

• I • C • L • E • I

 **CITIES for CLIMATE PROTECTION**

# New Haven Community



## Clean Air Initiative

# Climate Action Plan 2004

August 4, 2004



City of New Haven  
John DeStefano, Jr., Mayor

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# 1. Introduction

## 1.1. Introduction to Global Climate Change

Global climate change is widely recognized as the most serious environmental threat facing civilization as the new century begins. Despite lingering uncertainty about the ramifications of greenhouse warming, there is now definitive scientific consensus on the principles behind the phenomenon. Specifically, most scientists now concur that anthropogenic activity is changing the chemical composition of the earth's atmosphere and that these atmospheric changes are likely to alter the earth's climate systems – and the political, economic and social institutions that rely on their stability.

Naturally existing atmospheric gases, like carbon dioxide, methane, and water vapor, trap a small amount of the sun's energy as it radiates off the surface of the earth and back into space. Without these gases, Earth would be as cold and as uninhabitable as Mars. However, as the concentration of heat-trapping gases in the atmosphere increases as a result of anthropogenic emissions, more heat is trapped near the earth's surface. The precise long-term effects of global warming are unknown. Increases in the frequency and severity of extreme weather events such as storms and droughts, geographic shifts or losses of ecosystems, changes in ocean currents, decline in fisheries, melting polar icecaps and sea level rise, shifting disease vectors and alterations in regional agricultural productivity are some of the predicted repercussions.

These repercussions will likely be significant on the local scale as well as the global. In Connecticut, for example, the average temperature has increased by approximately 1.4% over the last century, while precipitation has risen by nearly 25%. Climate models predict that this trend will continue through the next century, with the average annual temperature in New England increasing between 3.1-5.3° C (6-10° F) by 2100.<sup>1</sup> The 1990s were characterized by an unusual number of extreme weather events in the New England area. The 1998 ice storm was the worst in recorded history in terms of loss of life, power outages and damage to forest ecosystems. The summer of 1999 was one of the hottest, driest summers on record, while the summer of 2000 was one of the coolest and wettest. An increase in temperature could significantly impact Connecticut's forests, altering seasonal foliage displays, wildlife habitats and the productivity of forest economies. The commercial fishing industry and the integrity of coastal ecosystems are threatened by sea level rise, and changes in precipitation could affect the quality of the region's freshwater supplies. The human population of Connecticut will likely face a combination of elevated populations of disease carrying insects such as mosquitoes and ticks, and a growing range of infectious diseases such as encephalitis and malaria. For more details about impacts to the New England Region, see New England Regional Assessment (citation below).

The 2001 Report of the Intergovernmental Panel on Climate Change shows dramatic increases in the atmospheric concentrations of the three principle greenhouse gases. Concentrations of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), have increased by 31%, 151% and 17%, respectively, since the industrial revolution. These dramatic changes are due to anthropogenic activities, primarily fossil fuel combustion for purposes of transportation and electricity generation. Other culprits include the

proliferation of rice agriculture, cattle ranching, landfills, and deforestation.<sup>2</sup> As forests all over the world are converted to pastures, parking lots, and buildings, the earth becomes less able to store excess carbon dioxide in biomass, and the earth's natural warming mechanism is magnified.

Despite the scientific consensus surrounding climate change, there is little political consensus regarding what should be done. In July 2001, the United States backed out of negotiations on the Kyoto Protocol, therefore diminishing prospects for an effective international regime. Although 178 nations have agreed to continue cooperation, the accord's effectiveness will be limited by the exclusion of the world's largest polluter. The White House policy on climate change, announced in February 2002 has been criticized by environmentalists and economists alike for being far less aggressive than the scientific evidence warrants. The lack of forward movement at the international and national levels makes local action essential.

## **1.2. The Need for Climate Action in New Haven**

New Haven, Connecticut is a town of 126,000 residents, located on Long Island Sound in the South-Central region of the state. New Haven has long served the region as an industrial, commercial, and transportation hub. Like many major cities in the United States, cars, trucks, factories and buildings feature prominently on the landscape. Implicit in the prominence of these features has been an intense consumption of fossil fuel-based energy, reminders of which exist in the hulking silhouettes of United Illuminating's Harbor Station, the controversial English Station, and the petroleum farms that dot the harbor shore. In 1999, the New Haven community was responsible for the release of 2,026,210 tons of eCO<sub>2</sub> into the atmosphere.<sup>3</sup> As a member of the global community, New Haven has a responsibility to make a concerted effort to reduce its ecological footprint by minimizing its greenhouse gas emissions.

There are significant secondary benefits to reducing greenhouse gas emissions in this area. New Haven currently does not meet the air quality standards for fine particulate matter or ozone established by the 1990 amendments to the Clean Air Act. This means that the city's inhabitants breathe an excess of pollutants, primarily byproducts of fossil fuel combustion, and suffer the corresponding excess of respiratory ailments. The water quality of Long Island Sound is another victim of the area's excessive dependence on fossil fuels. Street runoff and industrial discharges find their way into the Sound, damaging aquatic environments and threatening ecosystem health. The cost of energy is of local concern as well. New Haven is a poor city; the less money spent on energy costs, the more available for other necessities. The cost savings that could be achieved by improving the operational efficiency of New Haven's transportation systems and the electricity and fuel consumption of its buildings and homes is substantial. Although societies typically deal with these issues separately, fossil fuel combustion is a common thread that links together potential solutions. Various players in New Haven municipal government (hereafter, the City) engage in different pieces of the energy puzzle for different reasons. For the City's Office of Emergency Management, the petroleum farms and the local power plant are potential targets for terrorist attacks. The Health Department and community groups are concerned about poor air quality and the association with high rates of asthma among New Haven children. Minimizing increases in local taxation and allocating dollars to the most valuable end-uses is

the Office of Management and Budget's priority. They recognize that annual energy costs, while representing only a small fraction of the City's total operating budget, amount to millions of dollars of controllable expenditure. Finally, the City Plan Department, charged with the task of shaping a long-term vision in the Comprehensive Plan of Conservation and Development, recognizes New Haven's duty to act as a responsible global citizen with respect to climate change. Under this obligation, the City should strive to reduce greenhouse gas emissions where possible within its area of influence. With this in mind, on July 2, 2001 the Board of Alderman passed a resolution committing the City to the International Council for Local Environmental Initiative's Cities for Climate Protection Campaign (See Supporting Document #1).

### 1.3. ICLEI and Cities for Climate Protection

The International Council for Local Environmental Initiatives (ICLEI) is an international association of local governments dedicated to the prevention and solution of local, regional, and global environmental problems through local action. More than 350 cities, towns, counties, and their associations worldwide comprise ICLEI's membership. Through its campaigns, ICLEI helps local governments generate political awareness of key issues, build capacity through technical assistance and training, and evaluate local and cumulative progress toward sustainable development. ICLEI's Cities for Climate Protection Campaign (CCP) offers a framework for local governments to develop a strategic agenda to reduce greenhouse gas emissions while improving local air quality and urban livability. More than 400 local governments from around the world participate in the campaign, including over 100 U.S. cities and counties.<sup>4</sup>

The Cities for Climate Protection Campaign outlines a 5-Milestone process:

- **Milestone One:** Conduct a **baseline emissions inventory** for the community as a whole and for municipal government operations. From baseline data, projections are forecasted for both sectors, assuming that no action is taken to address greenhouse gas emissions. The emissions examined in the inventory come primarily from use of electricity and heating fuels for residential, commercial, and industrial facilities and the combustion of fossil fuels for transportation purposes. CCP methodology calculates eCO<sub>2</sub> emissions based on downstream consumption; i.e., emissions estimates do not take into account energy used to generate, transmit and distribute energy to the site. Nor do they take into account inefficiencies or leaks. Likewise, emissions are allocated geographically to the site of end-use consumption, rather than the point of generation.
- **Milestone Two:** Set an **emissions reduction target**.
- **Milestone Three:** Develop a **local action plan** – a program of practical initiatives that outlines the steps toward emission reductions. These must be suited for local conditions and circumstances and must reflect the priorities of the community.
- **Milestone Four:** Action plan **implementation**. Various initiatives may require the effort and coordination of municipal departments, the Board of Aldermen, state and regional entities, local businesses and community members.
- **Milestone Five:** Monitor emissions reductions. **Monitoring and verification of progress** is an ongoing step that begins once measures are implemented.

## 2. The Greenhouse Gas Inventory

During the summer of 2001, the City of New Haven completed the first milestone by developing a baseline greenhouse gas emissions inventory and forecast for New Haven. An inventory was taken of both community-wide emissions and those directly resulting from the activities and facilities of municipal government.<sup>5</sup> The inventory has been recently updated to reflect better information about the 1999 baseline emission profile and emission forecasts.

### 2.1. Community Emissions

New Haven's greenhouse gas inventory includes emissions from energy use (electricity and heating fuel) in residential, commercial and industrial sectors, as well as emissions associated with transportation and waste disposal. Emissions were estimated for the 1999 baseline year and projected under a business-as-usual scenario for 2020. In 1999, New Haven's greenhouse gas emissions equaled roughly 1,871,665 tons eCO<sub>2</sub> (CO<sub>2</sub> equivalent, as measured by the global warming potential of CO<sub>2</sub>). The 2020 forecast estimates emissions will increase to approximately 2,129,588 tons eCO<sub>2</sub>, an increase of nearly 14%.

**Figure 1. Community GHG Emissions in New Haven, CT**

Year	Population	Total eCO <sub>2</sub> (tons)	Energy Use (MMBTU's)	Per Capita Emissions
1999	123,626	1,870,696	22,072,406	15.1 tons / person
2020 (projected) <sup>6</sup>	136,730	2,128,597	24,887,349	15.6 tons / person

The 1999 per capita emissions rate of 15.1 tons/person is above the state's rate of 12.87 per person. This is predictable because of the concentration of commercial activity and transportation thoroughfares in New Haven.

In 1999, the transportation sector was responsible for the largest share of New Haven's emissions (36%), followed by the residential (26%) and commercial (22%) sectors. Accordingly, gasoline combustion was the largest single source of GHG emissions (26%), followed by natural gas (22%) and electricity (21%).

**Figure 2. GHG Emissions by Sector**

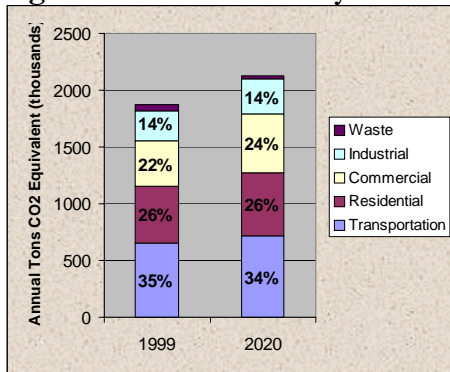
1999	Transportation	Residential	Commercial	Industrial	Waste
Emissions (tons)	655,681	494,923	406,718	258,719	54,271

**Figure 3. GHG Emissions by Source**

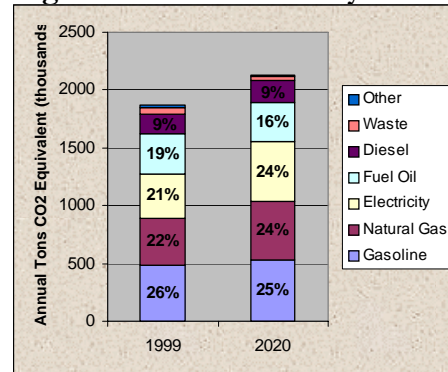
1999	Gasoline	Nat. Gas	Electricity	Fuel Oil	Diesel	Waste	Other
Emissions (tons)	484,577	404,298	384,915	351,846	162,061	54,656	28,343



**Figure 4: GHG Trends by Sector**



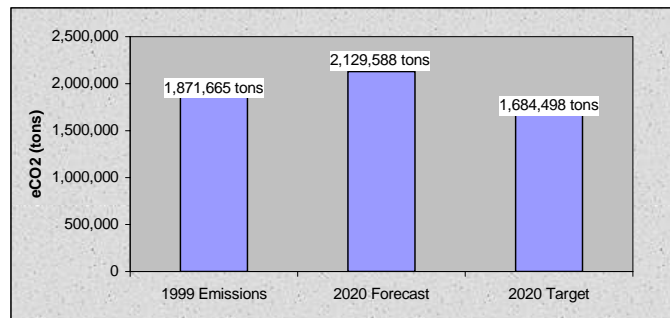
**Figure 5: GHG Trends by Source**



### 2.1.1. Community Greenhouse Gas Reduction Target

It is the recommendation of this report that the City of New Haven should commit to reducing greenhouse gas emissions by 20% below 1999 levels by 2020. By 2020, this percentage reduction would represent a GHG reduction of 632,040 tons per year, or 30%, compared to projected emissions.

**Figure 6. Community Emissions (Business-as-Usual Forecast vs. Target Achieved)**



## 2.2. Government Emissions

In the New Haven Greenhouse Gas Inventory, municipal government emissions are treated as a special subsection of community emissions. Government emissions are the result of operations directly under the purview of the City of New Haven, and are therefore subject to energy conservation efforts undertaken by the City’s Energy Management Program.<sup>7</sup> In 1999, emissions from municipal government buildings, streetlights, sewage treatment, and vehicle fleets totaled 82,151 tons eCO<sub>2</sub>. Government emissions were projected to 2010, assuming that no action would be taken to reduce emissions. Under this business-as-usual scenario, government emissions were projected to grow to 98,226 tons eCO<sub>2</sub>, an increase of nearly 20%.

**Figure 7. Government Emissions**

Government Sector	1999 Emissions (tons eCO <sub>2</sub> )	2010 Forecast (tons eCO <sub>2</sub> )
Buildings	31,175	43,718
Vehicle Fleet <sup>8</sup>	24,241	24,241
Streetlights	4,707	5,765
Water/Sewage	22,017	27,247
<b>Total</b>	<b>82,151</b>	<b>98,266</b>

The dramatic increase in projected government emissions over this time period is directly attributable to New Haven’s School Construction Program. All together, 43 schools will be constructed or “gut” renovated at a capital cost of \$1.1 billion. In a business-as-usual scenario, this program is anticipated to increase the energy consumption of the school system from approximately 253,208 MMBtus to 380,499 MMBtus.

### 2.2.1. Government Greenhouse Gas Reduction Target

Although government emissions represent just 4.4% of total community emissions, the Climate Action Plan places a special emphasis on existing and proposed measures to reduce government greenhouse gas emissions from government operations. Given predicted growth due to school construction, this report recommends that the City of New Haven should establish a government emissions reduction target of 20% below 1999 levels by 2010. This target would require the City to reduce emissions by 32,545 tons, or 40% below business-as-usual projections. By reducing government emissions, the City has an opportunity to lead by example, thus setting a model for other institutions and residents within the community. By publicizing energy conservation programs and attempting to quantify benefits in terms of GHG emissions reductions and cost savings, the City can provide an educational as well as leadership function.

### 2.3. Black Carbon Impacts

The impact of “black carbon” emissions on the global environment is one of the emerging issues of climate science. Black carbon, or elemental carbon, is released when diesel fuel is combusted. Emission sources, therefore, are ubiquitous. While there is growing certainty about the adverse health effects of diesel emissions, its impact on the global climate is the subject of evolving research. Several studies have shown that black carbon has a powerful heat-trapping effect. It is distinguished from traditional greenhouse gases by the fact that it does not accumulate in the atmosphere. It is a short-lived aerosol rather than a long-lived gas. But because emissions are continuous, its short life in the atmosphere does not diminish its importance as a climate-forcing agent. Some scientists have suggested that black carbon’s potency may be roughly equivalent to that of methane, the second most important greenhouse gas. It is likely that the International Panel on Climate Change (IPCC) will be addressing black carbon in the next assessment (2007) and will develop recommended methodology for assessing its impacts in inventories.

In the meantime, the City of New Haven has elected to treat black carbon in the same way it was treated in the Connecticut Climate Change Stakeholders Dialogue. Its impacts have been estimated in terms of CO<sub>2</sub> equivalent, using a methodology developed by Environment Northeast. The methodology is based on Mark Jacobson’s work, “Control of fossil-fuel

particulate black carbon and organic matter, possibly the most effective method of slowing global warming,” published in the Journal of Geophysical Research (2002).<sup>9</sup> Jacobson is one of the premier scientists working in this area and is widely cited as an authority.

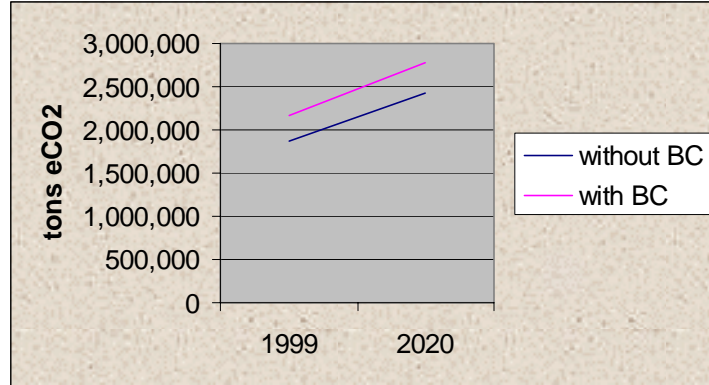
### 2.3.1. Black Carbon in the Community Inventory

Because the science and assessment protocols are still new and relatively untested, black carbon eCO<sub>2</sub> equivalencies are not included in the main part of the community GHG inventory and action plan. However, because New Haven believes that black carbon will prove to be an important component of the overall climate change picture, and because of the overwhelming evidence of health impacts of diesel exhaust, the City does plan to aggressively pursue reductions of this pollutant. Black carbon is therefore addressed in this document, albeit in a separate category than traditional greenhouse gases. Note: although black carbon is emitted from non-transportation sources such as residential, commercial, and industrial boilers, emission factors from these sources are still the subject of study. Only transportation-related emissions have been quantified in this report.

**Figure 8. Impacts of Black Carbon on Community Emissions**

	BC (eCO <sub>2</sub> tons)	Community Emissions including BC (eCO <sub>2</sub> tons)	BC as % of Community Emissions including BC
1999	289,064	2,160,729	13%
2020	342,033	2,471,621	14%

**Figure 9. Projected Community Emissions, With and Without Black Carbon**



### 2.3.2. Black Carbon in the Government Inventory

New Haven has elected to treat black carbon emissions differently in the government sector. Black carbon has been included in the government inventory and addressed in government reduction strategies for several reasons. First, the New Haven Community Clean Air Initiative’s Air Toxics Inventory identified diesel exhaust, the main source of black carbon, as the number one cause of health risk from air toxics in New Haven. In response, the City developed a strategic plan to reduce local diesel emissions, the “New Haven Diesel Reduction Strategy.” The City has hosted stakeholders meetings to discuss implementation of the strategy and continues to play a major role in statewide policy discussions.

To build New Haven's credibility as a leader on this issue, emissions from the municipal fleet the first targets of this strategy. By broadening the objectives of this strategy to include climate protection as well as public health protection, New Haven's experience can play an important role in helping to define impacts and solutions. By closely documenting the black carbon issue in the Government Inventory and Action Plan, the City can contribute to the overall body of knowledge about this issue and serve as a case study for other municipalities.

Quantification of black carbon impacts on the Government Inventory is addressed in section 4.1 of this report.

## 3. The Climate Action Plan

New Haven's Climate Action Plan identifies the set of recommended actions that will guide New Haven toward the goal of reducing community greenhouse gas emissions by 10% below 1999 levels by 2020.

The measures in the Plan are grouped according to the following categories:

- **Government Transportation and Community Transportation** – The transportation sector includes emissions from transportation-related fuel combustion that takes place within New Haven. It does not account for emissions generated outside of New Haven, even if they are the result of economic activity in New Haven or the actions of New Haven residents.
- **Government Energy and Community Energy** – The energy category includes emissions from the combustion of heating and industrial fuels, as well as emissions associated with electricity consumed on-site in New Haven. It does not include the upstream emissions associated with generating electricity (source consumption), nor does it take into account emissions associated with the distribution of heating fuel.
- **Government Waste and Community Waste** – The waste category addresses emissions associated with the disposal and/or incineration of waste.
- **Other Measures** – In general, this category includes activities that sequester carbon and therefore offset emissions, such as forestry or community gardens. Recommendations for partnerships are also included here.

### 3.1. What's in a Measure?

- A description of the measure
- Measure status – existing, pending or proposed
- Community partners
- Estimated annual eCO<sub>2</sub> savings
- Financial costs and savings
- Air quality and other benefits

STAPPA/ALAPCO and ICLEP's Clean Air and Climate Protection Software<sup>®</sup> Version 1.0 was used to perform emission reduction calculations. This software generates emission and emission-reduction estimates by multiplying user-provided energy consumption data with best available emission factors.

**Figure 8. Summary of New Haven Government Climate Action Plan Measures**

Category	Measure	Status	Estimated 2010 CO2 Reductions (tons)	Page of Climate Action Plan
<b>Government Transportation</b>	<a href="#">Hybrid Electric Vehicles for Administrative Fleet</a>	Pending	382	18
	<a href="#">Emissions Reductions for Police Fleet</a>	Proposed	396	18
	<a href="#">Ultra Low Sulfur Diesel Fuel</a>	Existing	1296	19
	<a href="#">Diesel Emissions Control Retrofits</a>	Pending	8423	20
	<a href="#">Alternative Commute Incentives for City Employees</a>	Proposed	Not quantified	21
<b>Government Energy</b>	<a href="#">Honeywell Performance Contract</a>	Existing	1,153	30
	<a href="#">Parking Authority Lighting Improvements</a>	Existing	588	30
	<a href="#">Nxegen Performance Contract, Years 1-2</a>	Existing	4,564	31
	<a href="#">Streetlight Upgrade</a>	Pending	784	32
	<a href="#">High Performance Schools</a>	Pending	6,881	32
	<a href="#">LED Traffic Lights</a>	Existing	555	33
	<a href="#">Procurement Policy</a>	Proposed	987	34
	<a href="#">Renewable Energy Purchase &amp; Development</a>	Pending	5,914	35
Total Reductions (tons eCO2)			31,923	
Total 2010 Emissions (net reductions)			66,343	
<i>% above/below 1999 emissions (82,151 tons)</i>			<i>19.2%</i>	
2010 Goal (20% below 1999 emissions)			65,721	
<i>Additional Reductions needed to meet 20% reduction goal (tons)</i>			<i>622</i>	

**Figure 9. Summary of New Haven Community Climate Action Plan Measures**

Category	Measure	Status	Estimated 2020 CO2 Reductions (tons)	Page of Climate Action Plan
<b>Community Transportation</b>	<a href="#">California Low Emission Vehicle Standards</a>	Existing	11,653	23
	<a href="#">Smart Growth Planning</a>	Existing	Not quantified	24
	<a href="#">Double Transit Ridership</a>	Proposed	14,619	25
	<a href="#">Enhanced Pedestrian and Bicycle Access</a>	Existing	1,037	26
	<a href="#">Diesel Emissions Reductions</a>	Proposed	*256,525	27
<b>Community Energy</b>	<a href="#">Building Standards for New Construction and Renovation</a>	Proposed	35,405	38
	<a href="#">Energy Conservation for Existing Buildings</a>	Proposed	33,745	40
	<a href="#">Renewable Energy – 20% by 2010 Implementation</a>	Proposed	147,007	41
Total Tons eCO2 Savings			243,466	
Total 2020 emissions (net reductions)			1,885,131	
<i>% above/ below 1999 emissions (1,870,696 tons)</i>			<i>(0.7%)</i>	
2020 Goal (20% below 1999 emissions)			1,496,557	
<i>Additional Reductions needed to meet 20% reduction goal (tons)</i>			<i>388,574</i>	

\*Because the CO2 equivalent of the black carbon in diesel exhaust was not included in the community emissions baseline, these reductions do not count toward the reduction target.

## 4. Transportation Sector

Greenhouse gas emissions from on-road cars and trucks are projected to increase by approximately 10% by 2020. Curbing these emissions will require a) reducing the emissions rate per vehicle mile traveled and b) reducing vehicle miles traveled.

### Government Transportation Measures

- [Hybrid Electric Vehicles for the City Fleet](#)
- [Emission Reductions for the Police Fleet](#)
- [Ultra Low Sulfur Diesel Fuel](#)
- [Diesel Emission Control Retrofits](#)
- [Alternative Commute Incentives for City Employees](#)

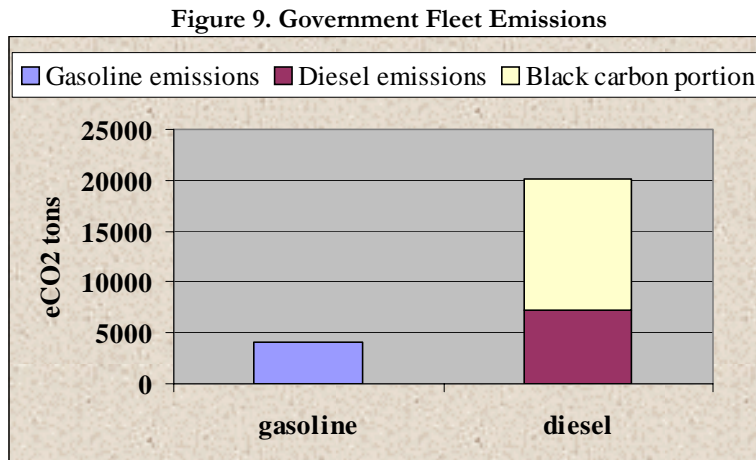
### Community Transportation Measures

- [California Low Emission Vehicles Standards](#)
- [Smart Growth Planning](#)
- [Double Transit Ridership](#)
- [Greenways and Bicycle Lanes](#)
- [Diesel Emissions Reductions](#)



## 4.1. Government Transportation Measures

In 1999, greenhouse gas emissions from New Haven’s municipal vehicle fleet totaled 24,251 tons eCO<sub>2</sub>. As discussed in Section 2.3.2., this figure includes the CO<sub>2</sub> equivalency for black carbon emissions from the City’s diesel vehicles. Black carbon emissions from New Haven’s diesel vehicles and CO<sub>2</sub> equivalency were calculated according to methods developed by Environment Northeast, based on Jacobson (2002)<sup>10</sup>, and used in the Connecticut Climate Change Stakeholder Recommendations (See [Appendix A – Black Carbon Memo](#)).



New Haven’s aggressive goal of reducing greenhouse gas emissions from municipal vehicles by 50% below 1999 levels by 2010 is reflective of the City’s comprehensive air quality goals. Although transportation-related emissions represent only 20% of the 2010 government greenhouse gas emissions profile, this is an area in which the co-benefits compel aggressive action.

New Haven is in non-compliance with federal air quality standards for both ozone and fine particulate matter. On-road vehicles are responsible for a large percentage of ozone-producing emissions and approximately 40% of air toxic emissions. High PM levels are attributed largely to diesel exhaust from local and through trucks and buses. For these reasons, the City of New Haven is committed to being a leader in the effort to reduce vehicle emissions, beginning with municipal vehicles.

#### 4.1.1. Hybrid Vehicles for the Administrative Fleet

Status: Existing

Responsible Department: Mayor's Office, Chief Administrative Officer, Facilities

Community Partners: Greater New Haven Clean Cities Coalition

eCO<sub>2</sub> Reductions in 2010: 382 tons

Description: In May 2004, New Haven's Mayor DeStefano replaced his Lincoln Navigator with a Toyota Prius, the City's first hybrid electric vehicle. The 2004 Prius carries a combined city/highway EPA fuel economy rating of 55 MPG, compared with the Navigator's 14 MPG. The Mayor's upgrade is a visible step in the fleet-wide conversion to low-emission passenger vehicles that began in 2003, when the City purchased four electric pick-up trucks and opened a CNG fueling station at the Department of Public Works garage. As old gasoline-powered passenger cars are retired through normal use, they will be replaced with hybrid-electric vehicles or CNG models. The carpool vehicles will be the first fleet targeted for replacement, but by 2010, the City anticipates achieving a full replacement of the administrative fleet (40 vehicles). The Police Department and Chief Administrative Officer are currently reviewing options for the replacement of police cruisers and other emergency vehicles.

Costs: At this time, the increment of additional cost of hybrid-electric vehicles versus gasoline vehicles is approximately \$2,000.

- Total Project Cost = \$2,000 \* 40 vehicles = \$80,000

Because the incremental costs of hybrid vehicles are expected to decrease over time as production increases and technology improves, the actual project cost may be less than \$80,000. New Haven may be able to secure funding through Connecticut's Alternative Fuel Vehicle (AFV) Demonstration Project, information at <http://www.2plus.com/altFuel.asp>.

Savings: When implemented, this measure will significantly improve fuel economy for the New Haven administrative fleet.

- Annual gasoline savings = \$46,178

Co-benefits: The Toyota Prius is considered a Super-Ultra Low Emissions Vehicle (SULEV) by the California Air Resources Board. This means it is approximately 90% cleaner than other new cars. Fleetwide, this measure would result in the following criteria pollutant benefits:

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM10
7,267 lbs	191 lbs	61,615 lbs	9022 lbs	39 lbs

#### 4.1.2. Emissions Reductions for Police Fleet

Status: New

Responsible Department: Chief Administrative Officer, Police

Community Partners: Greater New Haven Clean Cities Coalition, Neighborhood Management Teams

eCO<sub>2</sub> Reductions in 2010: 396 tons

Description: This measure recommends that by 2010, the City of New Haven Police Department should reduce emissions from its fleet by 15%. The City could implement this measure by replacing conventional cruisers with alternative fueled vehicles. Alternatively, the City could retire cruisers, substituting additional bicycle, motorcycle or mounted patrols.

Costs: Financial implications will depend on the implementation scenario. Increasing the number of bicycle, motorcycle or mounted patrols will tend to reduce capital costs and the cost of fuel. Currently, alternative fueled vehicles are incrementally more expensive than traditional cruisers. Over time, however, the increment of additional cost is expected to drop.

Savings: Since AFV's are more fuel efficient, the City would reduce fuel expenditures through this measure. Reducing gasoline consumption by 15% would save approximately \$47,173 per year.

Co-benefits: Again, co-benefits will vary according to the implementation scenario. If the 15% reduction in eCO<sub>2</sub> is implemented through a retirement of police cruisers or replacement by AFV's, this measure would yield the following co-benefits:

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM10
2,041 lbs	115 lbs	25,166 lbs	2,459 lbs	54 lbs

#### 4.1.3. Ultra Low Sulfur Diesel Fuel

Status: Existing

Responsible Department: Purchasing, Board of Education, Public Works

Community Partners: Environment Northeast, EPA, DEP

eCO<sub>2</sub> Savings in 2010: 1296 tons

Description: The City of New Haven began using ultra low sulfur diesel fuel in all diesel vehicles in the City fleet beginning in September 2002 (total annual usage = 660,000 gallons). The primary motivation for this switch was health-related. Diesel particulate matter contains more than 40 hazardous air pollutants and can aggravate respiratory and coronary ailments in children and adults. But because black carbon from diesel exhaust is a powerful greenhouse aerosol, the climate protection benefits of this measure are significant. On average, ultra low sulfur diesel fuel reduces particulate matter (a component of which is black carbon) by approximately 10%.

Costs: From 2002-2006, the increment of additional cost of ultra-low sulfur diesel versus regular diesel is estimated to be approximately \$0.12/gallon. Beginning in 2006, federal regulations require the use of ultra low sulfur diesel – regular diesel will no longer be available for on-road uses. This annual cost is therefore only applicable to 2002-2006.

- Annual Cost = (\$0.12/gallon \* 620,000 gallons/year) = \$74,400

Savings: Although there are no direct cost savings associated with this measure, the City has been able to obtain reimbursement from the federal government for the increment of additional cost (\$75,000).

Co-Benefits: Switching from regular diesel to ULSD reduces criteria pollutant emissions, particularly SO<sub>2</sub> and PM<sub>10</sub>. Hazardous air pollutants are also reduced commensurate with PM reductions.

#### 4.1.4. Diesel Emission Control Retrofits

Status: Existing

Responsible Department: Board of Education, Public Works

Community Partners: Environment Northeast, EPA, DEP

eCO<sub>2</sub> Savings in 2010: 8,423 tons

Description: During the summer of 2004, the City's school bus fleet will be retrofit with emissions control devices. By 2010, the City intends to retrofit or replace the Public Works and Parks fleet as well. Because the black carbon component of diesel exhaust is a powerful greenhouse aerosol, reductions in diesel exhaust due to engine retrofits will have climate protection benefits. The goal of this measure will be to reduce black carbon emissions by 75% below 1999 levels. This level is possible with today's emission control technology.

Costs: So far, the City has been successful at attracting external funding for emissions control retrofits. The Connecticut Department of Environmental Protection is funding the purchase and installation of emissions control devices on all (182) of the City's full-size school buses. The Department of Public Works is seeking funding from the U.S. Environmental Protection Agency to retrofit the garbage and recycling trucks. We anticipate that external funding will continue to be available, particularly now that New Haven has been designated non-attainment for PM<sub>2.5</sub>, a component of diesel exhaust. The Connecticut Diesel Work Group, of which New Haven is a member, is working to establish financial incentives for voluntary diesel equipment retrofits statewide, particularly in overburdened areas like New Haven.

Savings: There are no cost savings associated with this measure.

Co-Benefits: Like the ULSD purchase, this initiative is primarily intended to protect resident's health from the negative effects of diesel exhaust. Reductions in criteria pollutants, most significantly PM<sub>10</sub> are expected to be significant.

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM <sub>10</sub>
NA	2,339 lbs	45,213 lbs	5,913 lbs	925 lbs

Air Toxic emissions will decrease commensurate to PM<sub>10</sub> emissions.

#### 4.1.5. Alternative Commute Incentives for City Employees

Status: Proposed

Responsible Department: Chief Administrative Officer, Mayor's Office, Board of Aldermen

Community Partners: EPA, Rideworks

eCO<sub>2</sub> Savings in 2010: not quantified

The City of New Haven could reduce emissions, congestion and costs for employees by organizing an alternative commute program. As a first recommendation, the City should consult with Rideworks to identify commuting and incentive opportunities to meet the needs of New Haven employees. Some of these opportunities that could be implemented include:

- Organizing and/or educating employees about carpools or vanpools serving downtown New Haven,
- Joining DeduCT-A-Ride, a ConnDOT program that allows commuters to set aside pre-tax commuting expenses,
- Providing a parking cash-out program for those employees who receive free or subsidized parking, whereby an equivalent subsidy could be applied to transit or bicycle expenses.
- Publicizing Rideworks "Guaranteed Ride Home" Program. This provides free rides home to employees who usually use mass transit or vanpools/carpools, in the event that they need a ride at an off-time.
- Establishing a City-owned bicycle-pool for employees to use for travel to nearby meetings or events.
- Providing additional secure bicycle racks near municipal buildings.
- Partnering with the Greater New Haven Chamber of Commerce to create an incentive program to encourage non-motorized transportation, i.e. coupons usable at downtown shops and restaurants.
- Continuing to improve the network of bicycle paths and on-road bike lanes throughout the City.

The new Board of Aldermen commission on improving public and pedestrian forms of transportation is an ideal forum for discussing alternative commuting programs for City employees and residents at large.

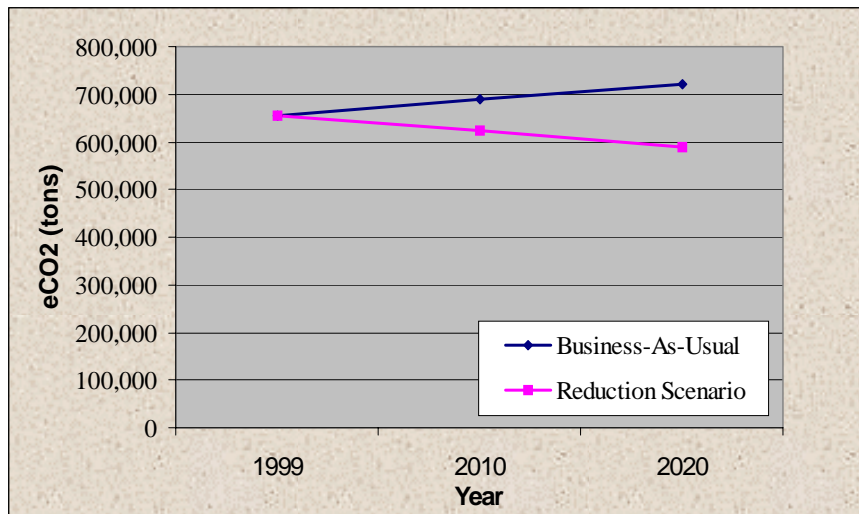
## 4.2. Community Transportation Measures

In 1999, community greenhouse gas emissions from the transportation sector totaled 655,681 tons eCO<sub>2</sub>. Transportation-related emissions are the largest component of New Haven's overall greenhouse gas profile, representing approximately 35%. This estimate is based on vehicle miles traveled (VMT) data and includes only emissions from on-road vehicles.

The City elected to exclude black carbon impacts from the community analysis in order to maintain methodological consistency with other Cities for Climate Protection cities. Accounting for black carbon would add 289,064 tons of eCO<sub>2</sub> to the inventory, increasing estimated emissions by 44%. Although recommendations to reduce these emissions have been included, impacts have not been quantified.

By 2020, the community forecast year, transportation emissions are expected to increase by approximately 10% to 721,516 tons. This increase is due to a predicted 20% increase in VMT moderated by increasingly stringent federal emission standards. New Haven's goal of reducing emissions by 10% below 1999 levels by 2020 will be met only with aggressive action aimed at 1) reducing VMT in New Haven and 2) shifting VMT to lower-emission vehicles.

**Figure 10. Business-As-Usual Versus Reduction Scenario**



#### 4.2.1. California Low Emission Vehicle II Standards

Status: Existing

Responsible Department: Mayor’s Office, City Plan Department

Community Partners: Connecticut Fund for the Environment

eCO<sub>2</sub> Savings in 2020: 11,653 tons

Description: The City of New Haven was a member of the Connecticut Clean Cars Alliance, a coalition of environmental and citizens’ organizations that successfully advocated for the adoption of the California Low Emission Vehicle (CAL LEV II) standards in Connecticut. California’s emission standards are more stringent than those required by the national program. By 2025, a minimum compliance scenario will result in an estimated 2.2% in additional greenhouse gas reductions, compared to the federal program.<sup>11</sup> The standards apply to new gasoline-powered passenger vehicles only, starting with the 2007 model year.

Costs: Since Connecticut is the fourth state in the region to adopt the CAL LEV II standards (after New York, Massachusetts and Vermont), the move is not expected to unduly burden automakers. Although pollution controls add an estimated \$100 to the cost of manufacturing a car, a survey of neighboring states found that retail car prices have not increased as a result of the standards. However, by 2020, 16% of cars sold in Connecticut will have to be Zero Emission Vehicles (ZEVs). During the early years of implementation, a consumer cost premium is expected for ZEV vehicles, including hybrids, electric and fuel cell vehicles.

Savings: Although emission standards applied to conventional internal combustion engines do not improve fuel economy, ZEV requirements ensure that consumers will save money on fuel expenses.

Co-Benefits: The CAL LEV II standards reduce criteria and air toxic pollutants that threaten public health and the environment. Connecticut Fund for the Environment calculated the following emission reduction percentages from CAL LEV II standards, compared with the federal Tier 2 program. Savings are estimated for 2025.

**Figure 11. Percent Reductions CAL LEV II beyond Tier 2<sup>12</sup>**

	NOx	VOC	Acetaldehyde	1,3-Butadiene	Formaldehyde	Benzene
% Reductions	11.1%	21.1%	34%	33.9%	34.4%	32%
Reductions in New Haven (lbs)	34,567	92,786	455	591	1474	4339

Follow-up: The City of New Haven has taken an active role in encouraging low-emission vehicles in New Haven by granting free parking at downtown meters to hybrid cars. The City should take this initiative a step further and include other categories of low-emission vehicles such as electric, CNG or biodiesel-fueled vehicles.

## 4.2.2. Statewide Smart Growth Planning

Status: Existing

Responsible Department: Mayor's Office, City Plan Department

Community Partners: 1000 Friends of Connecticut, State of Connecticut

eCO<sub>2</sub> Savings in 2020: Not Quantified

In 2003, the City of New Haven participated in the State of Connecticut's Climate Change Stakeholders Dialogue. This yearlong process resulted in near-unanimous endorsement of 55 different recommendations by a group of 26 stakeholders from state agencies, non-profits, the business community and academia. The City of New Haven was the only municipality invited to participate as a stakeholder. As members of the transportation work group, City Plan staff developed a "straw man" smart growth policy document (see Supporting Document #2). In conjunction with the transit recommendations developed by the Connecticut Department of Transportation, this measure sought to reduce VMT by 3% below 2020 projected levels.

The goal of the Smart Growth proposal was to redirect 25% of projected growth (population and employment) from inappropriate to appropriate locations, as defined by the State's Plan of Conservation and Development (PCD). The 25% Smart Growth Scenario does not change the directional trajectory of growth for non-urban or urban areas. Rather, it tips the curves to bolster walkable, bikable communities with sufficient population and employment density to support transit enhancements. Many studies have demonstrated that by increasing transportation alternatives to the single-occupancy-vehicle and reducing trip lengths, smart growth reduces VMT.<sup>13</sup>

Statewide, the VMT reduction considered obtainable by 2020 through transit investment and smart growth translates into 490,000 tons of eCO<sub>2</sub> reduced annually. It is unclear what portion of this reduction may take place in New Haven. Because New Haven is one of Connecticut's Central Business Districts and has densely developed residential neighborhoods and public transportation networks, it is identified as a growth-appropriate area. Ideally, this additional growth will result in local VMT reductions as more people take advantage of enhanced public and non-motorized transportation opportunities. It is possible, however, that as statewide VMT slows through smart growth reform, local VMT would increase in response to local growth.

New Haven's proposal outlines some of the growth management policy options available to the State of Connecticut through use of the following tools:

- 1) *Planning Coordination*: Develop and coordinate planning capacity within state agencies, municipalities and RPOs;
- 2) *Financial Mechanisms*: Target growth using incentives & subsidies;
- 3) *Regulation*: Establish appropriate constraints on suburban sprawl.

The broad reach of this proposal reflects the complexity of the problem we seek to address. As demonstrated by historical trends, sprawl – if unconstrained by statute and regulation – will continue to outpace the climate change effort. The implications extend far beyond



land use and energy consumption, ultimately impacting the quality of Connecticut's schools, job opportunity, economic growth and environmental quality.

### 4.2.3. Double Transit Ridership

Status: Proposed

Responsible Department: City Plan Department, Mayor's Office, Traffic & Parking

Community Partners: Transportation Strategy Board

eCO<sub>2</sub> Savings in 2020: 14,619 tons

Doubling statewide transit ridership by 2020 was included in the State's Climate Change Plan as a complementary element to the smart growth proposal. The State Department of Transportation considered this to be an ambitious but attainable goal. New Haven should strive to achieve this goal on the local level as well by enhancing transit opportunities for New Haven residents and commuters. The following proposed transit enhancements are recommended:

1. **New Haven – Hartford – Springfield Commuter Rail.** The preferred route would serve stations in New Haven (both Union and State Street), Wallingford, Meriden, Berlin, Hartford (Union Station), Windsor, Windsor Locks (with bus connection to Bradley International Airport) and Springfield. Implementing this route is a near-term priority of the State's Transportation Strategy Board.
  - Estimated annual potential VMT Reductions = 6,560,000
2. **Double Bus Ridership.** Connecticut Transit's New Haven Division encompasses New Haven and all or part of the 19 surrounding towns. Ridership within New Haven proper is estimated to be 120,000 passengers per week (roughly 2/3 of total division ridership). The City should work with the Connecticut Transit to implement feasible service extensions and enhancements with the goal of doubling ridership by 2020. Proposed enhancements include introducing a Cross Town West route connecting City Point, through the western neighborhoods to Hamden, significantly increasing headways on existing routes and improving intermodal connections.
  - Estimated annual potential VMT Reduction = 12,480,000
3. **Double Train Ridership.** New Haven is currently served by Shoreline East, Metro North and Amtrak passenger trains. Altogether, the annual number of trips estimated to originate or end at the New Haven train station is 502,260 (Amtrak) + 2,130,000 (MetroNorth) + 383,000 (Shoreline East) = 3,015,260. Doubling this ridership will require significant investment in infrastructure in trains and station facilities.
  - Estimated annual potential VMT Reduction = 6,030,520

Costs: Statewide, ConnDOT estimates that the transit enhancements required to double ridership by would cost almost \$1.8 billion. It was not possible to determine what portion of this statewide cost would go to New Haven enhancements.

Savings: Statewide, it was estimated that transit enhancements + smart growth would save approximately \$1.05 billion before 2020. Savings include avoided costs for road expenditures, healthcare costs, transportation expenditures, and development costs.

Co-Benefits: Decreased congestion is one major co-benefit of increasing transit ridership in New Haven. Decreasing congestion will improve the economic development climate in New Haven, reduce air pollution, and improve quality of life for commuters.

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM10
54,080 lbs	3,864 lbs	860,919 lbs	80,759 lbs	1,251 lbs

#### 4.2.4. Enhanced Pedestrian and Bicycle Access

Status: Existing

Responsible Department: City Plan Department, Traffic and Parking Department

Community Partners: Go-Alition, Share-the-Streets Advisory Committee.

eCO<sub>2</sub> Savings in 2020: 1,037 tons

Description: In the 2000 census, nearly 16% of New Haveners reported walking or biking to work. This is a higher percentage than other similar cities in New England, including Boston, which bills itself as “America’s Walking City.” In order to better serve this existing population and to encourage others to walk or bike, the City Plan Department developed the “Plan for Greenways and Cycling Systems” (see Supporting Document #2). The plan proposes enhancements to a system of Greenways that would link first and foremost the City’s park system but also would enhance access between residences, schools and colleges, job sites, retail stores, cultural attractions, and City landmarks. Wherever possible, segments should be developed off-road, separate from auto traffic, with the safety of pedestrians and bicyclists the priority. In other areas, a share-the-streets system will be used to enhance access to destinations, to link greenway segments and to improve overall non motorized mobility.

Specifically, by 2020, the City of New Haven will have a comprehensive network of bike trails and on-road lanes, consisting of nine interconnected segments. The Farmington Canal Line, the Fair Haven Greenway, the Harborside Trail, and the West River Greenway are multi-use paths that connect New Haven’s neighborhoods with parks, the waterfront, and one another. The Orange Street Bike Lane, and the proposed Westville-Dixwell-Downtown, Fair Haven, Hill-Hospital and Train Station Lanes are on-road bike facilities that will interconnect the Greenways system with neighborhoods, worksites, and commercial destinations. Sineage, additional bicycle parking and a bicycle safety campaign will improve the network’s visibility and encourage new users.

Costs: Total costs for on-street bike lanes (including labor and accessories) are expected to run approximately \$7,500/mile. Off-street multi-use trails are more expensive, from \$40,000 to \$125,000 per mile. Approximately 44% of the proposed trail network already exists. The City should seek funding from Federal, State and private sources to complete the remaining segments.

Savings: See “Making the Economic Case for Greenways in New Haven,” by Lisa Fernandez, <http://www.cityofnewhaven.com/govt/greenways/Review.htm>. This report

discusses the ways in which greenways can bring quantifiable financial benefits to a host community, by increasing property values, improving human and environmental health, stimulating commerce, attracting corporations and improving quality of life.

Co-benefits: In addition to the benefits articulated in Fernandez’s report, greenways produce ancillary benefits in areas of congestion mitigation and safety improvements. By providing safe opportunities for walking and biking, greenways encourage physical activity. Finally, the criteria pollutant reductions resulting from expected VMT reductions are listed below:

NOx	SOx	CO	VOC	PM10
3,836 lbs	274 lbs	61,075 lbs	5,729 lbs	89 lbs

#### 4.2.5. Diesel Emissions Reductions

Status: Proposed

Responsible Department: City Plan Department, Health Department

Community Partners: Environment Northeast, CT DEP, EPA Region 1

eCO<sub>2</sub> Savings in 2020: 256,525 tons (reduction does not count toward reduction target)

Because black carbon forcing from diesel exhaust was not included in the baseline 2020 projection, reductions from this measure can not count toward the reduction target. This measure assumes that by 2020, New Haven could achieve a reduction in diesel exhaust on the order of 75%. In the next 5 years, new on-road and non-road diesel engines will be required to meet strict federal emission standards. But because diesel engines often last for decades, old and dirty engines are likely to remain in use for years to come. New Haven’s Diesel Reduction Strategy and the State’s Diesel Work Group are avenues through which the City can work to encourage the retrofit and retirement of old diesel fleets.

Costs: The technology required to implement this measure is currently available and inexpensive. It costs approximately \$7,000 to retrofit a diesel engine with a diesel particulate filter, an emission control device that reduces particulate matter and other emissions by >90%.

Savings: The EPA’s cost/benefit analysis of the new emission standards for diesel engines shows that health savings are expected to outweigh costs by 40:1.

Co-benefits: This measure is essentially driven by the reduction in air pollutants that threaten human health. Since diesel exhaust is considered a probable human carcinogen and a known risk factor for respiratory illnesses like asthma, a dramatic reduction in diesel exhaust would yield dramatic health benefits to New Haven residents, particularly sensitive populations.

NOx	SOx	CO	VOC	PM10
n/a	n/a	980,840 lbs	156,317 lbs	351,369 lbs

## 5. Energy Sector

Greenhouse gas emissions from energy consumption in New Haven – including electricity and heating fuels – are expected to increase by nearly 19% by 2020. The increase amounts to an additional 214,851 tons of eCO<sub>2</sub> emissions. Curbing these emissions will require not only significant gains in energy efficiency but also real progress in the transition to renewable energy.

### **Government Energy Measures**

- [Honeywell Performance Contract](#)
- [Parking Authority Lighting Improvements](#)
- [Nxegen Performance Contract Years 1-2](#)
- **Nxegen Performance Contract Years 3-10**
- [Streetlight Upgrades](#)
- [High Performance Schools](#)
- [LED Traffic Lights](#)
- [Procurement Policy](#)
- [Renewable Energy Purchase](#)

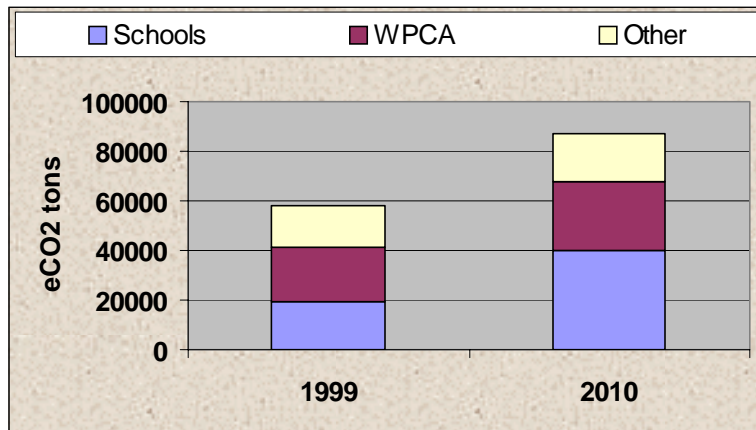
### **Community Energy Measures**

- [Comprehensive Plan Implementation](#)
- [Building Standards for New Construction and Renovation](#)
- [Energy Conservation for Existing Buildings](#)
- [Renewable Energy – 20% by 2010](#)

## 5.1. Government Energy Measures

In 1999, energy consumption (electricity and natural gas) for government operations was responsible for the release of 57,900 tons of eCO<sub>2</sub>. The largest components of this release were the Water Pollution Control Authority (22,017 tons) and the public schools (19,512 tons). Together, these entities are responsible for more than half of total government emissions. By 2010, government emissions due to energy consumption are expected to increase by 51% to 87,223 tons. The primary driver for this growth is the City's school construction project, scheduled to rebuild all of the City's schools by 2010.

Figure 12. Government Energy Sector Emissions – Business-as-Usual Projection



New Haven is seeking to moderate this growth through aggressive energy conservation programs complimented by staged implementation of the planned transition to renewable energy. The City has made significant progress on both fronts in the last decade. Early in 1994, the DeStefano Administration reviewed all aspects of City management and finance. The administration recognized that a plan was needed to resolve problems related to the rising use and cost of energy in public facilities throughout the city. The annual cost of energy for all city departments and authorities was about \$14,000,000 in 1994. These were spread over 700 electric and 300 gas accounts in over 300 facilities and the street lighting system. Mayor DeStefano directed the City's Budget Director to prepare and implement a comprehensive plan to understand and control the cost and use of energy. The resulting "Energy Management Program" consisted of a group of strategic objectives and capital investments aimed at reducing energy consumption and cost. Many of the initiatives described in this section fall under the umbrella of this program. See Supporting Document #3 for the Energy Management Program's FY2003/2004 report.

As of the close of FY2003, the cost of energy consumed by the City and all its agencies was approximately \$15,348,484/year, thus it has stayed relatively level since 1994 despite the addition of eleven new schools and other facilities. If this program had not been put in place the City's current energy cost would be \$3,300,000/year higher. The goal of this plan is to further offset increased consumption and cost by an additional \$6,159,325/year by 2010, which roughly translates to xx,xxx tons eCO<sub>2</sub>. The initiatives listed below outline an implementation plan for achieving the reduction target.

### 5.1.1. Honeywell Performance Contract

Status: Existing

Responsible Department: Energy Committee, Board of Education

Community Partners: Honeywell, United Illuminating

eCO<sub>2</sub> Savings in 2010: 1,153 tons

Description: This program began in 1997. Annual savings grew from \$383,000 in the first year to \$1,354,349 in FY2004. Cumulative cost savings over the nine year program are projected to total \$9 million. Since this measure was implemented before the inventory baseline year, only the savings made after FY1999 have been quantified here.

Costs: Estimated capital costs of the improvements described above amount to \$6.1 million. The City has received approximately \$250,000 in utility rebates and incentives for energy reduction improvements.

Savings: As of the end of FY2003, these improvements have paid for themselves, having saved the City approximately \$6,951,749 in energy and maintenance costs. A total of \$8,842,522 in savings is guaranteed over the nine-year program.

Co-benefits: The following annual reductions in criteria air pollutants are expected to result from this program.

NOx	SOx	CO	VOC	PM10
2,181 lbs	2,452 lbs	3,264 lbs	379	2,285

### 5.1.2. Parking Authority Lighting Improvements

Status: Existing

Responsible Department: Energy Committee, Parking Authority

Community Partners: United Illuminating

eCO<sub>2</sub> Savings in 2010: 588 tons

Description: Lighting improvements in the Crown Street Parking Garage, the Temple Street Garage and the State/Elm Tunnel began in 2001 and have saved \$357 thousand in energy and maintenance savings so far. Approximately 50% of the capital costs of these improvements have been offset by utility rebates, significantly decreasing their payback period.

Costs: Approximately \$2,303,100 was spent in capital costs for these upgrades. The City secured approximately \$230,000 in rebates to off-set these costs.

Savings: By the end of FY2003, the City had saved about \$357,000 in energy and maintenance costs. Annual energy and maintenance savings will amount to an estimated \$178,000.

Co-benefits: The following annual reductions in criteria air pollutants are expected to result from this program.

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM <sub>10</sub>
973 lbs	1,587 lbs	2,019 lbs	223 lbs	1,482 lbs

### 5.1.3. Nxegen Performance Contract, Years 1-2

Status: Existing

Responsible Department: Energy Committee

Community Partners: Nxegen, United Illuminating

eCO<sub>2</sub> Savings in 2010: 4,564 tons

Description: Beginning in 2002, the City contracted with Nxegen to perform a detailed audit of energy use and costs, and identify opportunities for reductions. In FY2003/2004, Nxegen installed real time and demand monitoring of electrical power consumption, as well as dimmable lighting, vending machine controls and demand management in 61 facilities throughout the City. In FY2003/2005, real time energy monitoring and controls will be expanded to 92 facilities (responsible for 80% of the City's total electricity demand) and boiler efficiency controls will be installed.

Costs: The improvements made during Years 1-2 of the Nxegen performance contract cost approximately \$5,830,000. The City received \$138,000 in utility rebates to offset the capital cost. In addition, the City has obtained \$2,531,00 in State and Federal grants for the purposes of developing a central energy management system.

Savings: Annual energy and maintenance savings are expected to amount to approximately \$1,448,000.

Co-benefits: The following annual reductions in criteria air pollutants are expected to result from this program.

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM <sub>10</sub>
7,558 lbs	12,322 lbs	15,682 lbs	1,734 lbs	11,508 lbs

Comments: To some extent, the Nxegen Performance Contract has primarily focused on cost reduction. The centralized energy management system makes it possible to decrease demand during the most congested hours the day when electricity costs the most. The City and Nxegen should ensure that reductions in consumption, and therefore the environmental benefits of this program going forward are emphasized as much as cost savings. The data management system developed to track progress should include energy savings as well as cost savings. This system should be made available to City staff for use in environmental analyses.

#### 5.1.4. Streetlight Upgrade

Status: Existing

Responsible Department: Energy Committee, Engineering

Community Partners: Nxegen, United Illuminating

eCO<sub>2</sub> Savings in 2010: 784 tons

Description: In FY2004/2005, the City's streetlighting system will be overhauled. The lighting fixtures are being upgraded with new technology that reflects light down to the street while preventing outward glare. The new fixtures have made it possible to downsize all light bulbs. 400 watt bulbs have been downgraded to 310 watts, 250 to 200, 150 to 100 and 100 to 70.

Costs: Implementation costs are expected to reach \$1,500,000 by the time installation is complete.

Savings: The City expects to save approximately \$200,000 per year on energy costs and approximately \$112,000 per year on maintenance costs.

Co-benefits: This program supports the City's "Light the Night" security objectives by angling more light onto the streets at night. In addition, it will reduce the amount of light pollution cast by streetlights, improving the visibility of the stars. Reduced energy use will result in the following annual criteria pollutant reductions:

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM <sub>10</sub>
1,299 lbs	2,117 lbs	2,695 lbs	298 lbs	1,978 lbs

#### 5.1.5. High Performance Schools

Status: Existing

Responsible Department: Board of Education

Community Partners: Citywide School Building Committee

eCO<sub>2</sub> Savings in 2010: 6,881 tons

Description: The City of New Haven and the New Haven Public Schools System have embarked on a ten year program to renovate every school in the City as well as add additional new schools where the need has been identified. To date, in the Phase I of the program that began in 1996, the City has rebuilt and added nine schools and five more are under construction. In the Phase II, which began in early 2003, nine schools are currently under design and sixteen are in the planning process. At the end of the program, all 48 public schools in New Haven will have either been replaced or thoroughly "gut" renovated.

The New Haven Public School system has established energy efficiency as one of the most important goals of its far-reaching construction program. With this in mind, the Citywide School Building Committee developed a High Performance Schools Design guide establishing energy, materials and construction standards consistent with efficiency goals.



Phase II schools will be designed such that the annual total energy consumption for electric power and fossil fuels will earn a numerical score of 75 or above when measured against the US Environmental Protection Agency Energy Star Target Finder System measurement technique.

The guidelines reference the Leadership in Energy and Environmental Design (LEED™) Green Building Rating system, developed by the US Green Building Council<sup>14</sup>. The LEED™ rating system incorporates the following five general categories of environmental principles to earn credits toward certification: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality. At the time of this writing, New Haven Public Schools System has not advocated for the adoption of the LEED™ rating system as a governing standard for school renovation and new construction. However, because required design standards are modeled closely on the LEED™ system, it is highly likely that several school capital projects will voluntarily attempt a LEED™ certification as a project goal.

Costs: It is estimated that meeting the High Performance Standard will cost the City approximately \$4.86 million, a 1% premium over the business-as-usual construction costs.

Savings: Savings due to reduced energy costs are expected to be \$1.74 million per year.

Co-benefits: Elements of the LEED™ standards (i.e. natural light, indoor air quality) improve the school environment, enhancing performance of both students and teachers. In addition, reduced energy use will result in the following annual criteria pollutant reductions:

NOx	SOx	CO	VOC	PM10
14,429 lbs	11,182 lbs	15,841 lbs	1,958 lbs	10,392 lbs

### 5.1.6. Traffic Signal LED Conversion

Status: Existing

Responsible Department: Traffic & Parking Department

Community Partners: Rebuild America

eCO<sub>2</sub> Savings in 2010: 55 tons

Description: Between 1998 and 2003, the City of New Haven converted all traffic signals to Light Emitting Diodes (LEDs). Monthly electricity consumption dropped from approximately 174,000 kWh before installation to approximately 44,000 kWh after installation.

Costs: The bonded capital cost of LED conversion was \$780,000. The City received \$240,000 from the Connecticut Department of Transportation and \$180,000 in utility rebates.

- Total Cost = \$780,000 - \$240,000 - \$180,000 = \$360,000

Savings: Annual electricity expenses dropped from \$323,238 in FY1998 to \$112,139 in FY2003 for an annual savings of \$211,099. Maintenance costs have been reduced by approximately \$120,000/year.

- Total Annual Savings = \$211,099 + \$120,000 = \$331,099

Co-benefits: Reduced electricity use has resulted in the following annual criteria pollutant reductions:

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM10
920 lbs	1,499 lbs	1,908 lbs	211 lbs	1,400 lbs

### 5.1.7. Procurement Policy

Status: Proposed

Responsible Department: Purchasing, Management and Budget

Community Partners: EPA Energy Star

eCO<sub>2</sub> Savings in 2010: 987 tons

Description: Office equipment accounts for a significant component of electricity consumption in City buildings and schools. There is a great deal of guidance available from the Federal Government in this area. To meet the 30% energy reduction target established by Executive Order 13123,<sup>15</sup> federal agencies are required to select Energy Star<sup>16</sup> and other energy-efficient products where they are deemed to be life-cycle cost-effective. Across the country, state and local governments have followed suit by building environmental and energy-efficiency considerations into procurement policies, RFPs, and resolutions.

In 1997, the State of Massachusetts wrote Energy Star Standards into its procurement specifications for computers, fax machines, copiers, printers, and other office equipment. Since there is no price premium on Energy Star products, and since they are available from almost all manufacturers, this policy is simple and inexpensive to implement. The policy requires vendors to enable all power-saving features at the time of shipment and a procurement team provides training to employees so that these features are not disabled.

There are approximately 7000 computers, 3500 printers and 200 copy machines in New Haven government facilities and schools.<sup>17</sup> Since the life cycle of office equipment is usually no more than five years, the City will need to replace all computers, monitors, printers and copiers sometime before 2010. Adopting an Energy Star procurement standard similar to Massachusetts' would help the City reduce CO<sub>2</sub> emissions and energy costs.

Costs: There is no price premium for Energy Star rated office equipment.

Savings: This measure would reduce energy costs by approximately \$266,288 per year.

Co-benefits: Reduced electricity use has resulted in the annual criteria pollutant reductions:

NOx	SOx	CO	VOC	PM10
1,634 lbs	2,665 lbs	3,391 lbs	375 lbs	2,489 lbs

### 5.1.8. Renewable Energy Purchase

Status: Existing

Responsible Department: Mayor’s Office, Office of Management and Budget

Community Partners: Environment Northeast, Connecticut Clean Energy FundeCO<sub>2</sub>

Savings in 2010: 5914 tons

Description: The City of New Haven has adopted the target of reaching 20% renewable energy use by the year 2010. This target corresponds to the “20% by 2010” campaign, a statewide effort to promote renewable energy, particularly among municipalities, institutions and large businesses. Because of the City’s demonstrated commitment to climate protection, the “20% by 2010” organizing committee<sup>18</sup> chose New Haven as the launch site for this campaign.

On July 7, 2003 the New Haven Board of Aldermen passed a resolution adopting the goal of purchasing at least 20% of the City’s electricity demand from renewable sources by the year 2010 (see Supporting Document #4). In this resolution, the Board of Aldermen requested that Mayor DeStefano’s Clean Energy Task Force define a strategy to meet the 20% goal. The Mayor’s Task Force, comprised of community members, city staff, local representatives and several environmental organizations, met over the course of two months to craft a recommended implementation strategy (see Supporting Document #5).

The strategy recommended by the Mayor’s Task Force is designed to engage local generation capacity, to the extent feasible. The task force felt that prioritizing local generation demonstrated the City’s commitment to improving air quality in New Haven by offsetting fossil fuel generation and served a valuable educational purpose. Beyond local generation, the Connecticut Renewable Portfolio standard and a municipal purchase of Renewable Energy Credits will also count toward the 20% target.

Costs: By 2010, the premium for Renewable Energy Credits is expected to be approximately \$0.0085 per kWh. At this premium, a 20% purchase would cost approximately \$135,000 per year. The City can minimize 2010 costs by encouraging private and state investment in local renewable generation.

Savings: Per kWh, the cost of renewable power generated locally is likely to be lower than the standard offer from United Illuminating, particularly if Clean Energy Fund seed money has contributed to the financing.

Comments: To date, City staff have attended exploratory meetings with private companies interested in developing wind, solar and landfill resources in New Haven. Furthermore, the Connecticut Clean Energy Fund has expressed interest in developing a local fuel cell farm on the English Station site. This interest exists because New Haven has shown itself to be a

leader by committing to the 20% by 2010 goal. New Haven should remain a leader by aggressively pursuing these partnerships and expediting the siting and permitting processes.

Co-benefits:

NO <sub>x</sub>	SO <sub>x</sub>	CO	VOC	PM <sub>10</sub>
9,793 lbs	15,967 lbs	20,320 lbs	2,247 lbs	14,912 lbs

## 5.2. Community Energy Measures

In 1999, approximately 1,160,360 tons of GHG emissions were released as a result of energy consumption by New Haven's residential, commercial and industrial sectors. This estimate includes emissions from electricity consumption and the combustion of heating fuels, primarily natural gas and fuel oil. Within this category, the combustion of heating fuels is responsible for two-thirds of emissions, while electricity is responsible for the remaining one-third. By 2020, emissions are expected to grow to 1,375,211 tons.

Reducing these emissions will require aggressive conservation coupled with a significant transition to renewable energy. There is little debate that conservation is the shortest, most cost-effective route to emission reductions. As the City has discovered through its energy management programs, low-hanging fruit abounds and resources are available to assist businesses and residents take advantage of energy saving opportunities. But because as the economy grows, energy consumption is expected to increase despite gains in efficiency, it is necessary that the community transitions away from fossil fuel consumption to renewable energy. Regional business-as-usual electricity models predict that by 2020, the New England Power Pool will emit more GHG's per BTU than in 1999. Governments and the private sector have many tools with which they can spur the development of renewable power in the NEPOOL region, including regulatory mechanisms, incentives, and education. The City of New Haven has taken a first step by committing to purchasing 20% renewable energy by 2010. Although symbolically significant, the real impact of this policy will be the extent to which it is modeled by the rest of the New Haven community.

Insert chart that has baseline compared to line w/conservation compared to line w/renewables.

### 5.2.1. Comprehensive Plan Implementation

Status: Existing

Responsible Department: City Plan Department

Savings in 2020: Not quantified

Description: In the Comprehensive Plan of Development, the City Plan Department codified the City's commitment to achieving a high standard of urban design, community stewardship and environmental protection. The plan's primary goal is to establish criteria with which to identify the most desirable and sustainable use of land in a fully-developed urban landscape. The plan recommends that environmental considerations play a more central role in the physical development process, recognizing the importance of environmental quality in enhancing the overall quality of life and economic vitality of the city. Recommendations are intended to improve air and water quality and to reclaim lands for open space and tidal wetland protection. Furthermore, recommendations strive to reduce the city's dependence on fossil fuels, improve public health, protect Long Island Sound and its contributing waters and conserve sensitive landscapes.

In that urban living is generally less energy-intensive than suburban or urban living (largely due to transportation requirements), efforts to strengthen cities can reduce energy consumption at a regional scale. By enhancing urban design, creating sustainable economies and protecting environmental resources, New Haven can enhance its competitiveness relative to other towns in the region. Engaging market forces to encourage mixed-use and transit-oriented development as well as infill and the re-use of abandoned urban infrastructure is supportive of climate protection objectives. Setting standards for energy efficient and low-impact design can uncouple energy consumption from desirable development.

The City should strive to ensure that proposed development conforms to standards outlined in the Comprehensive Plan as well as its overall spirit. Public and private developers should have to demonstrate a project's conformity before approvals are granted, and non-conforming projects should be rejected out of hand or substantially overhauled. It should serve as a principal reference document for the commissions and departments that oversee development, as well as community groups and "watch dog" smart growth advocates.

### 5.2.2. Building Standards for New Construction and Renovation

Status: Proposed

Responsible Department: City Plan Department, Livable City Initiative, Building Department

Community Partners: United Illuminating, Southern Connecticut Gas, Yale School of Forestry & Environmental Studies

Savings in 2020: 35,405 tons

Many cities across the country have adopted strategies to encourage the development of energy efficient building and residences without placing excessive burdens on developers,

owners or building occupants. New Haven’s High Performance Schools Program shows has demonstrated the benefits of integrating efficiency principals in the design phase of new construction and renovation. This plan recommends that the City expand green building requirements to other community construction by:

- 1) Establishing a committee to study existing energy efficient building codes in place in other municipalities;
- 2) Determining costs and benefits of existing models;
- 3) Designing a green building code appropriate to New Haven, designed to meet energy conservation goals; and
- 4) Working to adopt the code by ordinance.

The committee should consist of a representative from the City Plan Department, the Building Department, the Livable City Initiative, the School Construction Program, and the Board of Aldermen. Community members should include developers, architects, engineers, academics and advocates. The website of the U.S. Department of Energy’s Smart Communities Network, <http://www.sustainable.doe.gov/buildings/gbcodtoc.shtml>, contains links to codes and guidelines in use by municipalities throughout the country.

The school construction experience and evidence in other municipalities demonstrates that green building codes can reduce energy consumption by 20% without substantial development cost increases. The GHG reduction estimated above assumes that the increment of projected additional annual consumption for the residential, commercial and industrial sectors is shaved by 20% by 2020.

Costs: It is assumed that energy efficient construction may increase construction costs by approximately 1%. The dollar value of construction in 2000 was \$295 million dollars.

- $\$295,622,000 * 1\% = \$2,956,220$

Savings: Based on today’s energy costs, reducing the increment of projected additional energy consumption would save \$4,288,071 annually.

Comments: Mandating periodic updates to the state’s commercial and residential energy codes was among the stakeholder recommendations accepted by Governor Rowland as a priority action item. The City’s code committee should be aware of the state’s intentions and should seek to improve on state codes wherever possible. It is the recommendation of this report that the City of New Haven should strive to achieve a higher than the state as a whole.

Co-benefits:

NOx	SOx	CO	VOC	PM10
90,013 lbs	46,326 lbs	67,562 lbs	9,006 lbs	33,768 lbs

### 5.2.3. Energy Conservation for Existing Buildings

Status: Pending

Responsible Department: Livable City Initiative, Building Department

Community Partners: State of Connecticut, United Illuminating, Southern Connecticut Gas  
Savings in 2020: 33,745 tons

The State Stakeholder Recommendations include energy efficiency measures that are predicted to incrementally reduce energy consumption from existing residential and commercial buildings. The City of New Haven should actively pursue implementation of these measures locally, serving as a partner to the State and a resource for New Haven businesses and residents. If measures are implemented statewide proportional to population, the following greenhouse gas reductions are anticipated in New Haven:

#### Residential Measures:

- Appliance Standards = 7,799 tons
- Appliance Swapping Program = 760 tons
- Heat Pump Water Heater Replacement Program = 495 tons
- Bulk Purchasing of Appliances = 1,750 tons
- Expand Weatherization Program = 228 tons

#### Commercial Measures

- Training of Building Operators = 1,255 tons
- Remove Barriers to 3<sup>rd</sup> Party Load Management = 1,255 tons

There are other programs the City could help introduce locally that would increase energy savings from conservation measures. It is recommended that the City introduce an energy conservation campaign modeled after Vermont's successful "10% Challenge" program. If by 2020, the equivalent of 40% of New Haven businesses, residences, and industries decrease their electricity and natural gas consumption by 10%, this would reduce greenhouse gas emissions by 15,677 tons from the commercial sector, 11,252 tons from the residential sector, and 6,816 tons from the industrial sector. These figures encompass the reductions anticipated from the implementation of the State's recommended conservation measures listed above.

The City could publicize this effort through its new Environmental Awards program, a component of the Healthy Communities work plan. Implementation would require the participation of high profile businesses and local institutions and the local media. The pending Environmental Awards program is envisioned to debut at next summer's International Festival of Arts & Ideas. This is an opportunity for local environmental success stories to be told and progressive environmental actors to gain recognition.

The City must also play a role in connecting local businesses and households with United Illuminating's Energy Efficiency programs and resources. In Connecticut, the utility companies are responsible for distributing funds from the Conservation & Load Management Fund. The City has successfully capitalized on these resources and can help



others do the same. Additionally, the City should be an active defender of this fund at the State level. In the most recent legislative session, the C&LM fund was raided to balance the State’s general fund budget. As the municipal leader on climate change and air quality issues, and a beneficiary of this fund, the City of New Haven has a valuable role to play as an advocate for the restoration and future protection of rate-payer resources.

#### 5.2.4. Renewable Energy – 20% by 2010

Status: Pending  
 Responsible Department: Mayors Office  
 Community Partners: Smart Power, United Illuminating  
 Savings in 2020: 147,007

The push to introduce renewable power to the Connecticut market is centered on the “20% by 2010 Campaign.” The Smartpower coalition, including Environment Northeast and Clean Water Action, is spearheading this effort, and New Haven was selected as the first campaign target. The goal of the Campaign is to supply 20% of Connecticut’s energy from renewable resources by 2010. This objective is ambitious, yet possible, particularly in New Haven where the connections between energy supply and public health are more evident than in other areas in the state. The other State effort at play in New Haven will be the Renewable Portfolio Standard. By 2020, the Stakeholder Group unanimously recommended that by 2020, Connecticut’s RPS should have increased to 20%. This would require the utilities to provide 20% renewable power to Connecticut customers by 2020.

This report recommends that New Haven should set a target of 30% by 2020. The target is more ambitious than the State’s proposed RPS because it assumes that New Haven will continue to be a leader on this issue, benefiting from a head start and the continued efforts of the Smartpower coalition. The development of local renewable resources could play a role in moving beyond the RPS as well as an optional green power offer from the utility.

Costs: If 20% renewable energy is required by the RPS, costs only apply to the additional 10% needed to meet the 30% target. Assuming that in 2020, the premium for renewable energy is \$0.0085 per kWh, this measure will cost approximately \$947,000. Note: the price for renewable energy in 2020 depends on many variables and can not be accurately predicted.

Benefits: Fuel diversity, energy independence, public health, economic development.

NOx	SOx	CO	VOC	PM10
193,763 lbs	284,803 lbs	478,841 lbs	52,408 lbs	308,820 lbs

## 6. Other Measures & Moving Forward

The measures outlined in this document are not sufficient to meet the community target of reducing greenhouse gas emissions by 20% below 1999 levels by 2020. The City should consider researching and implementing additional measures in order to meet this goal.

These may include:

1. Nxegen Performance Contract Years 3-10 (Budget Office)
2. City-Wide Lighting Ordinance (City Plan)
3. Recycling (Mayor's Office / Public Works)
4. Urban Forestry and Community Gardens (Parks)
5. Commuter Programs (Traffic & Parking / City Plan)
6. Establish Energy Efficiency Environmental Coordinator position (Mayor's Office)
7. Develop Sustainability Website (City Plan / Mayor's Office)
8. Combined Heat and Power Program (state-level)
9. Natural Gas and Heating Oil Conservation Fund (state-level)

It is recommended that the City Plan Department host community meetings to discuss and revise this plan. After internal and community vetting, it should be adopted by resolution by the Board of Aldermen.

# Appendix

## Appendix A – Black Carbon Calculations

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This memo outlines the methodology used in this document for calculating an eCO<sub>2</sub> equivalent for the black carbon component of diesel exhaust. This method was outlined by Environment Northeast for the Connecticut Climate Change Stakeholders Dialogue. The Connecticut Stakeholders Recommendations adopted this methodology and included a black carbon scenario in the baseline analysis and recommendations.

“The method is based on an analysis by Mark Z. Jacobson, of Stanford University in his paper ‘Control of fossil fuel black carbon and organic matter, possibly the most effective method of slowing global warming’, Journal of Geophysical Research, Volume 107, No. D-19, 15 October 2002. In that paper, Jacobson ran a climate model incorporating a wide range of mechanisms by which black carbon emissions impact climate. (See graph, below). He included runs that reduced global emissions of individual climate forcing pollutants emissions to zero – including fossil fuel black carbon (f.f. BC), methane (CH<sub>4</sub>) and CO<sub>2</sub> (assuming both a 50 year atmospheric life and a 200 year atmospheric life). Each of these runs (by pollutant) provides a resulting global temperature reduction curve, which in turn allows the warming effects of each to be compared.” (Environment Northeast Memo, “Diesel Black Carbon Calculations – Baseline and Reductions,” October 22, 2003).

City of New Haven Diesel Fuel Consumption = 666,676 gallons

Low end eCO<sub>2</sub> estimate:  $660,000 * 8.1987E-06 * 0.9072 * 2 * 220 * 3.63 = 7,919.94$  tons

High end eCO<sub>2</sub> estimate:  $660,000 * 8.1987E-06 * 0.9072 * 2 * 500 * 3.63 = 17,999.87$  tons

where: 660,000 gallons is the City’s annual diesel consumption  
8.1987E-06 is the conversion factor gallons to short tons  
0.9072 is the conversion factor short tons to metric tons  
2 is the factor used to account for organic matter  
220 is the low-end multiplier  
500 is the high-end multiplier  
3.63 is the conversion factor to eCO<sub>2</sub>

Average estimate:  $(7,919.94 \text{ tons} + 17,999.87 \text{ tons}) / 2 = 12,959.91$  tons eCO<sub>2</sub>

## Appendix B – Bicycle Calculations

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This calculation is based on a bicycle sketch plan method developed by Goldsmith, described in the U.S. Department of Transportation’s Federal Highway Administration – Research, Development, & Technology Branch’s “Guidebook on Method to Estimate Non-Motorized Travel: Supporting Documentation.”

### Work Related Trips

- $46,597 * 15.5\% = 7223$  current bike/ped commuter population, New Haven  
where: 46,597 = daily commuter population  
15.5% = % of population bike/ped
- $26,089 - 7223 = 18,866$  potential new bike/ped commuter population  
where: 26,089 = # of New Haven commuters with < 20 minute commute  
7223 = current bike/ped commuter population, New Haven  
\* some portion of the New Haven commuters with < 20 minute commute are likely commuting to locations outside of New Haven. These are assumed to be balanced by those commuters who live outside of New Haven but commute < 20 minutes to a worksite in New Haven.
- $18,866 * 26\% = 4905$  likely NEW bike/ped commuter population  
where: 18,866 = potential new bike/ped commuter population  
26% = percentage of potential bike/ped commuters who would bike if safer facilities were available (Seattle survey)
- $4905 * 55.7\% = 2732$  single occupancy vehicle commute substitutions  
where:  
4905 = likely NEW bike/ped commuter population  
55.7% = percentage of single occupancy vehicle commuters
- $2732 * 3 * 240 * (3/5) = 1,180,224$  potential avoided commute VMT  
where: 2732 = single occupancy vehicle trip substitutions  
3 = average round trip bike/ped commute distance  
240 = average work days per year  
3/5 = proportion of bikable work days (weather, meetings, etc.)

### Non-work Related Trips

- $(2732 * 1.5 * 2 * 365 * 3/5) / 3 = 598,308$  potential avoided non-work VMT  
where: 2732 = single occupancy vehicle commute substitutions  
1.5 = factor for increased frequency of non-work utilitarian trips  
2 = average round trip bike/ped non-work utilitarian trip length  
365 = utilitarian trips days per year  
3/5 = proportion of bikable days  
3 = 1/3 trip substitutions from SOVs

## Appendix C – 20% by 2010 Implementation Plan

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By 2010, the City's annual electricity use will reach 114 million kWh. An annual reduction of 22.8 million kWh will be required to meet the 20% reduction goal by 2010.

### ***Connecticut Renewable Portfolio Standard: 35% of Target***

In the 2003 Legislative Session, the Connecticut General Assembly adopted renewable portfolio standard, applicable to all electricity distributed in the state. By law, 7% of electricity consumed in 2010 will be required to come from Class I renewable sources (wind, small hydro, landfill methane, solar, fuel cells). Mayor's Task Force resolved that the 7% RPS should count toward the City's 20% target.

### ***Local Generation: 30% of Target***

The following analysis of local generation capacity and anticipated costs was developed by Environment Northeast at the City's request.<sup>19</sup>

WPCA Fuel Cell: The New Haven Water Pollution Control Authority received a grant from the Connecticut Clean Energy Fund (CCEF) to install a 200 kW fuel cell to supply electricity and heat for the Fats, Oils, and Grease (FOG) processing system. The fuel cell will produce 10-15% of the plant's electricity and reduce energy costs by about \$13,000 per year. Costs: while purchase, installation and start-up costs were covered by the CCEF grant, the City will need to purchase the renewable energy credits (RECs) at an estimated cost of \$16,000 per year. RECs are currently owned by CCEF.

Estimated 2010 Output = 1,664,400 kWh (7.3% of Target)

New Haven Landfill: The New Haven Landfill closed in 1991. Several developers have expressed interest in developing the site for electricity generation although the landfill gas output is not known precisely. Because gas collection infrastructure is already in place, capital costs are expected to be relatively low. If New Haven were to negotiate a percentage of generated RECs with a developer in exchange for the gas output, this could be a cost-free project.

Estimated 2010 Output = 1,551,808 kWh (6.8% of Target)

Photo Voltaic Installation: The City should seek funding for PV installations on New Haven schools and/or municipal buildings through the Connecticut Clean Energy Fund, the U.S. Department of Energy or U.S. Environmental Protection Agency. New Haven should pursue funding opportunities with the objective of installing at least 60 kWh capacity by 2010.

Estimated 2010 Output = 52,560 kWh (0.2% of Target)

Wind Installation: There are several sites in New Haven that could be viable locations for wind turbines (Lighthouse Point Park, East Rock Park, Water Pollution Control Authority). With additional funding from the Connecticut Clean Energy Fund, New Haven attract a developer and negotiate RECs in exchange for use of City property. A 1.5 MW turbine (considered feasible by developers) would produce an estimated 3,500-4,000 MW per year.

Estimated 2010 Purchase = 3,500,000 kWh (15.4% of Target)

***Renewable Energy Credits: Balance (~45%) of Target***

The balance of the 2010 commitment will be met through a cost-effective purchase of renewable energy credits (“RECs” or “tags”). The City’s purchasing department recently contracted with Community Energy to provide an escalating percentage of green tags through 2010. Community Energy’s tags come from Green-e certified wind in Pennsylvania and New York and new landfill projects in Pennsylvania.

## Supporting Documents



## Supporting Document #1 – Cities for Climate Protection Campaign Resolution

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### **RESOLUTION OF THE BOARD OF ALDERMEN AUTHORIZING THE CITY OF NEW HAVEN TO PARTICIPATE IN THE CITIES FOR CLIMATE PROTECTION CAMPAIGN**

WHEREAS, a scientific consensus has arisen that Carbon Dioxide (CO<sub>2</sub>) and other greenhouse gases (ghg) released into the atmosphere will have a profound effect on the Earth's climate; and

WHEREAS, scientific evidence indicates that global warming is already beginning, with the 1990's the hottest decade in recorded history; and

WHEREAS, based on scientific evidence, the United States has pledged along with 160 countries under the United Nations Framework Convention on Climate Change to reduce its greenhouse gas emissions; and

WHEREAS, energy consumption, specifically the burning of fossil fuels, e.g. coal, oil and gas, accounts for more than 80% of U.S. greenhouse gas emissions; and

WHEREAS, local government actions taken to reduce greenhouse gas emissions and increase energy efficiency provide multiple local benefits by decreasing air pollution, creating jobs, reducing energy expenditures, and saving money for City government, it's businesses and it's citizens; and

WHEREAS, the City of New Haven is a member of the Greater New Haven Clean Cities Coalition; and

WHEREAS, the Cities for Climate Protection Campaign, sponsored by the International Council for Local Environmental Initiatives, has invited the City of New Haven to become a partner in the Campaign;

BE IT HEREBY RESOLVED, that the City of New Haven pledges to join with jurisdictions from all over the world in the Cities for Climate Protection Campaign and, as a participant in the Cities for Climate protection Campaign, the City of New Haven pledges to:

1. Take a leadership role in increasing energy efficiency and reducing greenhouse gas emissions from municipal operations;
2. Develop and implement a local action plan that the City of New Haven will take to reduce both greenhouse gas and air pollution emissions; the plan will include:

- a) a greenhouse gas emissions analysis and forecast to determine the source and quantity of ghg emissions within the City;
- b) a CO<sub>2</sub> or greenhouse gas emissions reduction target; and
- c) a strategy for meeting the City of New Haven's greenhouse gas reduction target, including an outline of the programs and measures that will be implemented to achieve the target.

Enacted by the New Haven Board of Aldermen on July 2, 2001.

## Supporting Document #2 – Smart Growth for Climate Protection

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NEW HAVEN CITY PLAN DEPARTMENT  
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TEL (203) 946-6378 FAX (203) 946-7815

### TRANSPORTATION WORKING GROUP SMART GROWTH FOR CLIMATE PROTECTION

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**TO:** Transportation Working Group  
**FROM:** City of New Haven  
**DATE:** November 19<sup>th</sup>, 2003  
**RE:** Smart Growth Recommendations

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This report was prepared by the City of New Haven at the request of the Transportation Working Group, a sub-committee of the Connecticut Climate Change Stakeholders Dialogue.

### SPRAWL AND CLIMATE CHANGE – INTRODUCTION

Current statewide land development patterns have the effect of increasing greenhouse gas emissions in Connecticut in three ways:

1. **Transportation emissions** – Residential and commercial development in suburban and ex-urban areas increases vehicle-miles-traveled (VMT) as distances between home and jobs increase. Low-density development can not support public transportation, often making the single-occupancy-vehicle the only commute alternative. Since 1970, Connecticut's population has increased by a modest 12%, while VMT has increased by 78%. The National Governors Association reports that nationwide, the increase in VMT is attributable to more miles driven by existing drivers, rather than new drivers. This is consistent with Connecticut's experience, where the average commute is now 24 minutes, up 16% since 1990. Greenhouse gas emissions (and other harmful pollutants) have kept pace with the growth in VMT. Ancillary problems associated with VMT growth include traffic congestion and infrastructure deterioration and the accompanying deleterious effects on Connecticut's economy and quality of life.
2. **Energy intensity** – Suburban and ex-urban residential development is often driven by the low cost of land relative to urban centers. As a result, typical suburban dwellings tend to be more energy intensive than their traditional, urban counterparts. In the 1990's the Australian state of Victoria prepared a thorough analysis of energy and transportation emissions in various neighborhoods. The results are not surprising; in traditional neighborhood forms, carbon emissions are significantly lower. As compared

with a conventional 1980s suburb, traditional neighborhoods achieved a 26% reduction in dwelling unit emissions. Also notable was a 57% reduction in transportation emissions.<sup>20</sup> Please see recommendations of the Residential, Commercial and Industrial Working Group regarding the energy intensity of new development.

3. **Open space deterioration** – Over the past thirty years in the State of Connecticut, the amount of land settled at urban densities increased by 102%.<sup>21</sup> New development has displaced open space, including farmland and forests. Recent research has shown that the hardwood forests of New England may play a significant role in carbon sequestration on the global scale. As these forests are cleared for development, stored carbon is released and the landscape’s capacity for future sequestration is depleted. The development of open space also has negative impacts on groundwater supplies, surface water quality, wildlife habitat, the state’s tourism industry and the overall quality of life for Connecticut residents. Please see recommendations of the Agriculture, Waste and Forestry Working Group regarding open space preservation and implications for carbon sequestration and release.

The purpose of this proposal is to present a strategy for curbing future growth of vehicle-related emissions through land-use and transportation management. It recommends that the State target development to areas identified as appropriate for growth through coordination of land use and transportation planning.

## **BACKGROUND**

Since 1999, eight major reports have documented the impacts of sprawl on Connecticut’s economy, transportation systems, urban infrastructure, environmental resources and social equity.<sup>22</sup> These studies have put forth recommendations for reducing sprawl by redirecting growth patterns through appropriate constraints, incentives and long-term planning. As these eight reports demonstrate, the State has much to gain by planning for growth in appropriate areas rather than permitting unfettered development to perpetuate. Efficient re-use of existing infrastructure, reinforced funding for existing schools, improved air and water quality, reduced road and sewer extension costs, congestion mitigation, increased access to jobs and affordable housing are recognized benefits of growth management. Connecticut’s commitment to reducing greenhouse gas emissions underscores the needs identified by these reports and introduces an additional benefit to the already long list. This proposal borrows from the excellent work contained in these eight reports, with emphasis on recommendations that directly address the sprawl–climate change nexus.

## OBJECTIVES

As noted above, there is a clear correlation between the rapid increase in urbanized land in Connecticut and VMT. Although both are certain to increase in the future, the strategies proposed herein seek to moderate the growth curve. Between 2000 – 2020, annual VMT is projected to increase by 22.2%, from 30.4 billion miles to 37.1 billion miles. This trajectory predicts annual CO<sub>2</sub> emissions to increase by 3.35 MMTCO<sub>2</sub>e. The Transportation Working Group believes that by integrating land-use planning with transit improvements, the State can achieve greenhouse gas reductions of approximately 3% below 2020 business-as-usual projections (0.6 MMTCO<sub>2</sub>e).

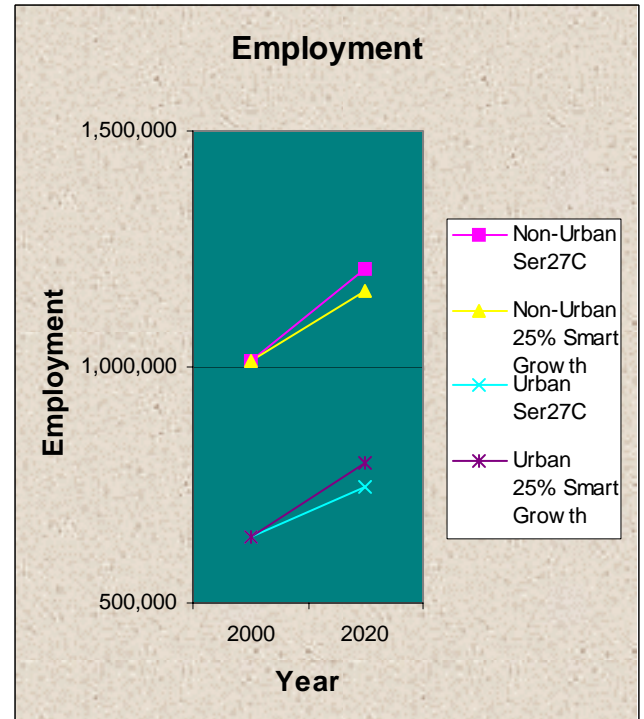
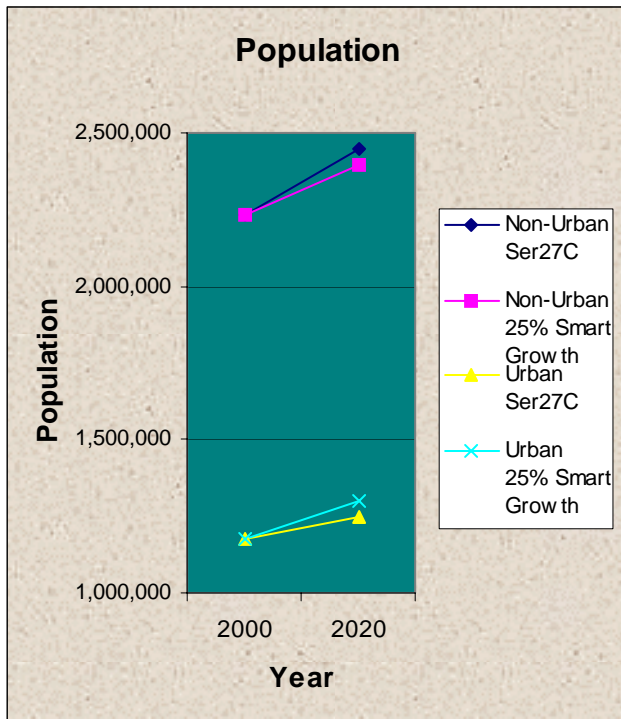
To achieve these reductions, the Transportation Working Group recommends that the State commit to incorporating principles of “Smart Growth” in planning and fiscal policy. Smart Growth, as defined by the Blue Ribbon Commission on Property Tax Burdens and Smart Growth Incentives, is “*a comprehensive planning process that encourages more efficient land use patterns of development that accommodate sustainable economic growth, reduce transportation congestion, protect natural resources, preserve the traditional character of communities and ensure equitable access to affordable housing, jobs, and community services.*”<sup>23</sup> For purposes of the climate change plan, this entails a concerted effort to coordinate growth in such a way that future development is targeted to developed areas where infrastructure already exists and where transit alternatives are available. This group also recommends that the State use financial and planning tools to discourage growth in ex-urban areas where alternatives to the automobile are not available. Strategic enhancement of Connecticut’s transit system is a crucial complement to growth management (see Transit Proposal).

The proposal is a measured response, acknowledging that most new growth will continue to follow current trends. With this in mind, the working group recommends a modest 25% penetration of Smart Growth principles by 2020, manifested by a 25% redirection in growth from inappropriate to appropriate locations, as defined by the Plan of Conservation and Development. The figures below compare the State’s Series27C (business-as-usual) population and employment projections with a hypothetical 25% Smart Growth scenario. For purposes of calculation, this scenario redirects 25% of population and employment growth projected for non-urban areas to central cities and “stressed” municipalities, as defined in *Connecticut Metropatterns*<sup>24</sup> as well as state-designated Central Business Districts (CBDs). The 25% Smart Growth Scenario does not change the directional trajectory of growth for non-urban or urban areas. Rather, it tips the curves to bolster walkable, bikable communities with sufficient population and employment density to support transit enhancements. Many studies have demonstrated that by increasing transportation alternatives to the single-occupancy-vehicle and reducing trip lengths, smart growth reduces VMT.<sup>25</sup>

Table 1:  
Alternative Growth Scenarios – Population and Employment

	Non-Urban			Urban		
	2000	2020 Ser27C	25% Smart Growth	2000	2020 Ser27C	25% Smart Growth
Population	2,231,310	2,448,600	2,393,577	1,174,255	1,248,050	1,303,073
Employment	1,012,303	1,208,985	1,159,822	640,622	745,810	794,973

Graphs 1 & 2:  
Series27C Growth vs. 25% Smart Growth  
Comparison of Population and Employment



## PROPOSAL OUTLINE

This proposal outlines some of the growth management policy options available to the State of Connecticut through use of the following tools:

- 4) *Planning Coordination*: Develop and coordinate planning capacity within state agencies, municipalities and RPOs;
- 5) *Financial Mechanisms*: Target growth using incentives & subsidies;
- 6) *Regulation*: Establish appropriate constraints on suburban sprawl.

The broad reach of this proposal reflects the complexity of the problem we seek to address. As demonstrated by historical trends, sprawl – if unconstrained by statute and regulation – will continue to outpace the climate change effort. The implications extend far beyond land use and energy consumption, ultimately impacting the quality of Connecticut’s schools, job opportunity, economic growth and environmental quality.

### 1) State Level

- a) Ensure that the new statewide Plan of Conservation and Development (PCD) serves as an enforceable blueprint for statewide growth management. The PCD should establish “priority funding areas” to be referenced in land use and transportation planning and investment.
  - i) Areas targeted for development should support smart growth principles by:
    - (1) Increasing residential and employment density where density already exists, including brownfield sites.
    - (2) Locating new development where a variety of transportation modes can be made available.
    - (3) Refocus emphasis to traditional urban / village centers as well as appropriate corridor-based locations.
  - ii) Direct the Connecticut Office of Policy and Management to address climate change in the state PCD.
    - (1) Consider the transportation-related greenhouse gas emissions of projected development, directing growth in alignment with statewide transportation sector GHG targets.
- b) Adopt Smart Growth Legislation. Proposed components include items (a-c) above and the following:
  - i) Require state agencies to target state economic development spending to priority funding areas, as established in the State PCD, with particular emphasis on transit accessibility.
  - ii) Reform the School Construction Program formulas to align program funds with priority funding areas.
  - iii) Reform the Surface Transportation Program to align STP funding with priority funding areas.
  - iv) End state subsidies for sewer extensions in areas identified as conservation priorities.
  - v) Indemnify local land use bodies when challenged on content of model ordinance provisions.

- c) Establish capacity at the state level to coordinate planning activity and provide technical support for Smart Growth Legislation, including short- and long-term planning as well as monitoring of growth management decision-making. Primary tasks of this strengthened authority should be:
  - i) Further develop and enhance a layered Geographic Information System (“GIS”) database identifying existing urban, suburban, rural areas, as well as infrastructure, brownfields, natural resources, and transit access.
  - ii) Conduct a statewide build-out analysis under current land use regulatory format.
  - iii) Conduct a statewide evaluation of public costs associated with sprawl.
  - iv) Develop inter-agency coordination capacity, emphasizing the harmonization of state spending with Smart Growth/GHG goals.
  - v) Conduct a review of state policies that may encourage sprawl.<sup>26</sup> Engage with state stakeholders on appropriate reform.
  
- d) Establish a statewide outreach program to local planning and zoning commissions.
  - i) Integrate state, regional and municipal PCDs through a restructuring of Section 8.23 of C.G.S. Include a reporting mechanism for inconsistencies. Provide for enforcement “teeth.”
  - ii) Help municipalities to coordinate transportation, water and sewer systems infrastructure and land use planning.
  - iii) Promote diversity in housing and housing choice to eliminate the spatial mismatch between employment and residential opportunities.
  - iv) Mandate development of a new model growth management ordinance for large lot zoning, agricultural and forest land protection, transit-oriented development and cluster development programs.
  - v) Provide funding and technical support for local municipal zoning reform.
  
- e) Provide mechanisms for the strengthening and increased empowerment of Regional Planning Organizations (“RPOs”).
  - i) Provide funding mechanisms and other effective land use tools to ensure the utilization of regional PCDs, consistent with municipal and state PCDs.
  
- f) Align Connecticut's open space land acquisition policies and programs with the statewide plan of C&D so that conservation efforts contribute to a smart growth program. For example, strategic acquisitions of priority agricultural, rural, conservation properties at-risk for development would be pursued not only by negotiation, but also by eminent domain. See Agriculture, Waste, and Forestry Working Group Recommendations.
  
- g) Adopt a statewide policy statement on integrating bicycling and walking into the state’s transportation infrastructure, modeled after the USDOT’s Design Guidance, *Accommodating Bicycle and Pedestrian Travel: A Recommended Approach*.<sup>27</sup>
  - i) Provide funding and technical support to municipalities to promote biking and walking, including safety enhancements, education, and infrastructure (including bike racks, signage, bike lanes and trails).



- h) Update statewide building energy code to align with statewide energy conservation objectives. See Residential, Industrial, and Commercial Working Group Recommendations.
- i) Establish an oversight group comprised of senior managers from all state agencies, public and NGO participants. The mandate of this oversight group shall be to ensure that established smart growth policy is properly enforced by each state agency.

## **2) Regional and Local Level**

- a) Establish a regional compact aligning local plans with regional and statewide plans of development.
- b) Establish MPO / TIP guidelines supporting the growth management program.
- c) Adopt model statewide growth management ordinance and apply to local land use and zoning maps.
- d) Reaffirm energy and transportation efficiency recommendations in local PCDs and implement through ordinance amendments, zoning and site plan review provisions.
  - i) Analyze alternative development scenarios to optimize microclimate conditions and conserve building energy.
  - ii) Integrate landscape design features to provide for passive solar heating and cooling, including planting and shading techniques.
  - iii) Amend the subdivision ordinance to account for cluster zoning opportunities.
  - iv) Amend the zoning ordinance to align local regulations with VMT-reducing development alternatives.
  - v) Substitute existing language in low-density residential zone to provide balance between very large lot zoning and medium-density cluster developments as appropriate based on statewide plan and environmental conditions.
  - vi) Promote mixed use and transit oriented development opportunities; elevate standards for commercial retail developments that lack mixed-use components.
  - vii) Enhance urban environments to encourage walking and biking for short trips. Sidewalk repair, greenway development, improved biking facilities including signage, dedicated on-road bicycle lanes and additional bicycle racks in proximity to retail areas.

## COSTS AND BENEFITS

### 1) Costs

The most significant expenditures related to smart growth are associated with transit investments and are detailed in the Transit Proposal. We envision that the planning coordination and outreach recommended above may, to some degree, be accomplished through a reorganization of existing capacity and resources. However, there will likely be additional costs associated with enhanced state-level capacity and outreach to municipalities and RPOs. The Transportation Strategy Board estimated a one-time capital cost of \$10 million for state assistance in GIS mapping and technical analyses and a total operating cost of \$760,000 for state assistance with municipal / regional plan development over the next ten years. Opportunities to cover costs include revenues from VMT pricing or fuel tax increases. Any accounting of the costs of smart growth and transit recommendations should be accompanied by a detailed analysis of the public costs of sprawl (as recommended in state-level measure C-iii above) and thorough assessment of benefits of smart growth (see below).

### 2) Benefits

#### Health

*Reduced Air Pollution:* In Connecticut, mobile sources are responsible for the lion's share of criteria and hazardous air pollutant emissions. Health impacts of these emissions include respiratory disease such as asthma and bronchitis, cardiovascular disease and premature death. Although difficult to quantify, these emissions have real financial and social costs: treatment and hospitalizations for pollution-induced illness, missed work and school days, restricted activity, coping with symptoms of illness and premature deaths.

In addition to the aforementioned CO<sub>2</sub> savings, reducing VMT by 3% below 2020 projections would yield the following reductions in criteria pollutants:

Table 2: Criteria Pollutant Savings from 3% VMT Reduction<sup>28</sup>

	CO	NO <sub>x</sub>	PM10	SO <sub>2</sub>	VOC
Avoided emissions (tons)	18,935	1,226	35	82	1,767

McCubbin and Delucchi (1999)<sup>29</sup> estimate the associated health costs of marginal emissions of criteria pollutants on a per kilogram basis. The table below presents cost savings associated with a 3% the study's low and high predictive parameters.

Table 3: Cost Savings from Avoided Emissions (2000\$)<sup>30</sup>

	CO	NOx	PM10	SO2	VOC
\$ Cost savings (low)	\$217,182	\$1,645,263	\$391,410	\$648,966	\$202,673
\$ Cost savings (high)	\$1,954,641	\$24,313,336	\$5,370,544	\$6,162,357	\$2,330,738

Total annual health cost savings from air-pollution induced illness associated with a 3% reduction in VMT are estimated to range from \$3,105,494 to \$40,131,615.

*Increased Mobility:* Auto-centric development patterns have decreased mobility among adults and children, reducing opportunities for walking and bike riding. The Surface Transportation Policy Project released a report this year demonstrating a statistically significant correlation between sprawl, obesity and hypertension. Research suggests that people in compact, mixed-use areas reap benefits from increased opportunity to integrate walking and biking into the everyday routine.<sup>31</sup> Smart growth seeks to encourage centralized, mixed use communities with well-developed pedestrian and bicycle infrastructure. Given the myriad of health costs associated with inactivity, creating opportunities for increased mobility through smart growth has a clear (although unquantified in this analysis) economic value.

### **Avoided Expenditures**

To the extent that future growth can be targeted to developed areas, costly infrastructure investments can be avoided. Scarce resources can be utilized to repair and maintain existing systems rather than extending them into sparsely populated, exurban areas. The Research Institute for Housing America estimated the potential cost savings of smart growth measures (centralized development, infill, mixed land use, cluster development) nationally could be as much as \$250 billion over a 25 year period.<sup>32</sup> If this nationwide estimate is apportioned to Connecticut by population, the Connecticut savings could approach \$2.7 billion by 2025. The potential for avoided expenditures exist in the following areas:

- Sewer systems
- Storm water drainage
- Water supply infrastructure
- Local and state road extensions
- Housing and land costs
- Transportation costs

As this list demonstrates, in addition to costs borne by the state and municipalities, there are potential consumer savings associated with smart growth as well, particularly in transportation costs. A 2000 analysis of household transportation expenditures in 28 metropolitan areas found that transportation expenses are greater in low-density areas with few alternatives to the automobile. The study found that families living in low-density areas pay roughly \$1300 more per year in transportation expenses than families in compact, mixed use areas.<sup>33</sup> If this savings is assigned to the population shift associated with 25% penetration of smart growth measures in Connecticut (assuming an average household size

of 2.53 people) it results in decreased transportation expenditures amounting to over \$28 million in 2020.<sup>34</sup> Assuming linear penetration between 2003-2020, cumulative household savings over this period would approach \$114 million.

### **Environmental Benefits**

In addition to the air pollution benefits discussed above, there are other ways in which Smart Growth measures lessen the environmental impacts of development. Reduced impervious surfaces and improved water detention safeguard water quality. A study of New Jersey's Development and Redevelopment Plan found that compact development would produce 40% less water pollution than would more dispersed development patterns.<sup>35</sup> Urban sprawl is associated with habitat loss and habitat fragmentation, processes that can disrupt the stability of Connecticut's natural ecosystems. Clean-up and re-use of brownfield sites is an additional environmental benefit to smart growth.

### **Additional Costs of Sprawl**

The following consequences of sprawl are the subjects of extensive research, but are not addressed quantitatively in this proposal.

- Economic loss due to congestion
- Declining urban centers
- Social and economic segregation
- Disconnect between affordable housing and job location
- Declining availability of affordable housing
- Quality of life impacts

## **Supporting Document #3 – Energy Management Plan Annual Report**

Under development – Ed Melchiori

## Supporting Document #4 – Renewable Energy Resolution

(back to [Table of Contents](#))

### **FAVORABLE. FROM ALDERMAN VOIGT, A RESOLUTION OF THE NEW HAVEN BOARD OF ALDERMEN SUPPORTING THE USE OF RENEWABLE ENERGY.**

WHEREAS, the world's most respected association of climate scientists, the Intergovernmental Panel on Climate Change (IPCC), projects that global warming will be even more severe than previously thought, with temperatures in Connecticut projected to rise by approximately 4 °F this Century and with the vast majority of warming clearly attributable to human activity; and

WHEREAS: New Haven has within its boundaries several power plants (English Station, Harbor Station, the Yale University power plants, and others), is in the path of prevailing winds from three of Connecticut's "Sooty Six" power plants, and stands in the path of airborne pollution from power plants in upwind states; and

WHEREAS: New Haven has the highest hospital discharge rate for asthma in Connecticut, which is related to its high levels of air pollution; and

WHEREAS: greenhouse gas emissions can be reduced in a cost-effective manner that enhances economic development by applying currently available energy efficiency technologies and such renewable energy programs as many cities have implemented that save money, create jobs and strengthen local economies; and

WHEREAS: renewable energy resources -- such as wind and solar energy -- are constantly replenishing themselves, do not cause the buildup of global warming gases and other pollutants, and, if properly managed, will be available to serve our energy needs forever, and

WHEREAS: the City of New Haven is a member of the Cities for Climate Protection Campaign, which commits the city to be a leader in the reduction of greenhouse gas emissions both through conservation measures and through renewable energy purchases; and

WHEREAS: the 20% by 2010 campaign is a Connecticut not-for-profit initiative that has undertaken an effort to encourage community action in support of putting Connecticut's customers on a path to having 20% of their energy supply come from clean, renewable energy sources by 2010.

WHEREAS: Mayor DeStefano has convened a Clean Energy Task Force to research these issues, and to make recommendations for New Haven's participation in these efforts.

NOW, THEREFORE, BE IT RESOLVED that the New Haven Board of Aldermen recognize and support the goal of the 20% by 2010 campaign.

BE IT THEREFORE RESOLVED that the Board of Aldermen shall direct Mayor DeStefano's Clean Energy Task Force to define a strategy to meet the 20% by 2010 goal, and

BE IT FURTHER RESOLVED that the city of New Haven adopt the goal of making at least 20% of its energy purchases come from renewable energy sources by the year 2010, and encourage the City Administration to undertake further energy efficiency and conservation measures.

BE IT FURTHER RESOLVED that the Board of Aldermen shall encourage all businesses, institutions, and households within New Haven to engage in energy conservation measures and to adopt the goal of making at least 20% of its energy purchases come from renewable energy sources by the year 2010.

BE IT FURTHER RESOLVED that the Board of Aldermen shall encourage the State of Connecticut to create a strong state climate action plan that includes at least 20% of energy purchases for their operations to come from renewable sources by the year 2010 and promote energy efficiency and conservation.

## Supporting Document #5 – Mayor’s Clean Energy Task Force

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### Mayor’s Clean Energy Task Force Recommendations for City Renewable Energy Use

Over the past nine years, the City of New Haven has dramatically altered the way it uses energy. Aggressive conservation initiatives have saved the City millions of dollars, keeping tons of pollution from entering our air. Under the leadership of the Energy Committee, the City will continue to build on these initiatives. Beyond conservation, the next step in creating a comprehensive energy policy is to explore the use of clean renewable energy, and that is the focus of this report.

#### Conservation

Through nearly \$9 million of conservation and efficiency investments, the City has realized annual savings of approximately \$3 million, compared to a business-as-usual energy bill. Beyond monetary savings, anticipated investments are projected to offset annual carbon dioxide emissions by 47 million pounds, sulfur dioxide by 245,000 pounds, and nitrogen oxide by 155,000 pounds. Through this program, conservation initiatives have achieved the two goals of financial savings – which primarily drove this program – as well as reducing the City’s contribution to local air pollution.

It is estimated that one in four New Haven school children suffer from asthma, and outdoor air pollution is a known risk driver. Electricity generation from fossil-fuel power plants is a major source of the pollutants that aggregate asthma – sulfur dioxide, nitrogen oxide and particulate matter. Carbon dioxide, a powerful greenhouse gas, is another by-product of electricity generation. With projected temperature increases of 6-10 degrees F before 2100, climate change is an issue the City must take seriously.

Even with aggressive conservation initiatives, the City’s energy use is projected to continue to climb, increasing emissions. The only way to see an actual net reduction in pollution caused by the City’s energy use is to shift some of the City’s demand from dirty fossil-fuel generation to clean renewable sources. Issues of cost and the local benefits of reduced emissions are the major considerations framing this question as the City moves forward.

#### 20% by 2010

With the recognized and continuing cost savings from our conservation measures, we are well-positioned to consider how the City will take the next step to renewable energy use. The City will not be alone in exploring this question. Our efforts coincide with a statewide campaign to promote renewable energy, particularly among municipalities, institutions and large businesses.

The statewide campaign has established the target of 20% renewable energy use by the year 2010 – “20% by 2010” – and this report recommends the City of New Haven adopt this goal as our commitment to renewable energy (CT Class 1 Renewables).

There are a number of factors that will shape the manner in which the City meets this target. The statewide renewable energy portfolio standard (RPS), recently adopted this legislative session, mandates that a certain percentage of electricity consumed in Connecticut will be from renewable sources. By 2010, the RPS will require that 7% of electricity will be from Class I renewable sources



(wind, small hydro, landfill methane, solar, fuel cells). This standard will increase demand for renewable resources, driving supply and increasing the competitiveness of renewable sources in Connecticut's electricity market.

While the RPS provides an easier baseline from which the City can build toward the 20% goal, it might also drive up the cost of additional renewable purchases as distributors lay claim to the limited local supply to meet the 7% RPS. Connecticut has limited ability to produce renewable energy through wind and hydro, so our ability to expand the local supply is more limited than in many states. Under current estimates, it is unrealistic to expect that the entire state could meet the 20% by 2010 goal with renewable electricity generated locally, and even the 7% RPS will likely be met using outside generation.

Despite these limitations, we believe that the City should strive to A) meet the 20% goal and B) engage local generation capacity, to the extent feasible. Offsetting fossil fuel generation with local renewable generation is a priority of this task force. Prioritizing local generation demonstrates the City's commitment to improving air quality in New Haven and serves an additional education value. The WPCA's fuel cell and the New Haven landfill are local resources at the City's disposal, and the school construction program presents an opportunity to pursue photo voltaic installations.

Our current estimate is that local generation may contribute 5-6% towards the City's 20% commitment. This, combined with the 7% RPS, means that an estimated 8% of the City's electricity would be met through non-local renewable energy such as less expensive wind and hydro.

Therefore, members of the Clean Energy Choices Task Force recommend the following actions:

1. The City should aggressively pursue opportunities for developing clean, renewable resources in New Haven, including the New Haven landfill, fuel cells, photo-voltaic, wind, and other renewable sources (CT Class 1 Renewables) installations on schools and other municipal buildings. This would directly offset demand from local powerplants, and directly reduce the City's contribution to local air pollution. The City should investigate all possible funding sources for the above.
2. When local generation opportunities have been maximized, the purchase of renewable energy should occur in a cost-effective manner from generation sources within the New England Power Pool or from upwind states (New York, Pennsylvania, Ohio, parts of Canada), so as to offset emissions that impact New Haven residents.
3. Renewable energy generation should incorporate educational opportunities (targeting public high schools) and the City should strive to promote the 20% by 2010 goal among local businesses and institutions.

**The benefits of 20% by 2010:**

- Improve local air quality and human health by offsetting existing generation
- Reduce emissions of greenhouse gases, those pollutants that contribute to global warming
- Educate people on the benefits of renewable power
- Encourage participation by others in the community and region
- Stimulate the market for renewable power and help to bring down the cost of generation
- Continue to be a model city which others look to for new thinking on environmental issues
- Recognition through the GreenStar Connecticut and EPA Green Power Partnership

**Immediate and near-term renewable power opportunities, which should be investigated:**

- Fuel cell installation at the New Haven WPCA (in the final planning stages)

- Landfill methane, combined heat and power project at the New Haven Landfill (under investigation)
- Integration of photovoltaics at schools and other city buildings, both during new construction and retrofits
- Consider potential wind generation sites such as ridges and shoreline
- Renewable power purchase as a part of a competitive bid for the City's energy procurement
- Purchase of renewable energy certificates from upwind states.
- This is a long-term effort that will need creative solutions and input from the community, which may necessitate the continuation of the task force or some other advisory body.

**Renewable power is a piece of the City's integrated air quality program, which also includes:**

- The Energy Management Program, which oversees energy-efficiency and conservation investments
- The Clean Fleets/Clean Fuels program (natural gas vehicles, electric trolleys, ultra-low sulfur diesel fuel)
- The school construction program's commitment to build new schools to EPA Energy Star and the American Green Building Council's LEED standards to maximize building efficiency and reduce environmental impacts
- The Cities for Climate Protection program and the development of a local action plan to meet a greenhouse gas reduction target
- The transportation choices initiative embraced in the City's new comprehensive plan, including improving the City's bike paths and greenways.

New Haven should continue to embrace initiatives such as the 20% by 2010 campaign which make it a more livable and sustainable community.

The Clean Energy Task Force should continue to meet, oversee, and advise the city on the implementation of this policy. The Task Force should coordinate with and include Members of the Environmental Commission. The Task Force should also seek outside funding to assist with implementation and capital expenses and should also work to encourage and assist other groups in the New Haven community to form a network which embraces the 20% by 2010 campaign.

# Notes

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- 1 U.S. Global Change Research Program, "New England Regional Assessment of the Potential Consequence of Climate Variability and Change" (2001). Available online [www.necci.sr.unh.edu/2001-NERA-report.html](http://www.necci.sr.unh.edu/2001-NERA-report.html).
- 2 IPCC, "Summary for Policymakers: Third Assessment Report of Working Group I," 2001 (7). [www.ipcc.ch/pub/spm22-01.pdf](http://www.ipcc.ch/pub/spm22-01.pdf).
- 3 Madeleine Weil, "Greenhouse Gas Emissions Inventory & Forecast Report." New Haven Department of City Plan and the International Council of Local Environmental Initiatives, 2001.
- 4 See [www.iclei.org/ccp](http://www.iclei.org/ccp) for details.
- 5 For methodology and detailed results, see the City of New Haven's Greenhouse Gas Inventory and Forecast Report (Weil, 2001).
- 6 Connecticut Office of Policy & Management, "Current Population Projections," Series 95.1, September 1995, online, <http://www.opm.state.ct.us/pdpd3/data/project.htm>.
- 7 Emissions from the New Haven Parking Authority, the Water Pollution Control Authority, and the New Haven Public Schools are included in the corporate GHG inventory.
- 8 Includes black carbon from diesel vehicles.
- 9 Mark Z. Jacobson, "Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming," *Journal of Geophysical Research*, Vol. 107, No. D19, p. ACH 16-1 to 16-22, 2002.
- 10 Mark Z. Jacobson, "Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming," *Journal of Geophysical Research*, Vol. 107, No. D19, p. ACH 16-1 to 16-22, 2002.
- 11 Connecticut Fund for the Environment, "The Drive for Cleaner Air in Connecticut: The Benefits of Adopting the California Low-Emission Vehicle Standard for Cars and Light Duty Trucks," September 2003. This estimate is based on a minimum compliance scenario. CFE reports that if there is more aggressive adoption of alternative technology in passenger cars and light trucks, emission reductions beyond Tier II could amount to 4.2%.
- 12 These numbers were calculated using results from Mobile 6 model runs by Cambridge Systematics for Connecticut Fund for the Environment. Reductions calculated for the state of Connecticut were apportioned to New Haven using an estimated 2020 VMT ratio. Projected New Haven VMT = 924,618,002, projected Connecticut VMT = 37,100,000,000. Cambridge Systematics' model simulates a minimum compliance scenario.
- 13 See State and Local Leadership on Transportation and Climate Change, Center for Clean Air Policy (2003); *The Relationship Between Air Quality and Land Use Patterns: A Review of Relevant Technical Studies and Analytic Tools*, Hagler Bailly for the Ozone Transport Commission (1999); *The Smart Growth – Climate Change Connection*, Conservation Law Foundation (2000).
- 14 The US Green Building Council is the only nonprofit consensus coalition of the building industry that promotes the understanding, development, and accelerated implementation of "green building" policies, programs, technologies, standards and design practices. [www.usgbc.org](http://www.usgbc.org)
- 15 Executive Order 13123: Greening the Government through Efficient Energy Management. Federal Energy Management Program ([www.eren.doe.gov/femp/aboutfemp/exec13123.html](http://www.eren.doe.gov/femp/aboutfemp/exec13123.html)).
- 16 Energy Star® is a voluntary certification program managed by EPA and industry. The Energy Star label identifies products that are in the upper 25% of energy efficiency for all similar products, or at least 10% more efficient than the minimum level that meets federal standards
- 17 Conversation with Michael Fumiatti, City Purchasing Agent and Carl Ioveino, Information Technology, City of New Haven. Although some of these products are Energy Star rated, it is unlikely that energy-saving features have been enabled.
- 18 Clean Water Action, Smart Power, Environment Northeast and the Inter-religious Ecojustice Network.
- 19 Derek Murrow, Environment Northeast, Memo to City of New Haven Mayor's Task Force on Clean Energy Choices (12/18/2003).
- 20 Connecting Land Use and Energy, International Council for Local Environmental Initiatives, Case Study #32.
- 21 Orfield, Myron and Thomas Luce. "Connecticut Metropatterns: A Regional Agenda for Prosperity in Connecticut." Ameregis. Metropolitan Area Research Corporation, March 2003 (6).
- 22 See Report of the State of Connecticut Blue Ribbon Commission on Property Tax Burdens and Smart Growth Incentives (2003); *Connecticut Metropatterns: A Regional Agenda for Community and Prosperity in Connecticut*, Myron Orfield, et al. (2003); *Connecticut: Economic Vitality and Land Use*, Connecticut Regional Institute for the 21st Century (2003); *Is Connecticut Sprawling*, Regional Plan Association (2002); *Promoting Smart Growth in Connecticut*, Harvard Design School (2002); *10 Principles of Smart Growth in Connecticut*, Connecticut Conference of Municipalities (2001); *Connecticut Strategic Economic Framework [the "Gallis" report]* (1999); *Transportation: A Strategic Investment*, Connecticut Transportation Strategy Board (2003).
- 23 Report of the State of Connecticut Blue Ribbon Commission on Property Tax Burdens and Smart Growth Incentives, 2003 (41).
- 24 Central Cities: Bridgeport, Hartford, New Haven, Waterbury. Stressed Municipalities: Ansonia, Bristol, Derby, East Hartford, Meriden, New London, New Britain, Norwalk, Norwich, West Haven and Windham. CBDs (not already included in above lists): Danbury, Stamford.
- 25 See State and Local Leadership on Transportation and Climate Change, Center for Clean Air Policy (2003); *The Relationship Between Air Quality and Land Use Patterns: A Review of Relevant Technical Studies and Analytic Tools*, Hagler Bailly for the Ozone Transport Commission (1999); *The Smart Growth – Climate Change Connection*, Conservation Law Foundation (2000).
- 26 Two recent Blue Ribbon Reports, Report to the State of Connecticut of the Blue Ribbon Commission on Property Tax Burdens and Smart Growth Incentives (October 2003) and Report of the Blue Ribbon Commission to Study Affordable Housing (October 2000) are examples of in-depth research and analysis of two issues crucial to smart growth.
- 27 Accommodating Bicycle and Pedestrian Travel: A Recommended Approach. US DOT Policy Statement on Integrating Bicycling and Walking into Transportation Infrastructure (<http://www.fhwa.dot.gov/environment/bikeped/Design.htm>). See Also: Capitol Region Council of Governments Policy Statement on Integrating Bicycling and Walking into Transportation Infrastructure.
- 28 Calculated with ICLEI Clean Air and Climate Protection Software, Torrie Smith Associates, Inc. Based on 2020 fleet-wide passenger vehicle emission factors.
- 29 The Health Costs of Motor-Vehicle-Related Air Pollution, McCubbin, D., Delucchi, M., *Journal of Transport Economics and Policy* (1999).
- 30 McCubbin and Delucchi's cost factors were given in 1991 dollars. Consumer price index values were used to convert to 2000 dollars.
- 31 Measuring the Health Effects of Sprawl: A National Analysis. Barbara A. McCann and Reid Ewing, *Surface Transportation Policy Project* (2003).

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32 Linking Vision with Capital –Challenges and Opportunities in Financing Smart Growth, Research Institute for Housing America – Institute Report No. 01-01, September 2001. (<http://www.housingamerica.org/docs/RIHA01-01.pdf>)

33 Driven to Spend: The Impact of Sprawl on Household Transportation Expenses. Surface Transportation Policy Project (2000). (<http://www.transact.org/report.asp?id=36>)

<sup>34</sup> 55,023 people redirected from non-urban to urban areas. 2.53 people per CT household.  $55,023 / 2.53 = 21,748$  households.  $21,748$  households \* \$1300 per household = \$28,272,400.

<sup>35</sup> *Impact Assessment of the New Jersey State Development and Redevelopment Plan*. Center for Urban Policy Research (2001).