	SULEV II expected	N/A	Tier 2 Bin 8
EPA Fuel Economy City/Hwy	59/51	47/48	57/56	mid-30s	Up to 40	up to 40	18/20
Annual Greenhouse Gas Emissions (CO ₂ equivalent) ⁴	6,546 lbs	7,660 lbs	6,429 lbs	Around 10,286 lbs	Around 10,286 lbs	Around 10,286 lbs	Around 20,000 lbs
Hybrid Technology	I,R,D,E	I,R,D	I,R,D	I,R,D	I,R,D,E	I,R,D,E	I, some R

- Notes**
1. Based on best available information to date from automakers. Delivery dates and specifications subject to change.
 2. Lexus will produce a similar vehicle, the RX 400h, beginning in model year 2005.
 3. Vehicles meeting Federal Tier 2 standards (77 to 95 percent cleaner than current vehicles) are being phased in from 2004 to 2009 and will be available nationwide. Vehicles meeting the SULEV II (Super Ultra Low Emission Vehicle) standard are available primarily in California, New York, and Massachusetts. For more information about EPA emissions standards and availability, see www.fueleconomy.gov.
 4. Calculated using (15,000 miles / Combined MPG) x (24 pounds CO₂/gallon). Includes upstream CO₂ emissions and end-user CO₂ emissions. David Friedman, Senior Engineer, Union of Concerned Scientists. Personal communication 7/25/2003.
- Technology Key: I=Idle-Off Capability, R=Regenerative Braking, D=Downsized Engine, E=Electric-Only Drive, NA= not available.

Helping Local and State Governments Purchase Hybrids



The Center for a New American Dream, a nonprofit organization dedicated to assisting institutions and individuals to make environmentally responsible purchasing decisions, is helping local governments, states, and private entities purchase hybrid electric vehicles for their fleets. In 2003, the Center hosted a conference call with 280 participants to provide an overview of hybrid electric vehicles and fleet applications. The Center provides information on hybrids to organizations through a variety of formats. For information about the Center's Hybrid Project, contact Naomi Friedman, naomi@newdream.org or (301) 891-3683.



The National Association of Counties (NACo), which is collaborating with the Center, is the only national organization that represents county governments in the United States. NACo is a full-service organization that provides an extensive line of services including legislative, research, technical, and financial services to its more than 2,000 county members. For information on NACo's Environmental Program contact: Beth Bleil, Community Services Associate, (202) 942-4246 or bbleil@naco.org.

We are grateful to the United States Environmental Protection Agency for supporting the publication of this fact sheet. The Center for a New American Dream would also like to thank the following foundations for supporting our work on hybrid electric vehicles: Energy Foundation, Merck Family Fund, Oak Foundation, Overbrook Foundation, Surdna Foundation, Town Creek Foundation, Wallace Global Fund, Weeden Foundation. The views expressed in this fact sheet do not necessarily reflect those of the EPA or our other funders.

- Endnotes**
- ⁱ Friedman, David, "A New Road: The Technology and Potential of Hybrid Vehicles," Union of Concerned Scientists, January 2003.
 - ⁱⁱ Adjusted as though both vehicles were driven the same 12,215 miles/year.
 - ⁱⁱⁱ "Fleets Pleased With Hybrids' Performance," in *Fleet Executive*, National Association of Fleet Administrators, May 2003.
 - ^{iv} John J. Fialka, "Police Vehicles Go Green and Help Save Green," *Wall Street Journal*, February 6, 2003.
 - ^v M. Mindy Moretti, "County Hybrid Fleets Go Unplugged," *County News*, February 2, 2004.

A National Cooperative Purchasing Contract for Fleets

The Center has joined forces with U.S. Communities, a national cooperative purchasing alliance, to test the feasibility of creating a national contract to purchase hybrid electric vehicles for government fleets. The National Association of Counties, a founding member of U.S. Communities, is providing support for this effort as well. King County, Washington is acting as lead public agency, and cities, counties, schools, states, and other local government agencies will be able to purchase hybrid vehicles for their fleets if the contract is successful. The solicitation is under development and information about the project's progress is available through the Center's website at www.newdream.org and the U.S. Communities' website at www.uscommunities.org.

APPENDIX G—Contacts

Hamden Government Sources

Board of Education

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203-407-2000

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Community Development

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Economic Development (business)

Dale Kroop*
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203-287-7033

Finance

Joe Celotto*
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203-287-7007

Fleet Manager (all town vehicles)

Captain Gus Gertz
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203-407-3184

Legislative Council

Al Gorman*
President
203-288-0017

Parks & Recreation

Vinnie Lavorgna*
Brooksvale Park Ranger
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Planning & Zoning

Rich Stoecker*
Town Planner
rstoecker@hamden.com
203-287-7077

Leslie Creane*
Assistant Town Planner
lcreane@hamden.com
203-287-7074

Bruce Driska*
Zoning Enforcement Officer
bdriska@hamden.com
203-287-7076

Police (bikes, motorcycles, horses)

Bob Nolan
Police Chief
rnolan@hamden.com
203-230-4015

Public Works (waste and recycling, and vehicles)

Tom Brown*
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tbrown@hamden.com
203-287-2600

Ken Copeland
Transfer Station and Foreman of Sanitation
kcopeland@hamden.com
203-287-2600

Purchasing (except computers)

Judi Kozak
jkozak@hamden.com
203-287-7111

Traffic (signals and traffic flow)

Lee Davies
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203-287-2637

Clean and Green Commission

Elaine Dove
Chair
203-288-5095 (h)

Kelly Anthony*
860-685-2468 (w)

Natural Resources and Open Space Commission

Marty Mador*
203-281-4326 (h)

Aris Stalis*
203-239-4200 (w)

Solid Waste and Recycling Commission

Bob Mark
Chair
203-287-1180 (h)

Mary Lesser*
203-288-4290 (h)

Stephen Mayer*
203-248-8319 (h)

Amy Ruhlman*
203-248-4663

Community and Other Sources

Electricity—United Illuminating (energy conservation)

Tom Turco (old UI-Hamden partnership data)
Program Administrator
tom.turco@uinet.com
203-499-2111

Roy Haller (current contact)
Commercial and Industrial Energy Services
Supervisor
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203-499-2025

Hamden Chamber of Commerce

Nancy Dudchik
Executive Director
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203-288-6431

Cinergy (formerly VESTAR)

Walt Micowski
Business Alliance Manager
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Transit

Sirisha Pillalamarri (area transit study)
Transportation Planner
South Central Regional Council of Governments
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Steve Warren (fuel economy of buses)
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CTTransit
860-522-8101

Donna Carter (trolleys and non-CTTransit buses)
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Greater New Haven Transit District
203-288-6282

Connecticut State Government

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Urban Forestry Coordinator
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New Haven Initiatives

Madeleine Weil
New Haven Community Clean Air Initiative
City Plan Department
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203-946-6752

*** Denotes member of Climate Change
Task Force**

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- ¹ Burlington Climate Action Plan, Introduction, pg 7.
- ² EPA's State and Local Climate Change Program, "Multiple Benefits of Emission Reduction Policies," ([http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BUTJC/\\$File/multiplebenefitsofreductionpolicies.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BUTJC/$File/multiplebenefitsofreductionpolicies.pdf))
- ³ EPA's Global Warming Site. Climate Section. Available at <http://yosemite.epa.gov/oar/globalwarming.nsf/content/climate.html>
- ⁴ H. Augenbraun et. al. "The Greenhouse Effect, Greenhouse Gases, and Global Warming" NASA Institute on Climate and Planets. (<http://icp.giss.nasa.gov/education/methane/intro/greenhouse.html>)
- ⁵ U.S. EPA.
- ⁶ Intergovernmental Panel on Climate Change "Climate Change 2001: Synthesis Report. Summary for Policymakers. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change"
- ⁷ EPA "Global Warming Uncertainties" 2000. Available at: <http://yosemite.epa.gov/oar/globalwarming.nsf/content/climateuncertainties.html#known>
- ⁸ Intergovernmental Panel on Climate Change "Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change" and National Research Council "Climate Change Science: An Analysis of Some Key Questions"
- ⁹ NERA is one of 16 regional assessments completed from a 1990 Congressional Act. The United States Global Change Research Program (USGCRP) was created by Congress in the Global Change Research Act of 1990.
- ¹⁰ Available at <http://www.necci.sr.unh.edu/2001-NERA-report.html>
- ¹¹ United Nations Framework Convention on Climate Change "Climate Change Information Sheet 8" Available at: <http://unfccc.int/resource/iuckit/fact08.html>
- ¹² Clean Air-Cool Planet. Fact Sheet. Available at: <http://www.cleanair-coolplanet.org>
- ¹³ World Wildlife Fund. "New England's Global Warming Solutions" August 2000. Prepared by Tellus Institute.
- ¹⁴ EPA "Climate Change and Connecticut" September 1997 Report# EPA230-F-97-008g ([http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BPQB7/\\$File/ct_impct.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BPQB7/$File/ct_impct.pdf))
- ¹⁵ Clean Air Task Force, "Death, Disease and Dirty Power," (http://www.catf.us/publications/reports/death_disease_dirty_power.php)
- ¹⁶ Resolution 26-4, Resolution Concerning Energy and the Environment. Adopted at the 26th Annual Conference of New England Governors and Eastern Canadian Premiers, August 26-28, 2001.
- ¹⁷ Data from Roy Haller (Small Business) and Tom Turco (all other sections) at UI.
- ¹⁸ U.S. DOE, Building Energy Codes Program, "Connecticut DOE Status of State Energy Codes," (http://www.energycodes.gov/implement/state_codes/state_status.cfm?state_AB=CT)
- ¹⁹ International City/County Management Association webcast, 4 August 2004, "Adopting Energy Codes: The Economic and Environmental Benefits for Local Governments."
- ²⁰ "Heat & Cool: Cooling Your Building Naturally," Energy Efficiency and Renewable Energy, U.S. Department of Energy (<http://www.eere.energy.gov/consumerinfo/pdfs/landscape.pdf>)
- ²¹ See James Howard Kunstler, *Home from Nowhere: Remaking Our Everyday World for the Twenty-First Century*, New York: Simon & Schuster, 1996.
- ²² "Motor-Fuel Use," U.S. Department of Transportation, Federal Highway Administration (<http://www.fhwa.dot.gov/ohim/onh00/onh2p8.htm>)
- ²³ "Licensed Drivers," U.S. Department of Transportation, Federal Highway Administration (<http://www.fhwa.dot.gov/ohim/onh00/onh2p4.htm>)
- ²⁴ (<http://www.epa.gov/smartway/documents/drivertraining.pdf>)
- ²⁵ (<http://www.cttransit.com/press/Press.asp?pressID={1CB58252-9A90-4642-A719-9C510C522EB8}>)
- ²⁶ ICLEI and STAPPA/ALAPCO's Clean Air and Climate Protection software, passenger vehicle default miles per gallon.
- ²⁷ (<http://www.epa.gov/epaoswer/non-hw/payt/sera.pdf>)
- ²⁸ U.S. EPA, "Pay-As-You-Throw: Illegal Diversion," (<http://www.epa.gov/epaoswer/non-hw/payt/top8.htm>)
- ²⁹ Brookline, Massachusetts Local Action Plan, p. 46.
- ³⁰ "Components of the Waste Stream and Recycling Rate," North Carolina Department of Environment and Natural Resources, 1998. (<http://www.p2pays.org/ref/02/0162203.pdf>)

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- ³¹ Plastic #1—PETE: polyethylene terephthalate, #2—HDPE: high-density polyethylene, #3—PVC: polyvinyl chloride, #4—LDPE: low-density polyethylene, #5—PP: polypropylene, #6—PS: polystyrene, #7—Other (mixed).
- ³² <http://www.cityofseattle.net/sustainablebuilding/Leeds/docs/LEEDSupplements.PDF>
- ³³ ICLEI, “Green Fleets: Green Your Fleet,” (<http://www.greenfleets.org/GreenFleetsProcess.html>)
- ³⁴ U.S. DOE, “Most and Least Efficient Trucks,” (<http://www.fueleconomy.gov/feg/best/bestworstEPATrucksNF.shtml>)
- ³⁵ Ford, “Escape Hybrid FAQs,” (<http://www.fordvehicles.com/escapehybrid/faqs/index.asp?bhcp=1#faq10>)
- ³⁶ Personal communication from Sergeant Randy Sparacino, Medford Police Department, July 12, 2004.
- ³⁷ Philadelphia Diesel Difference, “Clean Fuels,” (<http://www.cleanair.org/dieseldifference/fuels/>)
- ³⁸ U.S. DOE, “Alternative Fuel Price Report,” March 23, 2004.
- ³⁹ Maryland Energy Administration “Energy Efficiency for Transportation,” (<http://www.energy.state.md.us/energysources/energyefficiency/transportation>)
- ⁴⁰ <http://www.das.state.ct.us/Purchase/Epp/Index.htm>
- ⁴¹ Center for Clean Air Policy, “Connecticut Climate Change Stakeholder Dialogue: Recommendations to the Governor’s Steering Committee: Executive Summary” January 2004, p. ES-1.