

ENERGY &

CLIMATE

ACTION

PLAN



City of Binghamton
December 2011

Energy & Climate Action Plan Vision

CHOOSING OUR FUTURE

The goal of this Energy and Climate Action Plan is to put Binghamton on a path to a healthy future that preserves and enhances our quality of life for residents, visitors, workers, businesses and institutions. The plan is designed to inspire responsible resource use, energy consumption, waste management, and development of renewable energy technology. These efforts will guide our community and help us to thrive now and into the future.

ENVISIONING TOMORROW

- Binghamtonians are actively minimizing waste by recycling, re-using, improving waste management and are leading the way in the transition from a fossil-fuel economy to a renewable-energy based economy.
- Our homes, offices, shops and public buildings are comfortable, energy efficient, healthy, and powered by renewable energy.
- Binghamton streets are lined with urban forests cooling our city. Community gardens and green roofs are living landscapes that clean our air and water, provide food and beautify our public spaces.
- Much of our food comes from regional farms and backyard and community gardens and sustains economic vitality. Regionally produced, healthy foods are accessible to all.
- Our business districts, neighborhoods, schools, and parks are walkable and bikeable. Many people carpool, and vehicles are efficient and run on clean energy.
- Our historic buildings and housing stock have been preserved to retain the character of our city and to prevent the embodied energy in these buildings from ending up in the landfill.
- Green-collar jobs are a significant component of our economy and partnerships with our educational institutions keep Binghamton on the cutting edge of technology.
- Working together, government, citizens, and the private sector have informed themselves of the likely impacts that climate change will bring to our region and have implemented appropriate policies, plans and infrastructure changes to ensure that Binghamton continues to prosper in an era of warmer temperatures, more volatile weather, and more frequent flooding and severe droughts.

Acknowledgments

The City of Binghamton wishes to thank the following community members, staff, and student interns for their contributions in developing this Energy and Climate Action Plan.

Climate Action Citizen Advisory Committee

(Affiliations of the Advisory Committee members are provided for identification purposes only and are not intended to represent the endorsement of their organizations.)

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TIMELINE

2008-2012: Kyoto Protocol compliance period
(United States target: 7% below 1990 levels)

Kyoto Protocol

1997

Mayor Matt Ryan introduced a Resource Conservation Policy to help the City reduce carbon emissions, minimize resource consumption, and cut costs

2008

The City became a member of Local Governments for Sustainability (ICLEI), and committed to participating in ICLEI's Cities for Climate Protection campaign

2009

The City of Binghamton's greenhouse gas inventory for the baseline year 2006 was completed

2010

Binghamton Climate Action Plan is completed

December 2011

Goal: Implementation of the Action Plan

2012-2025

1992

Rio Earth Summit (United Nations Framework Convention on Climate Change)

2007

Mayor Matt Ryan signed the United States Conference of Mayors Climate Protection Agreement pledging a reduction in the City's greenhouse gas emissions to 7 percent of 1990

2009

The City's Commission on Sustainable Development and Smart Growth released its report, *Moving Toward Sustainability: An Opportunity for Growth and Prosperity*

2010

City Selected to Participate in the Development of the New York State Climate Action Plan

2011

The installation of a 49.68 KW solar photovoltaic system at the City's Water Treatment Plant was completed

2012-2025

Goal: Monitor and evaluate the impacts of the Action Plan

2025

Binghamton Goal: 25% below 2006 levels

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Commonly Used Abbreviations

AFV – Alternative fuel vehicle

Be2 – Binghamton Energy Efficiency Program

BMTS- Binghamton Metropolitan Transportation Study

BTU –“ British Thermal Unit” a traditional unit of energy

C&D – Construction and demolition

CAP- Climate Action Plan

CAUD – Commission on Architecture and Urban Design

CO₂e- Carbon Dioxide Equivalent

DEC – Department of Environmental Conservation (New York State)

DMV – Department of Motor Vehicles

DPW – Department of Public Works

EPA- Environmental Protection Agency

EPEAT- Electronic Product Environmental Assessment Tool

EPP – Environmentally Preferable Purchasing

EV- Electric Vehicle

FHWA- The U.S. Federal Highway Administration

GIS- Geographic Information System

GHG- Greenhouse Gas

HERS- Home Energy Rating System

HPEV- High Performance Electric Vehicles

HUD – Department of Housing and Urban Development

ICLEI- ICLEI Local Governments for Sustainability - an international association of local governments and national and regional local government organizations that have made a commitment to sustainable development.

IECC- International Energy Conservation Code

LED- Light Emitting Diode

LEED- Leadership in Energy and Environmental Design

MSW – Municipal solid waste

NYPIRG- New York Public Interest Research Group

NYSEG- New York State Electric and Gas

NYSERDA- New York State Energy Research and Development Authority

PACE programs- Property Assessed Clean Energy

PHEV- Plug-in Hybrid Electric Vehicle

PILOT- Payment In Lieu of Taxes

SEQRA – State Environmental Quality Review Act

USDOE – United States Department of Education

USGBC – United States Green Building Council

VINES- Volunteers Improving Neighborhood Environments

VMT – Vehicle miles traveled

I. Letter from the Mayor

I am pleased to present Binghamton's Energy and Climate Action Plan. The completion of this plan is an important step in our efforts to cut energy costs and combat climate change. Guided by this plan, the City of Binghamton will carry out policies, practices and programs to minimize household, business, and government energy costs and greenhouse gas emissions. These efforts will help our community thrive now and in the future. I would like to thank the City staff and Climate Action Citizen Advisory Committee members who worked tirelessly on this effort over the past two years.

I believe that long-term strategies that promote a clean environment, social equity, and a green economy are essential for the prosperity of our city and our country. Since I came to office in 2006, I have prioritized green municipal practices and sustainable development. On April 4, 2007, I signed the United States Conference of Mayors Climate Protection Agreement, pledging a reduction in the City's greenhouse gas emissions to 7% of 1990 levels by 2012. Later that year, I worked with City Council to dedicate resources for a Sustainable Development Planner so that our City would have the expertise and leadership to meet our sustainability goals. We have since implemented a number of policies and practices to reduce emissions, such as purchasing hybrid police vehicles, adopting a conservation policy for City operations, installing solar panels at the Water Treatment Facility, and promoting waste reduction and recycling. The release of the Energy and Climate Action Plan is just the latest achievement in these efforts.

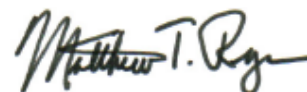
We can no longer pretend that climate change isn't occurring. Binghamton has been devastated by two 100-year flooding events in just five years. Scientists are gathering data which indicates that rain storms and floods *are* increasing in frequency and magnitude and *are* a result of human-caused climate

change.¹ Climate change is hurting citizens financially and putting them in harm's way here Binghamton and beyond. We must act now to counter these disturbing trends.

Reducing energy consumption and curbing greenhouse gas emissions not only combats climate change, but also promotes energy independence, creates jobs, limits taxes, reduces energy expenses for residents and business owners, and develops a more vibrant economy. The actions outlined in this plan will help Binghamton achieve each of these goals.

This Energy and Climate Action Plan is a call to action. It sets out measures that Binghamton can take to reduce emissions of greenhouse gases by 25% by 2025. I urge all Binghamton residents to join the City as we take these bold steps toward developing a sustainable and prosperous future for generations to come.

Sincerely,



Matthew T. Ryan
Mayor, City of Binghamton, NY

¹ R. M. Hirsch & K. R. Ryberg (2011). *Has the magnitude of floods across the USA changed with global CO2 levels?* Hydrological Sciences Journal, DOI:10.1080/02626667.2011.621895. Available at: <http://dx.doi.org/10.1080/02626667.2011.621895>

New York State Water Resources Institute. *An Overview of Possible Changes in Regional Climate and Hydrology*. Available at: http://wri.eas.cornell.edu/climate_change.html.

II. Executive Summary

Rising energy costs and climate change are two of the defining challenges of the 21st century. Binghamton has already experienced many climate extremes in the last decade and set new local records for flooding, number of summer days over 90 degrees, and extreme winter snowfalls. Over 2,500 scientists in 130 countries make up the Intercontinental Panel on Climate Change and their report concludes that:

1. The Earth's climate is changing.
2. The change is caused by human activity.
3. These effects will worsen if no action is taken.

If we allow the current business-as-usual trends to continue, we will see drastic changes in climate and skyrocketing prices for energy. Both pose significant threats to the wellbeing of people across the planet. However, we shouldn't just see climate change as a threat – taking action to combat climate change is an *opportunity* to create jobs, develop a safer and more reliable energy supply, lower our housing costs, save tax dollars, enhance our environment for generations to come, and improve the quality of life for all residents of our planet. This plan identifies 51 actions in six categories to put Binghamton on a path to accomplish an emission target of a 25% reduction below 2006 levels by 2025 while achieving all of these additional, important goals. Further, the plan addresses actions Binghamton should take to ensure that it is prepared to endure the impacts of climate change.

Binghamton has joined with many other cities across the nation to participate in the Cities for Climate Protection (CCP) campaign sponsored by ICLEI – Local Governments for Sustainability. Officials in each of these cities have publicly recognized global climate change as a legitimate local concern and have committed themselves to addressing that threat by developing and implementing action plans. The development of this Energy and Climate Action Plan and establishing a reduction target for the City of Binghamton is a part of the five milestone climate action process that Binghamton is undertaking as a member of ICLEI. The five milestones are:

1. Conduct a baseline emissions inventory and forecast ✓
2. Adopt an emissions reduction target ✓
3. Develop a Local Action Plan ✓
4. Implement policies and measures
5. Monitor and verify results



Binghamton's MacArthur Elementary School during the 2011 Flood

Overview of Binghamton's Energy and Climate Action Plan

An Energy and Climate Action Plan plots our course for an important journey into our future. Such a plan is a description of the actions – policies, programs, and projects – a government will take to reduce a community's dependence on fossil fuels and to meet its greenhouse gas (GHG) reduction target. Our Energy and Climate Action Plan Committee has undertaken an intensive process to explore policy and program options for reducing Binghamton's emissions and has selected the most practical actions for our community. In this Plan, we have outlined those actions with details as to why they were selected and how they can be implemented.

This plan was developed by a Climate Action Citizen Advisory Committee with input from City staff and assistance from the City's Sustainable Development Planner and Planning Department interns. The eleven member Climate Action Advisory Committee consisted of concerned residents, community leaders, and local professionals. From the winter of 2009 to the fall of 2010, the Committee worked to identify and evaluate potential policies and measures that would reduce greenhouse gas emissions and energy consumption while enhancing public health, economic competitiveness, and City government's operating efficiency. The recommended actions listed in this plan were selected out of hundreds of potential actions for their cost effectiveness, overall impact, feasibility, and related co-benefits. Input from City staff was also sought and considered in the selection process.

To ensure the plan is implemented and that measurable progress is made, the City of Binghamton should:

- Develop an annual action plan and provide an annual report summarizing the progress toward implementing the Energy and Climate Action Plan
- Evaluate existing actions and identify new actions every three years or as needed
- Conduct a greenhouse gas emission inventory every five years
- Update the Energy and Climate Action Plan every ten years

The Plan: Objectives and Actions

1. Buildings and Energy

2. Transportation and Land Use

3. Waste Management, Reduction, and Recycling

4. Local Food, Agriculture, and Urban Forestry

5. Outreach & Education

6. Government Action

7. Adaptation

III. Introduction

Two strategies exist for coping with climate change and its consequences: *mitigation* and *adaptation*. This Energy and Climate Action Plan focuses mainly on mitigating climate change—implementing policies to reduce greenhouse gas levels. Adaptation, which is briefly addressed in section V, refers to implementing initiatives and measures that reduce our vulnerability to the effects of climate change. As the International Council for Local Environmental Initiatives phrases it, mitigation protects nature from society, while adaptation protects society from nature.

The reality is that even if all nations were to reduce their greenhouse gas emissions by 80% by 2050, the Earth’s climate will continue to change and average temperatures will continue to increase well into the 21st century, with average temperatures rising by at least several degrees. However, if we allow the current business as usual trends to continue, we will see not only drastic changes in climate but skyrocketing prices for energy. Both pose significant threats to the wellbeing of people across the planet.

Though meaningful action to address climate change and improve our nation’s energy policies has not taken place on the Federal level, bold reforms and innovative actions have emerged over the decade at both the state and local levels. More than 1054 mayors from the 50 states, the District of Columbia and Puerto Rico, representing a total population of over 88,499,854 citizens, have signed the Mayor’s Climate Protection Agreement. More than 1,100 cities worldwide, including 600 in the US, have joined ICLEI-Local Governments for Sustainability (ICLEI). Through this work, ICLEI helped local governments reduce their greenhouse gas emissions by 23 million tons in 2005 alone. This translates into about \$600 million in annual cumulative savings, largely on energy expenditures.² Most Mayors and Governors, who deal daily with economic, environmental and social challenges introduced by climate change, are stepping up to the challenge of combating climate change. Rather than waiting for direction from Washington, our state and local leaders have instead taken bold action to deal responsibly with climate change. To these officials, it has become clear that investing in GHG mitigation strategies is a path toward a more vital, prosperous and secure future (see section VI. *Energy and Climate Policy: The National and Global Context* for more on this subject).



Map of Signatory Communities of the US Conference of Mayors’ Climate Protection Agreement. Source: <http://www.usmayors.org/climateprotection/ClimateChange.asp>

² ICLEI-Local Governments for Sustainability Website: <http://www.icleiusa.org/about-iclei>.

The development of this Energy and Climate Action Plan and establishing a reduction target for the City of Binghamton is a part of the five milestone climate action process that Binghamton is undertaking as a member of ICLEI. The five milestones are:

6. Conduct a baseline emissions inventory and forecast ✓
7. Adopt an emissions reduction target ✓
8. Develop a Local Action Plan ✓
9. Implement policies and measures
10. Monitor and verify results

Strategies for completing the remaining two milestones are addressed in the conclusion of this plan.

The remainder of this introduction will address climate change in the northeast and provide an overview of the structure of this Energy and Climate Action plan, along with detail on how the plan was developed.

A. Climate Change in the Northeast^{3,4}

The most frequently discussed impacts of climate change include changes in sea ice, rising ocean levels, and more severe droughts in arid regions (for a more detailed overview of Climate Change, see *Appendix A: Climate Change 101*). Because Binghamton is neither coastal nor arid, these impacts may seem distant. Binghamton and the Northeastern United States will experience different kinds of changes with a shifting climate that will have significant impacts on our agricultural economy and quality of life in rural to urban communities.

1970 to the Present

In 2009, in *Global Climate Change Impacts in the United States*, Thomas R. Karl of NOAA's National Climatic Data Center wrote that "since 1970, the average temperature in the Northeast has increased by 2°F, with winter temperatures rising twice this much". The rise in temperature, according to the report, has resulted in many other climate-related changes, including:

³ Northeast Climate Impacts Assessment (2007). *Confronting Climate Change in U.S. Northeast*. Available at: <http://www.climatechoices.org/assets/documents/climatechoices/confronting-climate-change-in-the-u-s-northeast.pdf>.

⁴ Union of Concerned Scientists (2007). *New York: Confronting Climate Change in the U.S. Northeast*. Available at: http://www.climatechoices.org/assets/documents/climatechoices/new-york_necia.pdf.

- More frequent days with temperatures above 90°F
- A longer growing season
- Increased heavy precipitation
- Less winter precipitation falling as snow and more as rain
- Reduced snow pack
- Earlier breakup of winter ice on lakes and rivers
- Earlier spring snowmelt resulting in earlier peak river flows
- Rising sea surface temperatures

The report notes that “The Northeast is projected to face continued warming and more extensive climate-related changes, some of which could dramatically alter the region’s economy, landscape, and quality of life”. Over *the next several decades*, the report projects a rise in Northeast temperatures of an additional 2.5°F to 4°F in winter and 1.5°F to 3.5°F in summer. Of particular concern to the Binghamton region is the increased likelihood, as noted just above, of increased periods of extreme precipitation which will increase flooding. As the U.S. Global Change Research Program noted in its 2010 report *Global Climate Change Impacts in the United States* “one of the clearest precipitation trends in the United States is the increasing frequency and intensity of heavy downpours.” It is projected to result in “rainfall that will measure 10 to 20 percent higher than current averages” by the end of the century. Superfloods such as that of 2006 may with increasing frequency threaten human health and economic security of the Southern Tier.

Projected Northeastern Climate Change to 2100

When developing projections of what the climate is likely to be over coming decades, scientists typically generate three scenarios: one for a “lower”, one for “middle”, and one for “higher” human caused or “anthropogenic” greenhouse gas emissions. The lower emissions scenario assumes an 80 percent reduction of greenhouse gas emissions by 2050. The higher emissions scenario, *a.k.a.* “business as usual”, assumes little if any significant reduction in annual human caused or anthropogenic greenhouse gas emissions. Under the business as usual scenario, the National Climatic Data Center report projects that by the end of this century, in the Northeast:

- The length of the winter snow season would be cut in half across northern New York, Vermont, New Hampshire, and Maine with fewer cold days and more precipitation
- Cities that today experience few days above 100°F each summer would average 20 such days per summer
- Short-term (one-to-three month) droughts are projected to occur as frequently as once each summer in the Catskill Mountains
- Hot summer conditions would arrive three weeks earlier and last three months longer
- Extreme heat and declining air quality will pose increasing problems for human health, especially in urban areas
- Large portions of the Northeast are likely to become unsuitable for growing popular varieties of apples, blueberries, and cranberries
- Climate conditions suitable for maple/beech/birch forests are projected to shift dramatically northward, eventually leaving only a small portion of the Northeast with a maple sugar business

- Agricultural production is likely to be adversely affected as favorable climates shift northward. Dairy cattle are projected to suffer declines in July milk production because of increased heat stress
- Quality of life will be affected by increasing heat stress, water scarcity, severe weather events, and reduced availability of insurance for at-risk properties

B. What is an Energy and Climate Action Plan?

An Energy and Climate Action Plan plots our course for an important journey into our future. Such a plan contains a description of the actions – policies, programs, and projects – a government will take to meet its greenhouse gas (GHG) reduction target. Binghamton’s Energy and Climate Action Plan Committee has undertaken an intensive process to explore policy and program options for reducing Binghamton’s emissions and has selected the most practical actions for our community. In this Plan, we have outlined those actions with details as to why they were selected and how they can be implemented.

The plan provides us with guideposts pointing the way to:

- a prosperous local economy
- a future with more transportation options
- more choices for efficient, renewable energy
- energy-efficient buildings
- a healthier population
- reduced waste and less costly landfills
- a greener city with better air quality

A Energy and Climate Action Plan helps everyone envision pathways to:

- Transition to a better future by focusing on key sectors: buildings, energy, land use, waste management, transportation, and food networks
- Educate our community about solutions
- Advocate for policy changes at the local level and gain a commitment from stakeholders
- Promote innovation and investment
- Inspire residents and business to work together toward a better future on this planet
- Improve the image of Binghamton as a city moving toward a positive future, thus attracting new residents, visitors and economic development.

Why do we need an Energy and Climate Action Plan?

Since half the world’s population lives in urban areas and a significant portion of the human activities that lead to global climate change are concentrated in cities, city governments must be included in global efforts to mitigate climate change. Municipal governments have an

important role because they have considerable authority over land-use planning, transportation policy and waste management, and can also 'lead by example' by reducing energy consumption and greenhouse gas (GHG) emissions.

Binghamton has joined with many other cities across the nation to participate in the Cities for Climate Protection (CCP) campaign sponsored by the International Council for Local Environmental Initiatives (ICLEI). Officials in each of these cities have publicly recognized global climate change as a legitimate local concern and have committed themselves to addressing that threat by developing and implementing a Climate Action Plan.

Binghamton has already experienced many climate extremes in the last decade and set new local records for flooding, number of summer days over 90 degrees, and extreme winter snowfalls. For more information on the basics of climate change and expected impacts for our planet and region, see Appendix A, Climate Change 101.

Over 2,500 scientists in 130 countries make up the Intercontinental Panel on Climate Change and their report concludes that:

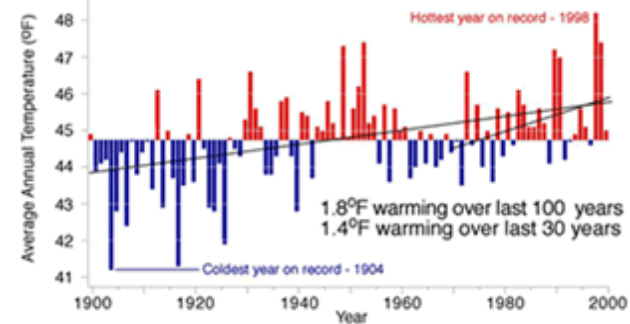
1. The Earth's climate is changing.
2. The change is caused by human activity.
3. These effects will worsen if no action is taken.

Every person, business and governmental agency on the planet has a responsibility to take action in face of this growing threat to our way of life. However, we shouldn't just see climate change as a threat – taking action to combat climate change is an *opportunity* to create jobs, develop a safer and more reliable energy supply, lower our housing costs, save tax dollars, enhance our environment for generations to come, and improve the quality of life for all residents of our planet.

C. Overview of Binghamton's Energy and Climate Action Plan

This plan was developed by a Climate Action Citizen Advisory Committee with input from City staff and assistance from the City's Sustainable Development Planner and Planning Department interns. The eleven member Climate Action Advisory Committee consisted of concerned residents, community leaders, and local professionals. From the winter of 2009 to the fall of 2010, the Committee worked to identify and evaluate potential policies and measures that would reduce greenhouse gas emissions and energy consumption while enhancing public health,

Average Annual Northeast Temperature



Courtesy of the Climate Data Map Service,
University of New Hampshire

Local government agencies spend more than *\$10 billion a year on energy* to provide public services and meet constituent needs.

Local governments also must grapple with tightening budgets – another reason to save money by reducing energy use.

economic competitiveness, and City government’s operating efficiency. The recommended actions listed in this plan were selected out of hundreds of potential actions for their cost effectiveness, overall impact, feasibility, and related co-benefits.⁵ Input from City staff was also sought and considered in the selection process.

From the winter of 2010 to summer of 2011, the Committee wrote the plan, taking care to layout each recommended action in nontechnical terms with helpful information that can be used to facilitate implementation. An effort was made to provide information in the same format for every recommended action. In cases where a cost analysis was omitted, it was determined that implementing the recommended action would not result in any significant costs or expenditures of staff time for City government. Additionally, some recommended actions do not have CO₂e, energy, and financial savings analysis at the top of the page if this information was provided in a related recommended action or if an accurate analysis wasn’t feasible. The plan has four core strategic action areas (see below for detail) which are used to outline recommended actions to reduce emissions for both the community and local government. The four core strategic action areas are:

- 1. Buildings and Energy**
- 2. Transportation and Land Use**
- 3. Waste Management, Reduction, Re-Use and Recycling**
- 4. Local Food, Agriculture and Urban Forestry**

Each core strategic action area has a set of broad objectives relating to promoting energy conservation, energy efficiency, the use of renewable energy sources, or offsetting carbon emissions.

Binghamton’s Target: 25% Reduction by 2025

The Climate Action Citizen Advisory Committee proposes that the City adopt the emission target of a 25% reduction below 2006 levels by 2025. The Committee believes that this target is ambitious yet attainable if the recommended actions in this plan are implemented. Coupled with the State and Federal policies and programs, the Committee hopes that this goal will even be exceeded.

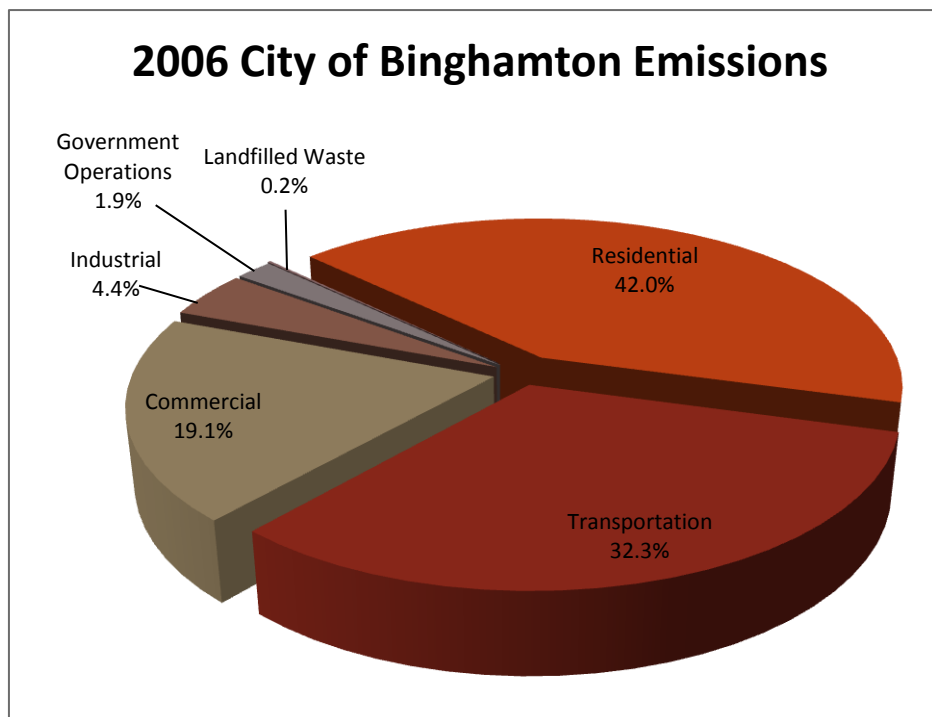
⁵ Strategies that reduce greenhouse gas emissions typically have additional benefits, labeled in this document as co-benefits. For example, policies that reduce vehicle miles traveled and greenhouse gas emissions from transportation also have public health co-benefits, i.e. improved air quality and thus reduced asthma rates, increased physical activity and thus reduced chronic disease rates, etc.

IV. Greenhouse Gas Inventory Summary⁶

In 2009, a comprehensive, city-wide Greenhouse Gas Inventory for the baseline year of 2006 was performed in order to determine the components of Binghamton's greenhouse gas emissions and what activities were responsible for producing those gases.⁷ An inventory is an essential part of developing a climate action plan as it helps a community determine which investments will generate the greatest reductions in emissions.

The overall profile of Binghamton's greenhouse gas emissions is similar to that of other communities in the United States, with buildings and transportation accounting for the majority of emissions. In Binghamton, the private building sector (commercial, industrial & residential) accounts for 60.5% of overall emissions. Transportation is the next largest emission source and contributes to nearly a third of Binghamton's emissions. The remaining sectors (industrial, governmental, and landfilled waste) account for a relatively small portion of Binghamton's overall emissions, but are significant sources nevertheless (see 2006 City of Binghamton Emissions Figure).

The inventory reported that Binghamton's total greenhouse gas emissions in 2006 was 648,544 tons of carbon dioxide equivalents (CO₂e).⁸ Based on population data from the 2000



Source: *City of Binghamton Greenhouse Gas Inventory Report for Baseline Year 2006.*

⁶ It should be noted that costs outlined in this section are no longer current. Utility and vehicle fuel costs have risen significantly since 2006.

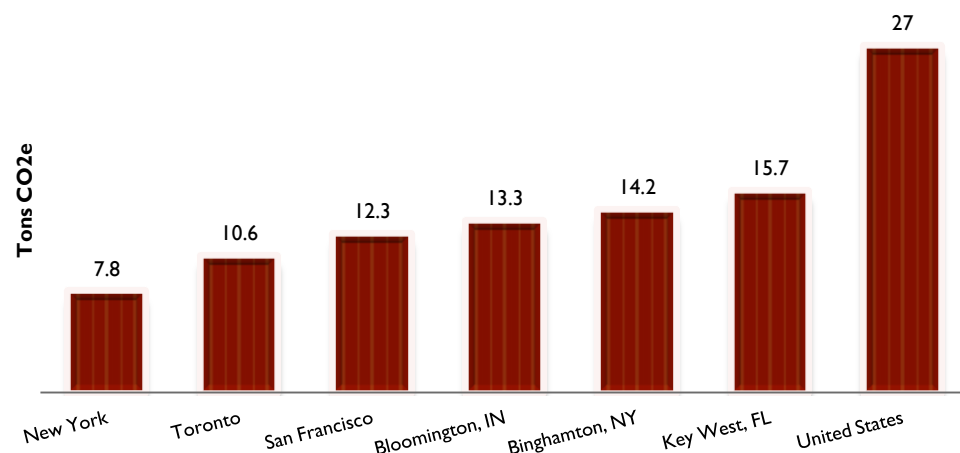
⁷ The complete inventory can be found online at: <http://www.cityofbinghamton.com/department.asp?zone=dept-planning&pid=78&pm=page>.

⁸ As one reads through this report, it is important to note that the term carbon dioxide equivalents (CO₂e) is often used to quantify emissions as opposed to tons of each type of gas. Since different greenhouse gases have different global warming potentials (GWP), scientists developed CO₂e as a universal standard of (footnote continued)

Census, Binghamton's 2006 emissions per capita were 14.2 tons of CO₂e. This number is significantly lower than the United States per capita emissions, yet it is higher than the per capita emissions for larger North American cities (see Per Capita Emissions Chart).⁹

Like other communities, the inventory showed that the majority of emissions in Binghamton came from the private sector, or the 'Community' as categorized by the Clean Air Climate Protection inventory software. Only 1.9% of the emissions in Binghamton came from activities that are within the City government's financial or operational control.

Per Capita Emission Comparison



Residential energy consumption accounted for the majority of the community's greenhouse gas emissions. Data from NYSEG on residential electric and gas consumption was used to calculate emissions from this sector. Transportation accounted for nearly a third of community greenhouse gas emissions. The Binghamton Metropolitan Transportation Study (BMTS) determined that there was an average of 885,499 vehicle miles traveled (VMT) daily, or 323,207,135 VMT annually, on roads within the City of Binghamton's boundaries. Gasoline passenger cars and light trucks accounted for 93% of the vehicles traveled in Binghamton, while diesel passenger cars, light trucks and heavy duty trucks accounted for the remaining 7%.

The remaining constituents of the community's greenhouse gas emissions came from commercial and industrial businesses and landfilled waste. Landfilled waste produced

101,910 lbs of methane and accounted for 0.2% of the community's emissions. Also, a large portion of the City Government's Department of Public Works fleet was devoted to the transportation of waste to the landfill, indirectly contributing to harmful emissions within the City. It

measure for greenhouse gases. The ability of a gas to trap heat compared to carbon dioxide is considered its GWP, i.e. methane has a GWP of 21 times that of carbon dioxide therefore one ton of methane gas is the equivalent of 21 tons of CO₂, or simply 21 CO₂e.

⁹ Data from other greenhouse gas inventories was used to develop this comparison; however, it is important to recognize that inventories may be completed with slightly different methods. While this comparison might not be perfect, it is a good tool for understanding where Binghamton generally stands relative to other communities in per capita emissions. Source: *City of Binghamton Greenhouse Gas Inventory Report for Baseline Year 2006*.

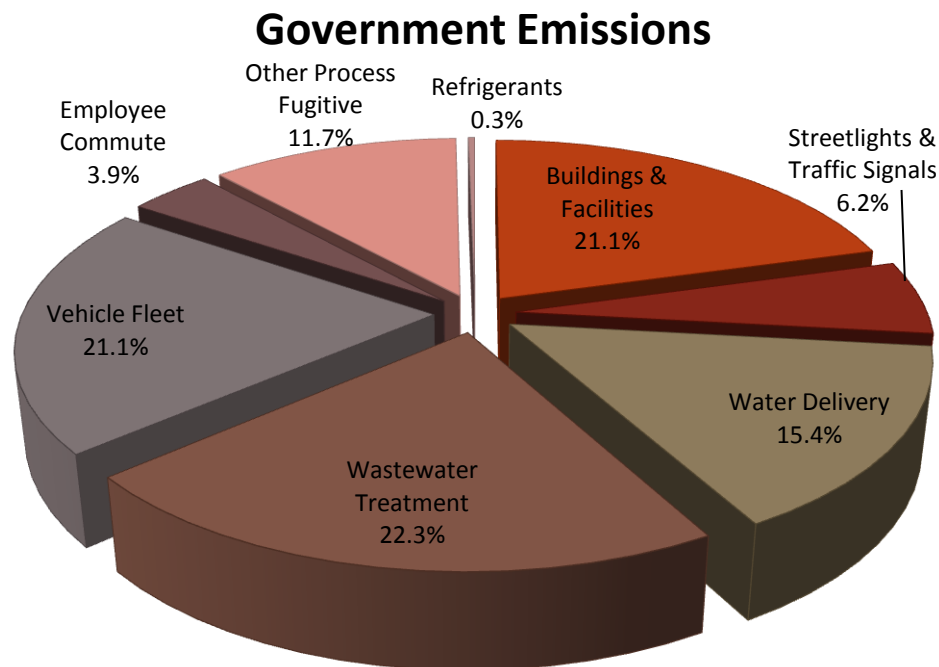
should be noted that while the tonnage of waste landfilled has been increasing overall in the past decade, the percentage of waste being recycled has declined.

City Government contributions to the total greenhouse gas emissions were broken down into Buildings & Facilities, Streetlights & Traffic Signals, Water Delivery, Wastewater Treatment, Vehicle Fleet, Employee Commute, Other Process Fugitive and Refrigerants (see Government Emissions Figure next page). The largest sources of emissions from government operations were Wastewater Treatment, Vehicles, Buildings, and Water Delivery.

Drinking water treatment & delivery and wastewater treatment accounted for 49.4% of the Government's total greenhouse gas emissions. While these are essential processes for urban communities, they are very energy intensive.

The sewage treatment plant is jointly owned by the City of Binghamton and Johnson City and alone counts for 34% of local government emissions. Since the City owns the majority share of the Plant, ICLEI's protocol for inventorying local government emissions dictates that these emissions be included in Binghamton's inventory. On average, the plant processes 20 million gallons of water daily, and 7.3 trillion gallons annually. Energy use at the sewage treatment plant generated 2,265 tons of CO₂ emissions in 2006, 22.3% of government emissions, and cost \$629,597. Since the plant uses anaerobic digestion in the treatment process, biogas (a mixture of methane and carbon dioxide) is produced. In 2006, the Joint Sewage Treatment Plant started to capture some of this biogas to fuel boilers, but 48.12 metric tons of methane were still released into the atmosphere along with nitrous oxide, another greenhouse gas. These "process fugitive sources", meaning they are stationary air pollution sources that generate pollutants from open spaces exposed to wind, accounted for 11.7% of local government emissions.

The Water Delivery sector of the inventory is comprised of the Water Treatment Facility and the pumps that supply water to the community. Water from the Susquehanna River is treated and then pumped up to water tanks on surrounding hills, from which it flows down to the City to service water users when needed. The Water Treatment Facility treats roughly 7 million gallons of water per day and 2.55 billion gallons



Source: City of Binghamton Greenhouse Gas Inventory Report for Baseline Year 2006.

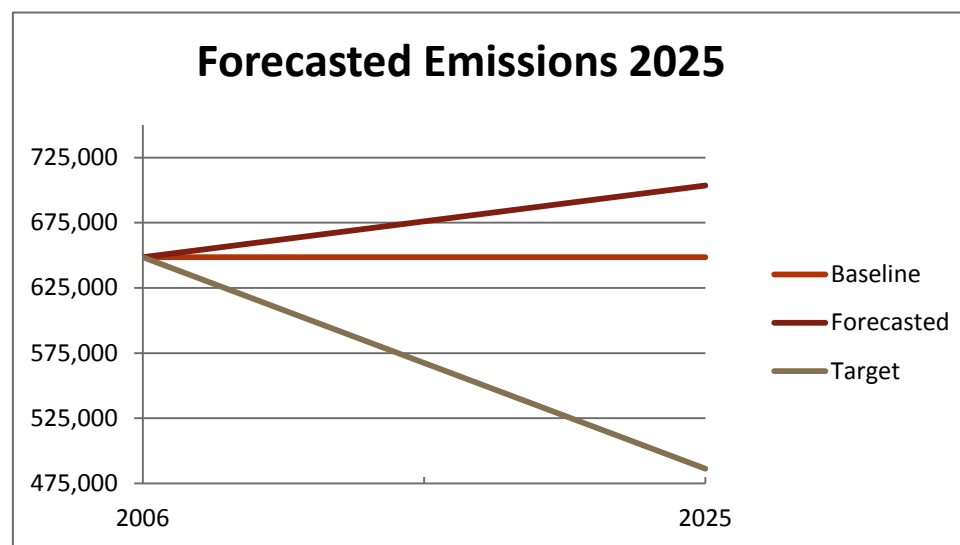
annually. Energy needed for water treatment and delivery processes produced 1,920 tons of CO₂e in 2006, or 15.4% of local government emissions, which cost the City a total of \$238,163.

The Buildings and Facilities sector of the local government consisted of the places over which the City had operational and/or financial control. The facilities included in this sector ranged from fire stations to City Hall to the Central Garage. The analysis found that the Buildings and Facilities sector was responsible for 21.1% of the CO₂e emissions from government operations. Data on the types of energy used, amounts consumed, and electric and gas costs were available in the City's utility bills. The majority of electricity consumption came from the City Hall, accounting for 46% of the total emissions in the Buildings category.

Vehicle Fleet energy consumption for the City Government also was responsible for 21.1% of emission from government operations. Emissions were analyzed by department and the amount of diesel and gasoline purchased by each department and the corresponding CO₂e emissions were calculated and recorded. The Department of Public Works and Police Department consumed the largest amount of gasoline and diesel. All of the departments combined used 134,080 gallons of gasoline and 95,671 gallons of diesel, costing the City \$422,186 and emitting 2393 tons of CO₂e, or 21.1% of local government emissions.

Streetlights were responsible for almost five times more GHG emissions than traffic lights and underpass lights combined, emitting 692 tons of CO₂e in 2006, 6.2% of local government emissions, and costing the City \$296,940.

In addition to assessing emissions from 2006, the City Binghamton Greenhouse Gas Inventory Report also provides a forecast of Binghamton's future emissions. Projected changes in GHG emissions were determined using resources such as The Annual Energy Outlook conducted by the Department of Energy. If the City were to maintain its current practices (a "Business as Usual" scenario), it would emit 703,634 tons of CO₂e in 2025, 8.5% more than the 642,344 tons it emitted in 2006. To achieve a 25% reduction in emissions from the baseline year of 2006 by 2025, Binghamton must cut its greenhouse gas emissions by 162,136 tons.



V. The Plan: Objectives and Actions

1. Buildings and Energy

2. Transportation and Land Use

3. Waste Management, Reduction, and Recycling

4. Local Food, Agriculture, and Urban Forestry

5. Outreach & Education

6. Government Action

7. Adaptation

1. Buildings and Energy



Overview

Buildings in the U.S. account for 72 percent of the nation's electricity consumption and 38 percent of all carbon dioxide emissions, use 40 percent of raw materials globally, and create 136 million tons of building-related construction and demolition debris annually. Binghamton is like most other U.S. cities in that buildings account for 60.5% of all emissions produced in the City. Buildings have an enormous impact on our health, environment, and economy. Reducing the amount of energy we consume through our buildings will provide countless benefits for the community. Creating more efficient buildings will lower utility costs, decreasing the operating costs for businesses and making homes more affordable. Making energy efficiency improvements to our buildings will also create many local employment opportunities.

Reducing energy needs in this sector by 25% of 2006 levels will prevent over 105,294 tons of CO₂e from being released into the atmosphere. Many approaches can be pursued in order to reach this goal.

Co-Benefits

- Job Creation
- Reduced Utility Costs
- Energy Independence
- Cleaner air and water
- Increased Property Values

1. Buildings and Energy

2025 Objectives	Recommended Actions
1. Reduce energy use in existing buildings by at least 25%	1.1 Promote programs that offer incentives for residential and commercial building energy efficiency improvements
	1.2 Develop additional financial programs to help building owners undertake energy efficiency improvements
	1.3 Improve the energy efficiency of properties that are participating in City programs
	1.4 Encourage the disclosure of building energy performance to prospective tenants and buyers
	1.5 Develop “Greener is Greater Binghamton Challenges” for homes and for businesses
	1.6 Create incentives for adaptive reuse of residential and commercial buildings
	1.7 Develop green building incentives for Projects Receiving Payment In Lieu of Taxes (PILOT) Agreements
2. Reduce energy use in new construction and major renovations of existing buildings by at least 30%	2.1 Adopt green building incentives for high performance new construction
	2.2 Support adoption of the 2012 International Energy Conservation Code in New York State
3. Promote the use of renewable energy in place fossil fuels	3.1 Encourage residents and businesses to purchase electricity from renewable supply sources
	3.2 Encourage homeowners and businesses to install onsite renewable energy generation systems

1.1 Promote Programs that Offer Incentives for Residential and Commercial Building Energy Efficiency Improvements

Based on the performance of the Long Island Green Homes Program, properly insulating a one family home and using the right size furnace or boiler can:¹⁰

CO₂e Savings: Decrease CO₂e emissions 40% (5-10 pounds of CO₂e per day)

Energy Saved: Decrease energy use up to 40%

Financial Savings: Save an average of \$1,050 per year in energy costs

Reducing energy consumption through energy efficiency improvements and conservation measures in existing buildings is one of the most cost effective ways to reduce greenhouse gas emissions. At the same time, this work will help to bolster our economy by creating local jobs and reducing utility costs for residents. Three elements are essential to driving the demand for home energy improvements: 1) a trained, competent workforce, 2) sufficient financing for the improvements, and 3) education and marketing to drive consumer demand. Despite rising energy costs, a high unemployment rate amongst construction workers, and the presence of financial incentives, the demand for energy efficiency improvements remains slack. Contractors are more likely to layoff than to hire, and workforce training programs in this field locally are not meeting enrollment targets. Consumers find the retrofitting process cumbersome, time-consuming and uncertain, and given the high cost of the work, often choose to do nothing. Research indicates that outreach and marketing programs can change this equation if they are customized to address the needs of

¹⁰Home Performance Resource Center (2010). *Best Practices for Energy Retrofit Program Design*. Available at:

http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/best_practices_case_study_long_island.pdf



Co-Benefits

- Reduced utility costs for homeowners & renters
- Improved comfort for occupants
- Job creation

Success Story

Tompkins County Cornell Cooperative Extension's Energy Leadership Program (ELP) generates market demand for energy efficiency improvements by educating community leaders about the potential economic value of the retrofitting process, starting in their own homes. The ELP provides community leaders with information regarding funding opportunities and qualified contractors. These leaders in turn use their trusted positions in their social networks to spread that information. This further generates demand and creates conditions for an expanding workforce.

specific populations, build on existing relationships of trust, make the process easy and fast, and communicate effectively and succinctly.

The City of Binghamton is working with a number of partners, including Broome County Cooperative Extension to replicate the Tompkins County Energy Leadership Program (ELP) for the Binghamton area (see Success Story). Launched in June 2011, the ELP will help connect Binghamton building owners and renters with energy efficiency financing and grant programs [such as those offered by the New York State Energy Research and Development Authority (NYSERDA)]. As more financing programs become available, the ELP will help people find the program that best fits their needs and will help guide them through the process of navigating these programs to successfully upgrade their building. The City should look for additional opportunities to educate building owners about the incentives for and benefits of energy efficiency upgrades.

Cost Analysis: The City is allocating \$160,000 of its Energy Efficiency and Conservation Block Grant funds to seed the Broome County Energy Leadership Program.

Action Steps

- Evaluate the ELP program annually and make improvements
- Explore additional grant and partnership opportunities to expand the ELP and other educational programming
- Encourage owners of large or complex buildings to get a professional commissioning study for their buildings and operations through targeted mailings
- Educate commercial building owners and tenants about energy efficiency incentives
- Explore opportunities to encourage or require entities receiving support through the Binghamton Local Development Corporation to take advantage of state and federal incentives for energy efficiency improvements in order to receive funds for building improvements

“We must make it easy for homeowners to identify and access home energy retrofit financing tools and products.”

- White House Council on Environmental Quality
in *Recovery Through Retrofit* (2009)

Possible Sources of Funding for Building Owners and Renters:

- The New York State Energy Research and Development Authority (NYSERDA):
www.getenergysmart.org
- The Weatherization Assistance Program:
www.eere.energy.gov/wip/wap.htm
- FHA/HUD PowerSaver Program
(in development)

1.2 Develop Additional Financial Programs to Help Building Owners Undertake Energy Efficiency Improvements

A number of factors can prevent people from undertaking energy efficiency work. Two major factors are often: 1) the high upfront cost and 2) the risk of not seeing a financial return on that investment if the property is sold. While energy efficiency improvements pay for themselves through reduced energy costs, it may take years before the savings offset the initial investment.

The City of Binghamton can help to address the barriers caused by lack of credit and financing options by developing and advocating for innovative financing options that are accessible, repayable over a longer time period, and overall, more consumer-friendly than traditional loans. For example, Property Assessed Clean Energy (PACE) programs provide property owners with financing to undertake energy efficiency and renewable energy projects for their homes and commercial buildings that they repay through a special assessment on their property taxes for up to 20 years. This allows the responsibility for repaying the costs of the work to remain with the current owner of the house—meaning, the person enjoying the benefit (reduced energy costs) repays the benefit assessment. The City of Binghamton had initiated the development of a PACE program, called the Binghamton Energy Efficiency (Be2) program. However, roadblocks at the federal level have prevented the program from moving forward (For more information, visit the PACENow website, www.pacenow.org). On-bill financing, a similar type of

"The high turnover rate of housing in the United States has proven to be a significant problem when it comes to financing home retrofits. The debt accrued by a retrofit is tied to the individual making the investment, rather than the home itself, even though the savings are passed on to the next owner of the home. As a result, people are less inclined to invest in home retrofitting... Innovative financing mechanisms [i.e. PACE Programs] ... tie the retrofitting loan to the property instead of the individual, permitting the energy retrofit assessment to be paid off in annual installments as part of the property's usual property tax bill."

- White House Council on Environmental Quality in *Recovery Through Retrofit* (2009)



Success Story

The Long Island Green Homes Program was created by the Town of Babylon, NY in October of 2008. One of the first PACE programs in the nation, this program foots the entire upfront cost of home energy improvements and allows homeowners to repay the financing over time with the money saved from reduced energy bills. Over 400 homes have been completed to date. The average cost per house is \$8,200, and the average savings are \$1,085 per year and 5-10 pounds of carbon emissions per day, or ~20 - 40% reduction in overall household emissions. Since the creation of the program, the Town has seen a 23.5% increase in green jobs.

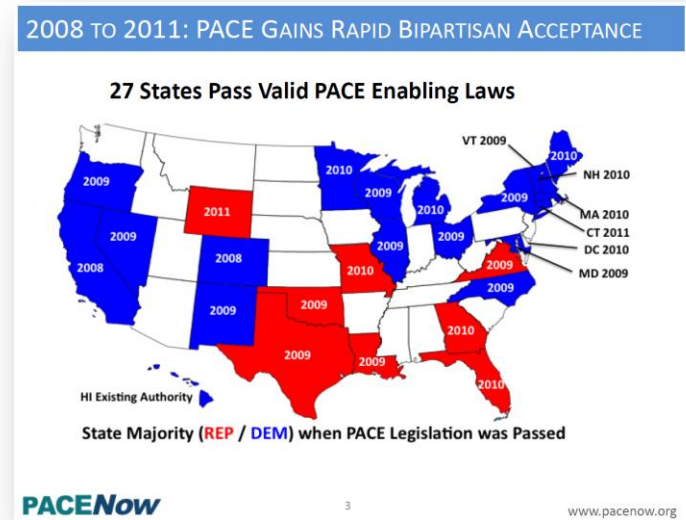
financing mechanism, allows building owners and renters to repay upfront financing directly on their utility bills through their energy savings. The New York Legislature recently passed a bill which would allow on-bill financing for energy efficiency improvements. The State is in the process of developing this financing structure, which should be available in 2012.

Cost Analysis:

PACE programs and other financing programs are designed to be self-sustaining and can be seeded with grants and maintained with a revolving loan fund or municipal bonds.

Action Steps:

- Continue to educate lawmakers about the importance of innovative financing programs such as PACE programs
- Explore options for developing energy efficiency financing programs in addition to PACE
- Apply for grants to seed the creation of financing programs
- Launch the Binghamton Energy Efficiency Program or other financing programs as they become feasible



Possible Sources of Funding:

- The Energy Efficiency and Conservation Block Grant
- Qualified Clean Energy Conservation Bonds
- Municipal Bonds

Informational Resources & References:

- White House Council on Environmental Quality (2009) *Recovery Through Retrofit*: http://www.whitehouse.gov/assets/documents/Recovery_Through_Retrofit_Final_Report.pdf
- PACENow: www.pacenow.org
- Center for Working Families: www.cwf.org

1.3 Improve the Energy Efficiency of Properties that are Participating in City Programs

The City of Binghamton provides assistance in the way of loans and grants for improvements to both residential and commercial properties through a variety of programs. In addition, more than 300 rental units in Binghamton receive rent subsidies through the City's Section 8 Housing program. When public dollars are invested in private projects, it should be done in such a way to advance the City's goals for neighborhood beautification, economic development, affordable housing, as well as long term energy independence. In fact, making buildings more energy efficient will advance Binghamton's progress toward these other goals by making our buildings more affordable to own and rent as well as by making more money available (through reduced utility bills) for investment in properties and the economy. While the majority of residential and commercial projects supported by City programs are renovation projects, the City should also set a standard for new construction supported with public dollars (i.e. require that all new homes be built to Energy Star standards).

Cost Analysis: This recommended action will not result in any additional expenses to the City. Financing for energy improvements is available through other State and Federal programs and can be easily leveraged to make City programs more effective.

Action Steps: Convene a team of City Staff and community partners to:

- Assess how each of the City's relevant programs can promote energy efficiency improvements for participating properties
- Develop and implement program guidelines that encourage or require energy efficiency improvements
- Annually monitor progress toward this goal

According to the U.S. Department of Housing and Urban Development, twenty-six percent of evictions were due to utility cut-offs in St Paul, Minnesota (<http://hud.gov/energy>).

Success Story

By the end of 2007, 3,856 new HOME-funded homes were reported to HUD as meeting the Energy Star standard—approximately 17 percent of all new HOME-funded units that year. HUD has goals to increase this number each year.

Examples of Relevant City of Binghamton Programs

Housing:

- 1) Single Unit Rehabilitation Program
- 2) Multi-Unit Rehabilitation Program
- 3) Affordable Housing Program
- 4) Section 8

Binghamton Local Development Corporation:

- 5) Revolving Fund Loan
- 6) Micro Enterprise Loan
- 7) Commercial Facade Improvement Loan

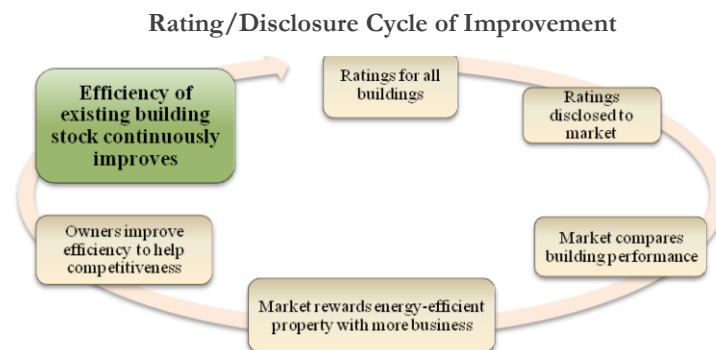
Informational Resources & References:

- Building Energy Star Qualified Homes and Incorporating Energy Efficiency and Green Building Practices into HOME-funded Affordable Housing: <http://www.hud.gov/offices/cpd/affordablehousing/library/modelguides/2008/200809energystar.pdf>

1.4 Encourage the Disclosure of Building Energy Performance to Prospective Tenants and Buyers

More than 40% of Binghamton's Community CO₂e Emissions come from the residential sector. Since buildings last for many decades, efforts to reduce emissions from buildings must address both new construction and existing structures. As of May 2010, a total of six U.S. states and major cities have enacted commercial rating and disclosure policies. They include the states of California and Washington, the District of Columbia, and the cities of Austin, Texas; New York; and Seattle, Washington.¹¹ Though the policies vary from state to state, they generally require energy usage of commercial buildings to be disclosed to all parties involved in a sale, lease or financing agreement of the property. Some require the energy usage of commercial buildings to be tracked in the EPA Energy Star Portfolio Manager¹² and for the building's Portfolio Manager rating be made available to the public. The European Union has passed legislation that will require energy ratings to be available for properties before they can be placed on the market, starting in 2012.

Currently there is a lack of information on energy performance in the housing stock. Energy performance disclosures would allow prospective buyers and renters to make more informed decisions while driving the market for more energy efficient houses. Sellers and landlords would have an added incentive to improve energy efficiency in order to compete in the market. Further, by reducing energy costs for residents, housing will become more affordable.



Source: Institute for Market Transformation

"Rating and disclosure policies can unleash the market's ability to encourage efficiency improvement by improving building energy transparency."

-The Institute for Market Transformation

¹¹ Institute for Market Transformation (2010). Empowering the Market: How Building Energy Performance Rating and Disclosure Policies Encourage U.S. Energy Efficiency. Available at:

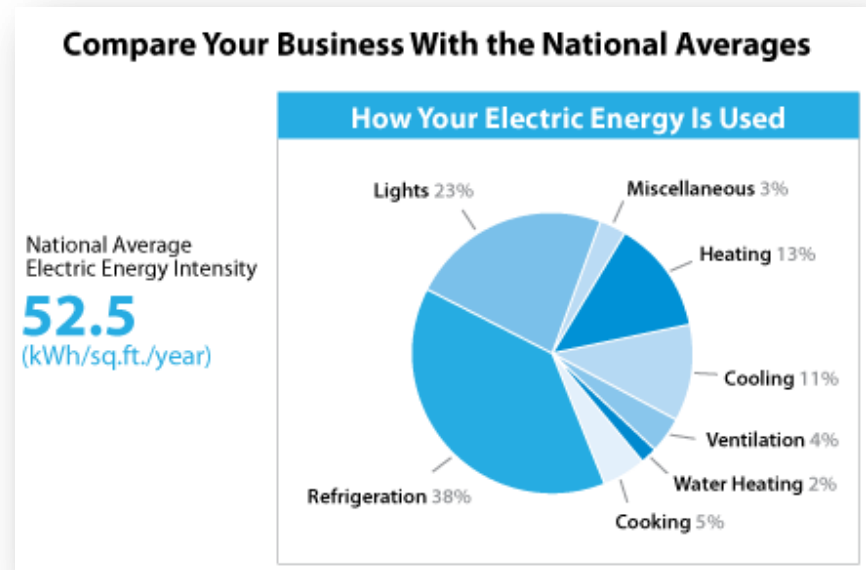
www.imt.org/files/FileUpload/files/Benchmark/Empowering_the_Market_How_Building_Energy_Performance_Rating_and_Disclosure_Policies_Encourage_U_S_Energy_Efficiency.pdf

¹² The EPA Energy Star Portfolio Manager is data tracking system that can provide buildings with an operational rating. It rates commercial buildings on a 1-100 scale relative to the energy efficiency of similar U.S. buildings. (http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager)

Cost Analysis: Costs to the City would include staff time and printing costs to promote the policy and educate the public. Building owners have access to a variety of tools, grants, and financing options that make it affordable to invest in building energy efficiency improvements and to track their utility usage.

Action Steps:

- Work with the Greater Binghamton Association of Realtors to add energy ratings and energy consumption information in property listings and other advertising materials
- Encourage building owners and renters to track their energy usage using a free online tool, such as Earth Aid¹³
- Inform tenants and potential renters through public outreach that they can request previous utility information so they can make a fully informed decision
- Give owners tips to improve the energy efficiency of their buildings, along with an estimate of the cost of these improvements and their potential savings
- Have building owners update ratings and consumption information on listings annually or as improvements are made
- Consider requiring owners of commercial buildings to track and report their building's energy performance and to disclose that information to prospective tenants and buyers



Informational Resources & References:

- Earth Aid: www.EarthAid.net
- Energy Star Portfolio Manager: www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager
- Tips to improve energy efficiency in homes: www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_index

¹³ Earth Aid is a free online tool that automatically keeps track of your home energy use and rewards you based on how much you save. Available at: www.EarthAid.net

1.5 Develop “Greener is Greater Binghamton Challenges” for homes and for businesses

CO₂e Savings: 10-30% of a participating home or business’ emissions

Financial & Energy Savings: 10-30% of a participating home or business’ energy costs

Indirect Financial Savings: Building systems maintenance costs are less because of reduced wear and tear, and healthcare costs are reduced. Additional savings will be realized from the reduction in water use and waste disposal.

The “Greener is Greater Binghamton Challenge” is a way to publicly recognize building owners and tenants for achievements in greening their operations. The Challenge will provide strategies, training and referrals to resources that can help homeowners and businesses develop a plan to become more energy efficient and reduce waste, water use, vehicle trips and emissions. The Challenge will be based on Chicago’s successful “Green Office Challenge”, which is being further developed and standardized by ICLEI for adoption by other communities. As ICLEI explains, “Property managers and office tenants register for the Challenge and commit to a year-long program in which they will receive ongoing training, support, and resources as they move through a six-step process. At the end of one year, those companies that have made the greatest strides in environmental performance will be recognized by the mayor for their accomplishments. Conducted year after year in a city or county, the Green Office Challenge can help the business community save significant money and reduce overall energy use and greenhouse gas emissions.” Binghamton could pioneer a parallel challenge for homeowners as well.

Cost Analysis: This program could be implemented with two interns supervised by the Sustainable Development Planner, time contributions from other City staff, and community volunteers who could serve technical advisors.

Action steps:



Co-Benefits

- Building owners and businesses get positive recognition
- Local economy is strengthened
- Cleaner air and improved health for everyone
- Binghamton is positioned as a healthy and forward-thinking place to live and work.

- Apply to ICLEI for assistance in developing the “Greener is Greater Binghamton Office Challenge” and the “Greener is Greater Binghamton Home Challenge”
- Analyze municipal staffing available to operate the “Greener is Greater Binghamton Challenges”, and pursue outside funding or other ways to fill staffing needs
- Recruit local partners to support and provide resources for the Challenges such as the Greater Binghamton Chamber of Commerce, NYPIRG, NYSEG, Binghamton University, and local media
- Solicit input from local community as to what resources would be most useful, and what types of recognition would be most rewarding for participants in the Challenge
- Conduct an outreach and education campaign to explain the “Greener is Greater Binghamton Challenges” and recruit charter participants
- Announce the pilot launch of the “Greener is Greater Binghamton Challenges”, and the charter participants
- After the first year is complete, recognize the successes of the participants and announce winners. Require all participants to provide follow-up evaluation, and modify and improve the program while recruiting the next class of participants

Informational Resources & References:

- ICLEI Green Office Challenge webpage - www.icleiusa.org/programs/climate/chicago-green-office-challenge/
- Charleston Green Office Challenge - www.gogreencharleston.org
- Chicago Green Office Challenge - www.chicagogreenofficechallenge.org
- Houston Green Office Challenge - www.houstongoc.org
- Westchester County Green Business Challenge - www.climatechange.westchestergov.com

1.6 Create Incentives for Adaptive Reuse of Residential and Commercial Buildings

Preserving a single family home would create the following savings:

CO₂e Savings: 177,122 pounds CO₂e **Energy Saved:** 6,700,000 MBTU

Financial Savings: \$27,290

Adaptive reuse takes advantage of existing infrastructure by adapting old structures for purposes they were not originally intended. Reusing an existing building is a sustainable practice in that the energy embodied in an existing building (meaning the energy required to construct the building and its materials) can be 39% of all of the energy required for maintenance and operations for the entire life of the building.¹⁴ Providing incentives for adaptive reuse of buildings can also help maintain the character of historic areas to convey an image of neighborhood quality. Using adaptive reuse in conjunction with smart growth principles will prove particularly helpful in downtown revitalization. Local government agencies hold an important role in this process. Local historic districts stabilize, and often increase, residential and commercial property values. Rehabilitation often costs less than new construction and requires more labor, greater specialization, and higher skill levels, resulting in more local jobs. The federal historic rehab tax credit generated over \$4.7 billion in private investments in 2009 and created 70,992 jobs. Demolition on the other hand, produces 1/3 of the waste generated in this country.

¹⁴ WBDG Historic Preservation Subcommittee (2008, June). *Sustainable Historic Preservation*.

Available at: www.wbdg.org/resources/sustainable_hp.php



Co-Benefits

- Preserve historic structures
- Reinforces smart growth and reduces sprawl
- Saves Greenfields and lowers demand for landfill space

Success Story

Phoenix has had substantial success with its Adaptive Reuse Program. The City follows the International Existing Business Code, offering guidance, expedited time frames and reduced costs to those looking to reuse buildings. Participants can save up to three months time and \$40,000 during the development process. The program won a “Crescordia” in the Livable Communities Category at Valley Forward’s Environmental Excellence Awards. The program is undergoing further expansion to include opportunities to rezone and reuse vacant strip malls and big box centers.

While securing resources for a restoration project, it is important to protect the structure from weathering and vandalism through mothballing. Mothballing includes making the necessary physical repairs to prevent deterioration while the building is vacant. This process connects with adaptive reuse because it saves the embodied energy of a building rather than losing it through demolition.

The City of Binghamton is committed to preserving and adaptively reusing existing buildings. The City's Commission on Architecture and Design (CAUD) offers information on historic properties and free evaluations on proposed alterations. Commercial property owners may be eligible for the Federal Historic Rehabilitation Tax Credit Program, which allows a 20% tax credit for the rehabilitation of historic properties in accordance with federal preservation standards. In addition, owners approved to receive the 20% federal rehabilitation tax credit automatically qualify for state tax credit (additional 20%) if the property is located in an eligible census tract under the NYS Rehabilitation Tax Credit for Commercial Properties. Residential properties may also be eligible for a 20% tax credit under the NYS Historic Rehabilitation Tax Credit. One million dollars spent in historic rehabilitation creates 5 to 9 more local construction jobs and 4.7 more new jobs elsewhere in the community, while providing \$107,000 in community income.

Action Steps:

- Educate homeowners and businesses on the existing incentives provided for adaptive reuse, and offer peer consult workshops
- Target abandoned sites that may be causing lower property values and higher insurance premiums within the neighborhood
- Improve the enforcement of the City's Vacant Property Ordinance that requires property owners to stabilize and mothball vacant properties until suitable adaptive reuse projects are available
- Foster partnerships that facilitate the financial stability and broaden the funding base for historic preservation
- Develop a competitive matching grant for exterior rehabilitation and stabilization of historic homes
- Promote the City's deferred assessment increase policy that is available to historic properties when they undergo renovation

Historic Property Deferred Assessment:

Owners of designated historic properties who carry out any work for historic preservation purposes which results in an increase in assessed taxes may qualify to have that increase deferred for a total of 10 years: 100% deferral for the first 5 years, 80% deferral for year 6, 60% for year 7, 40% for year 8, and so on.

Possible Sources of Funding:

- Federal Historic Rehabilitation Tax Credit Program
- NYS Tax Credit Program for Incoming Producing Properties
- NYS Historic Homeownership Rehabilitation Tax Credit
- Farmer's Protection and Farm Preservation Act: NYS Historic Barns Tax Credit
- NYS Heritage Area System: Historic Preservation Grant Program (OPRHP)

To calculate your building's embodied energy, visit:

www.thegreenestbuilding.org

1.7 Develop Green Building Incentives for Projects Receiving Payment In Lieu of Taxes (PILOT) Agreements

Payment in lieu of taxes (PILOT) agreements are periodically made between private entities and local governments to reduce property taxes on a development for a negotiated period of time in order to help make the development more financially feasible. PILOTs are used to attract beneficial developments that may have otherwise gone elsewhere. Taxes are collected to cover the costs of providing public services to the property itself (police, fire, water and sewer infrastructure) and to the residents of those properties (transportation infrastructure, schooling, parks & recreation, etc). When reducing the amount of taxes a development will pay over its lifetime, the City should make sure that the development positively impacts public goods (i.e. health, safety, environmental quality). Private development clearly has a significant impact on greenhouse gas emissions and climate change, which will have considerable impacts on the well being of the public for years to come. In exchange for a PILOT agreement, developers should ensure that their projects are being constructed in a way that minimizes environmental impacts. Doing so is not only in the best interest of the public, but in the best interest of the project as a high-performing green building will have lower maintenance and energy costs over its lifetime than conventional buildings and maintain value over time as the markets evolve to favor energy efficient buildings.

Action Steps:

- The City should develop a uniform PILOT policy, which it currently lacks. Each request for a PILOT agreement is currently negotiated individually. Such uniform policies add predictability to the process for developers and also help to ensure that PILOT agreements are fairly negotiated from project to project
- Include in the City's PILOT program a policy that provides incentives for building to green standards, which could include LEED, Energy Star, or other standards

Success Story

The City of Memphis has a Special Incentive section with a Green Initiative included in their PILOT program. This incentive gives buildings that are certified LEED Silver one additional year to their PILOT agreement and two additional years if certified LEED Gold or Platinum. The City of Memphis has attracted the company Electrolux to build a \$190 million manufacturing facility in their city. The plant is going to be designed to LEED certification requirements thanks to the Green Initiative in their PILOT program.

Model Program

The City of Binghamton could model its policy after Onondaga County's Green PILOT Credit policy that credits a certain percentage of the hard construction costs, depending on the LEED certification level.

Additional Resources:

- Memphis & Shelby County Industrial Development Board PILOT Program Overview: www.shelbycountyttn.gov/DocumentView.aspx?DID=1340
- Onondaga County Uniform Tax Exemption Policy: www.syracusecentral.com/green/pdf/FinalUTEPPdf.pdf

2.1 Adopt Green Building Incentives for High Performance New Construction

CO₂e Savings: Basic changes in building design and construction cut CO₂e by 35%

Energy Saved: Green buildings are 20-30% more efficient than standard buildings

Direct Financial Savings: Lower costs for energy, water, land and waste disposal

Indirect Financial Savings: Improved occupant health, productivity, and satisfaction reduces tenant and employee turnover

Buildings have an enormous impact on our health, environment, and economy. The green building movement has developed to minimize the negative impacts of the built environment. By making use of efficient technologies and design, green buildings on average consume 30 percent less energy than traditional buildings. They reduce operating costs by decreasing water consumption and maintenance costs. They use environmentally sound materials to improve indoor air quality (improving occupant health and worker productivity), conserve natural resources and reduce solid waste.

A number of programs have been developed to rate and certify the energy efficiency and sustainability of new and renovated buildings. Energy Star, a joint project of the US Environmental Protection Agency and the US Department of Energy, is a government-sponsored program to certify the energy efficiency of new and renovated buildings. LEED (Leadership in Energy and Environmental Design) from the US Green Building Council, and Green Globes, from the Green Building Institute, are private non-profit green building certification programs that evaluate not only energy efficiency, but avoidance of waste and sustainability in materials and land use. A NYS program, The Green Building Tax Credit, provides a standard and a system to certify a building's eligibility for the credit. The City of Binghamton should encourage developers of new and renovated buildings to pursue evaluation and certification of their project through an accepted independent green building program.

Though building green has proven benefits, real and perceived obstacles prevent the widespread adoption of green building. Thus, municipalities often adopt incentives to promote the practice. Some of the most popular incentives for building to green standards for developers are: density bonuses, expedited permit processing,



Binghamton University's Downtown Center at 67 Washington St, Binghamton earned LEED Silver Certification

Co-Benefits

- Increased productivity through improved health and a safer and more aesthetic atmosphere
- Increased property values
- Less pollution and greater energy and water savings

Success Story

The Plaza at PPL Center in Allentown, Pa was built to the LEED Gold Standard. Abundant natural light allows for a 30 percent reduction in energy use for lighting during the day. And while an extra \$1.5 million was spent in upfront construction costs to build to LEED standards, the building is so energy efficient that this is expected to be paid back within four years through decreased energy costs.

development fees partially or fully refunded, and tax reductions. The City should develop a Green Building Working Group to lead the process in determining which incentives best suit the local market and help educate the public on green building.

Cost Analysis: The cost for implementing this recommendation will vary according to the incentive(s) selected. For example, density bonuses and expedited permit processing would cost the City little to no money. Tax credits would cut tax revenue, but this loss of revenue for the City could be offset by increased development that otherwise may have gone elsewhere.

Action Steps:

- Create a Green Building Working Group made up of City staff, City Council members, private sector building industry representatives, community members, and other stakeholders
- Organize educational opportunities for City staff, residents, and the professional and building community about the benefits of green building and create informational materials for the public on green building
- Conduct a survey and hold focus groups with stakeholders to determine roadblocks to green building and solutions to roadblocks
- Determine the incentive or policy tool most appropriate for Binghamton and adopt legislation to incentivize green building and to eliminate regulatory barriers to using green building techniques
- Consider recruiting a renovation project to become a flagship success story for green redevelopment in the city, provide support to the developer to assist with the certification process, and maybe even a subsidy for the certification fees

Did you know?
Energy Star buildings have a 3.6 % higher occupancy rate and sell for an average of \$61 per square foot more than their peers. LEED buildings have a 3.8% higher occupancy rate and sell for an average of \$171 per square foot more than non-green buildings.

...a minimal up-front investment of about 2% of construction costs typically yields lifecycle savings of over ten times the initial investment.
-The Costs & Financial Benefits of Green Buildings, a Report to California’s Sustainable

Informational Resources & References:

- Energy Star Homepage - www.energystar.gov/
- EPA Basic Green Building Information - www.epa.gov/greenbuilding/pubs/about.htm
- U.S. Green Building Council LEED Information - www.usgbc.org/DisplayPage.aspx?CategoryID=19
- Green Building Success Stories - www.pennenvironment.org/energy/green-buildings/success-stories
- The Benefits of Building Green, Recommendations for Green Program & Incentives for the City of Lowell- www.uml.edu/centers/cfwc/Repports/buildinggreen.pdf
- CoStar Group cost/benefit study: www.costar.com/News/Article.aspx?id=D968F1E0DCF73712B03A099E0E99C679
- State of California cost/benefit study - www.calrecycle.ca.gov/Greenbuilding/Design/CostBenefit/Report.pdf

2.2 Support Adoption of the 2012 International Energy Conservation Code in New York State

CO₂e Savings: 6 lbs CO₂ annually per square foot of building

Energy Saved: 30% per new building

Direct Financial Savings: Building energy costs reduced by 30%

When the demand for energy is reduced, the demand for new production capacity can diminish, thereby reducing the cost of energy for everyone. The introduction of new or updated Energy Codes may reduce energy demand from new construction. As of January 1, 2011, new commercial and residential buildings, including major renovations, constructed in New York State are required to comply with the NYS Energy Conservation Construction Code. This code is based on the 2009 International Energy Conservation Code (IECC), which in turn was developed as a model energy efficient code by the US Department of Energy, ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers), AIA (American Institute of Architects), and state and local building code officials. In general, all states have adopted the IECC as their respective building codes, though local conditions may apply. In New York, local municipalities may adopt a more restrictive local standard but only with State review and approval. New York State is expected to adopt the 2012 IECC, which is now in final development and will result in a 30% energy savings over the 2006 IECC, as well as a 15% savings over the 2009 IECC. This substantial reduction will not be realized unless new code requirements are understood and successfully implemented.

Cost Analysis: The NYS Codes Division and affiliate organizations provide annual training that addresses any new Code modifications. Nevertheless, the City may need to provide additional specialized training for selected enforcement staff, as needed to meet new requirements and testing protocols. These tests and procedures may also place demands that cannot be met without outside technical support, from the consulting engineering community, or obtained through specialized testing equipment/procedures. In addition, aggressive enforcement may demonstrate the need for additional enforcement personnel.

Action steps:

- Maintain membership(s) in the International Code Council, as a municipality, and support the 2012 IECC
- Provide specialized training for relevant City personnel as needed
- Revise or expand monitoring and enforcement procedures
- Provide public outreach and education programming on the new code to local developers, design professionals, and building contractors

Co-Benefits

- Peak utility loads reduced
- Cleaner air, indoors and out
- Property values increase
- Building sellers & landlords gain competitive marketing edge

Informational Resources & References:

- 2012 International Energy Conservation Code - www.newbuildings.org/comprehensive-iecc-proposal
- Building Codes for Energy Efficiency Fact Sheet - www.epa.gov/cleanenergy/documents/suca/buildingcodesfactsheet.pdf
- Building Energy Codes University (free training, software and support for code enforcement officials) – www.energycodes.gov/becu/

3.1 Encourage Residents and Businesses to Purchase Electricity from Renewable Supply Sources

Renewable energy technologies are clean sources of energy that have a much lower environmental impact than conventional energy technologies. Most renewable energy investments are spent on materials and workmanship to build and maintain facilities, rather than on costly energy imports. Renewable energy investments are spent within the U.S. and frequently in the same state. These investments stay within the community, helping to fuel local economies. According to the U.S. Department of Energy, wind energy alone could provide 80,000 jobs by 2020¹⁵.

Through NYSEG, customers may choose to participate at any level, purchasing 5% to 100% power from wind turbines. The wind energy that you purchase is delivered to the power grid for statewide distribution. Wind energy may be incorporated into any organization's power mix, regardless of who supplies your electricity. Along with wind energy, NYSEG provides certified low-impact hydropower in their clean energy products. For a resident of Broome County, 50% clean energy electric supply costs \$0.06930/kWh for one year. 100% clean energy electric supply costs \$0.07730/kWh for one year. NYSEG has also partnered with Earthspouse to provide solar power to qualified homeowners and businesses.

The City of Binghamton can encourage clean energy development in the state and region by demonstrating environmental leadership. Primarily the City should assist in educating the public about opportunities for purchasing renewable energy. This recommendation should be considered in conjunction with those of the Green Homes Challenge and encouraging the use of onsite renewable energy.

Action Steps: Inform the public of the benefits of renewable energy and about how they can purchase renewable energy through their energy supplier.



Additional Resources and References:

- www.nysegsolutions.com
- www.ReliableNowRenewable.com

¹⁵ Western Organizations of Resource Councils (2003). *Benefits of Renewable Energy*. Available at: <http://www.worc.org/userfiles/file/benefitsofrenewableenergy.pdf>

3.2 Encourage Homeowners and Businesses to Install Onsite Renewable Energy Generation Systems

CO₂e Savings: a 2.5 kW solar system saves approximately 3 tons

Energy Saved: a 2.5 kW solar system saves approximately 6,800 BTU annually

Financial Savings: a 2.5kW solar system can save up to \$47,000 over 10 years along with adding \$14,000 to the value of your home

Electricity and gas are primarily responsible for a majority of residential and commercial emissions in Binghamton. Renewable energy generation can create local jobs in engineering, design, manufacturing, construction, accounting, and management. According to the Renewable and Appropriate Energy Laboratory in Berkley, renewable energy creates more jobs per megawatt of power installed, per unit of energy produced, and per dollar invested, than the fossil fuel based sector.¹⁶ This is because a larger share of clean energy expenditures goes to manufacturing, installation, and maintenance

Power Source	Manufacturing* (jobs/MW)	Construction & Installation (jobs/MW)	Operation & Maintenance (jobs/MW)	Total Jobs/MW
Solar PV	15.2	7.1	0.1	22.4
Wind	3.5	2.6	0.3	6.4
Solar Thermal	N/A	5.7	0.2	> 5.9
Geothermal	4.8	4.0	1.7	10.5
Natural Gas**	N/A	1.0	0.1	> 1.1

* Includes component manufacturing.

** Natural Gas is not considered a renewable energy. It is included here for comparison.

Job Creation from Renewable Energy Projects Per Megawatt Capacity

http://www.epa.gov/statelocalclimate/documents/pdf/on-site_generation.pdf

which overall is more labor intensive than the extraction and transportation sectors that compromise most fossil fuel jobs. For example, the solar PV industry creates 22.4 jobs per megawatt while natural gas in comparison creates 1.1¹⁷.

Co-Benefits

- Create local, green collar jobs
- Create a more reliable, resilient power supply through decentralization and diversity

⁶Renewable and Appropriate Energy Laboratories (2004). *Putting Renewables to Work: How Many Jobs can the Clean Energy Industry generate in the U.S.?* Available at: rael.berkeley.edu/node/585

¹⁷EPA Clean Energy Strategies for Local Governments On-site Renewable Energy Generation (2008). *Figure 7.2.1. Job Creation From Renewable Energy Projects per MW Capacity.* Available at: www.epa.gov/statelocalclimate/documents/pdf/on-site_generation.pdf

The City of Binghamton should work to educate the community on existing incentives that make installing renewable energy systems more affordable and cost competitive. Holding seminars, workshops, and green buildings tours geared towards homeowners and businesses are great ways to raise awareness about renewable energy potential in Binghamton. In 2010, The Tompkins County Green Buildings Open House featured 32 local homes and businesses with homeowners and business-owners onsite to answer questions and discuss their building's green features. Binghamton should promote the use of onsite small-scale renewable power generation technologies by promoting state and federal incentives and developing additional local incentives. The work to implement this recommendation should be coordinated with developing the "Greener is Greater Binghamton Challenges" and the Energy Leadership Program.

Cost Analysis: The cost to the City for implementing this recommendation will be minimal. For a building owner, the cost of renewable energy varies greatly depending on size, system and type. However, federal, state, local and utility tax credits and rebates can substantially reduce the payback period for these systems.

Action Steps:

- Utilize GIS mapping to assess the current state of on-site renewable energy generation in Binghamton as well as its potential
- Create a section on the City website dedicated to providing information on the benefits of renewable energy and the incentives available for installation
- Reduce permit fees for renewable energy system installations for onsite use
- Conduct an educational campaign, including seminars, green home tours, workshops, and professional training, to inform community members about the environmental benefits of renewable energy
- Continue to advocate to the Federal government for Property Assessed Clean Energy (PACE) programs to be allowed without undue restrictions from federal regulatory agencies or the banking industry
- At such time that operating a PACE program becomes feasible, launch a PACE program and allow funding for onsite renewable energy systems
- Promote innovative programs for reducing the cost of renewable installation and for installation financing [i.e. leasing options, group purchasing (One Block Off the Grid, <http://1bog.org/>)]

International Success:

For years Germany has been the center of innovation for renewable energy generation. Germany's solar industry has had great success with solar photovoltaic feed in tariffs and is continually working to reduce its production costs. Renewable energy created 249,300 jobs in 2007 with 34% of those jobs in wind power and 16% of those jobs in the solar sector. In 2010 solar generation capacity amounted to 5,372.366 megawatts.

Informational Resources & References:

- How Local Governments can Reduce Energy Costs and Minimize Impact on Global Climate Change: syracusecoe.org/EFC/images/allmedia/LIBRARYresearchbrief_green.pdf
- Planning for a Sustainable Future: A Guide for Local Governments: www.epa.gov/region02/sustainability/greencommunities/Planning_for_a_Sustainable_Future.pdf

2. Transportation and Land Use



Overview

In 2006, the Binghamton Metropolitan Transportation Study estimated that about 885,499 miles are traveled by vehicles within the City every day. This travel uses fossil fuels, which causes transportation to account for about a third of all emissions produced in the City of Binghamton. Reducing the energy consumed by travel, as well as utilizing alternate fuels, is an important way to decrease our effects on the environment, and to create a more energy independent future.

Co-Benefits

- Decreased traffic congestion
- Less money spent on gas and maintenance
- Cleaner air
- Improved human health
- Preservation of resources

Many changes can be made in the ways in which we get from place to place in order to achieve the goals of reducing transportation emissions while improving public health and creating a more attractive community. First, there must be a reduction in the amount of fossil fuels we use through conservation and efficiency. Second, exploring alternative energies can reduce (if not eliminate emissions) support ingenuity, and create jobs. Lastly, changing the ways in which we manage and develop the land will reduce the amount of emissions produced.

2. Transportation and Land Use

2025 Objectives	Recommended Actions
1. Reduce transportation emissions through greater fuel conservation and efficiency	1.1 Promote and facilitate commuting by walking, biking, carpooling, and public transit instead of private cars
	1.2 Reduce idling by commercial and private vehicles
	1.3 Provide education for vehicle owners on how to improve vehicle fuel economy
2. Reduce transportation emissions by encouraging the use of alternative fuel sources	2.1 Provide information to the public on alternative fuel sources in our area
	2.2 Accelerate the transition to plug-in hybrids and electric vehicles by supporting the installation of a network of electric car charging stations
3. Reduce energy consumed and emissions produced as a consequence of how land is used and developed	3.1 Adopt land use strategies which reduce emissions and encourage smart growth
	3.2 Expand waterfront development
	3.3 Consider greenhouse gas emissions in environmental evaluations of planning scenarios and individual land use decisions
	3.4 Partner with other municipalities and regional planning agencies to encourage smart growth and sustainable development throughout the region

1.1 Promote and Facilitate Commuting by Walking, Biking, Carpooling, and Public Transit Instead of Private Cars

CO₂e Savings: an annual savings of 5.5 metric tons of CO₂e per car taken off the road

Energy Saved: If a commuter who drives 10 miles to work carpools with two other people roughly 100,800 gallons of gas would be saved annually.

Financial Savings: The average annual cost of a daily 10 mile commute is \$1,320 if driving alone. A three person carpool will save a person \$876 and taking mass transit will save \$840 and biking will save \$1,320.¹⁸

Promoting and facilitating commuter use of walking, biking, carpooling, and public transit instead of private cars will benefit the City and its residents in multiple ways beyond reducing carbon emissions. Automobiles emit air pollutants, such as ozone, hydrocarbons, nitric oxides, carbon monoxide and particulate matter, that have negative health effects. Reducing the amount of miles traveled by car will decrease air pollution and have positive health effects. Driving private cars less often also saves people money, not only by using less gas but by reducing vehicle wear and tear. An emphasis on walking and cycling promotes good health practices and stimulates clean-up initiatives and increases stewardship. In Charlotte, North Carolina a before-and-after study found that the use of light rail and increased physical activity are associated with a nearly 1.2 point reduction in body mass index and an 81% reduction in the likelihood of becoming obese.

To encourage walking and cycling a metropolitan transportation system must be truly intermodal. To accomplish this, the City will need to improve its infrastructure to accommodate each mode as well as linkages between them. This can be done

¹⁸ To get an even closer estimate, plug your own numbers into the Cost of Commuting Calculator at: www.commuterpage.com/Userweb/CostCommuting/CostCommuting.htm



Co-Benefits

- Traffic congestion improvements
- Less money spent on gas and automobile maintenance and more in the local economy
- Improved health and well being
- Increased transportation choices
- Improved air quality

Success Story

Charlotte's Clean Air Works! Program engages businesses in educating and motivating employees to utilize alternative methods of commuting. Clean Air Works! has helped people reduce and avoid more than 400,000 miles traveled by educating people about alternatives such as walking, biking, carpool, mass transit, telecommunicating, and alternative schedules such as four-day work weeks.

using the ten elements of the Complete Streets Policy¹⁹. A car share program can also be developed, such as HourCar in Minneapolis, to allow people to use a car when necessary but not have to own one. Carpooling and public transit use should also be promoted in Binghamton. There is already a carpooling system in place, the Broome Tioga Greenride, which can be taken advantage of but needs additional publicity. To encourage commuters to use public transit instead of private cars, employers can supply lower cost transit cards for employees and provide preferred parking for carpools. Promoting commuter use of walking, biking and public transit can be accomplished by involving zoning and other land use practices that encourage pedestrian-friendly, mixed-use urban communities.

Cost Analysis: Promoting and facilitating commuter use of alternative modes of transportation in place of using private cars can reduce costs both for households and local governments on gasoline, health care, road maintenance and a host of other expenses. Savings can then be cycled into the economy as socially-beneficial spending or reduced taxes. A 1999 study by Todd Litman of the Victoria Transportation Policy Institute estimated that for each trip not driven, society saves between \$1 and \$3.50 in avoided costs associated with congestion, road maintenance, parking, pollution, noise, safety and other costs.

Action Steps:

- Encourage resident and employee carpool incentive programs, such as preferred parking or reduced parking fees for carpools and promote Broome Tioga Greenride
- Implement a Complete Streets Policy
- Expand and enhance bike and pedestrian infrastructure
- Work with BMTS and other partners to develop a car share program
- Work with Broome County Transit to improve public transit in Binghamton



Possible Sources of Funding:

- Federal Highway Administration Surface Transportation Program
- Transportation Improvements Program
- Congestion Mitigation Air Quality Improvement Program

Informational Resources & References:

- Broome-Tioga Greenride, free internet rideshare matching service at: www.BroomeTioga.Greenride.com
- HourCar service visit: www.HourCar.org
- Complete Streets Policy: www.completestreets.org/changing-policy/policy-elements/

¹⁹ The National Complete Streets Coalition’s Complete Streets Policy Elements are available at: <http://www.completestreets.org/changing-policy/policy-elements/>

1.2 Reduce Idling by Commercial and Private Vehicles

If only 50 cars reduced their idling by 5 minutes per day, we would save annually:²⁰

CO₂ Savings: 5.5 – 11 tons

Energy Saved: 570 - 1,140 gallons of gasoline

Direct Financial Savings: \$2,100 - \$4,300 (at \$3.75 per gallon of gas) with an additional \$1,600 - \$3,650 in savings from reduced vehicle wear and tear

Indirect Financial Savings: Vehicle exhaust is linked to asthma, heart disease, chronic bronchitis and cancer. The American Lung Association advocates for idling reduction legislation because reduced idling saves healthcare dollars.

Idling is when a vehicle engine is on, burning fuel, but going nowhere. Idling for just 10 seconds burns more fuel than restarting the engine. According to the EPA, “surveys say that trucks idle anywhere from 6-8 hours a day for as many as 250 to 300 days each year. “ And “each year, long-duration idling of truck and locomotive engines consumes over 1 billion gallons of diesel fuel and emits 11 million tons of carbon dioxide, 200,000 tons of oxides of nitrogen, and 5,000 tons of particulate matter into the air.” Reducing idling saves money, improves health, reduces carbon emissions – and it’s free.

New York State has already passed legislation limiting idling by heavy trucks to five minutes except under certain conditions (*NY Code SUBPART 217-3*). It applies to all trucks with a Gross Vehicle Weight Rating of more than 8,500 lbs., and prohibits idling for longer than 5 minutes, except when the vehicle is stuck in traffic, is performing emergency services, must be running in order to keep the temperature of the passengers within legal limits, is necessary to power an



Co-Benefits

- Cleaner air
- Improved health for everyone
- Quieter city
- Longer life for engines
- Reduced vehicle maintenance costs
- Improved highway safety

“Extended idling by commercial trucks costs truck owners about three billion dollars annually and wastes over one percent of US petroleum resources.”

(From a fact sheet by the American Lung Association for Vermont Idle-Free Fleets)

²⁰ In 5 minutes of idling alone, cars can burn between 0.4-1 cup of gasoline. Over the course of a year, this adds up to 11-22 gallons of gas (Multnomah County: <https://web.multco.us/idling-hurts/your-wallet>). Idling a vehicle for 5 minutes each day is the equivalent of 30 hours per year.

auxiliary function such mixing or unloading cargo, or to be serviced or tested. Mining and quarrying trucks being used on private property are exempt, as are farm equipment. Diesel trucks may be idled if they must be motionless for more than two hours when the temperature is below 25 degrees F. Hybrid electric vehicles being idled for charging purposes are also exempt.

Action steps:

- Conduct a campaign to inform drivers about the costs of unnecessary idling
- Pass a City anti-idling policy to reinforce and extend the state law to all trucks and cars
- Provide free or subsidized signage reminding drivers to turn engines off, to be posted in frequent idling areas such as school pickup areas, loading areas, and drive-up lanes
- Encourage shippers to establish a no-idling policy for trucks picking up from and delivering to them. Larger shippers can provide comfort stations where drivers can await loading and unloading without having to remain in their vehicles
- Consider opportunities to use design solutions that minimize idling at intersections

In a study commissioned by NYSERDA, NYSDOT, the NYS Thruway Authority and others, it was found that:

“Idling promotes increased localized of carbon monoxide (CO) concentrations that can cause headaches, dizziness, and nausea, which can affect driver health and job performance.”

Possible Sources of Funding:

- EPA Office of Transportation and Air Quality, various programs
- USDOT Congestion Mitigation & Air Quality Improvement Program
- DOE Clean Cities Program

Informational Resources & References:

- www.epa.gov/smartway/documents/420b06004.pdf
(Examples of state & municipal anti-idling codes)
- www.transportation.anl.gov/pdfs/TA/361.pdf
(Argonne National Laboratory Savings Calculator for Idling Reduction)

1.3 Provide Education on How to Improve Vehicle Fuel Economy

By increasing fuel efficiency by 15% through simple no cost improvements (i.e. proper tire inflation and better driving habits) for ~1/8th of the vehicles miles traveled in Binghamton, we would save daily:²¹

CO₂ Savings: 4.2 tons **Energy Savings:** 435 gallons of gasoline

Financial Savings: \$1,600

Preventative maintenance is one of the most cost effective ways to reduce fuel use. Clogged fuel injectors and air filters, dirty spark plugs and underinflated tires make engines and other vehicle components work harder and consume more gas. A simple task such as keeping tires properly inflated can improve gas mileage by 3.3% with equivalent gasoline savings of \$0.10/gallon. Fixing a serious maintenance problem, such as a faulty oxygen sensor, can improve mileage by as much as 40% and an equivalent gasoline savings of \$0.14/gallon. Inspections are strongly recommended to identify service items that can help vehicles run better, last longer, retain value, and provide optimal safety and security. Among other techniques, drivers can learn progressive shifting, engine speed optimization, idle reduction, smoother braking and acceleration, anticipatory driving, speed control, and optimal gearing. For example, rapid acceleration and braking can lower the fuel economy of a heavy duty vehicle by 33% on the highway and 5% in the city.²²

Action Steps:

- Work with the school district to provide education on the importance of fuel efficiency during driver education training
- Work with the DMV to require special emphasis on the importance of car maintenance and fuel economy in driver's education courses
- Educate mechanics on strategies to boost fuel how to educate drivers about this issue



Co-Benefits

- Reduce equipment failure
- Generate energy savings
- Enhance safety of the vehicle

Maintenance Tip:

An automatic tire inflation system monitors and continually adjusts the level of pressurized air in tires, maintaining proper inflation while the truck is in motion. Installing an ATI System on a truck costs up to \$800 and can produce an annual savings of 100 gallons of gas, \$346 in fuel costs, and 1 metric ton of greenhouse gas emissions- making the payback period just over 2 years.

²¹ According to the Binghamton Metropolitan Transportation Study, the average daily Vehicle Miles Traveled in Binghamton in 2006 was 885,499.

²² U.S. Department of Energy. Fuel Economy Strategies for Heavy-Duty Vehicles. Available at: www.afdc.energy.gov/afdc/vehicles/fuel_economy_heavy.html

2.1 Provide Information to the Public on Alternative Fuel Sources in Our Area

CO₂e Savings: Replacing 100 vehicles with cleaner air vehicles would reduce CO₂e emissions by roughly 145 tons annually

Energy Saved: Switching to an EV consumes no gasoline (if the electricity is received from a hydro, solar, or wind-powered plant then the energy will be renewable)

Financial Savings: Using electricity as the primary fuel source can produce a cost savings of 75%

Transportation is the fastest growing source of U.S. greenhouse gas emissions, accounting for 47% of the net increase in total U.S. emissions since 1990. Binghamton needs to systematically move from conventional fuels to alternative fuels to power its transportation network in order to achieve its energy and emissions reduction goals. Many people do not realize that they have options when it comes to fuel. This is why educating and informing the public on their choices can help to increase use of alternative, less carbon intensive fuels. Some of the alternative choices include hybrid or hybrid plug-in vehicles, electric vehicles, or biodiesel. There are even existing businesses in the area developing new alternative technologies, like BAE Systems that builds the HybriDrive® diesel-electric hybrid drivetrain for city buses, and is researching similar technology for trucks.

Action Steps:

- Educate the public on alternative fuel benefits as well as fuel choices in our area through an educational campaign, including public outreach, seminars, and workshops
- Educate the general public to promote fuel efficiency practices and influence current driver trends with public workshops
- Develop and disseminate outreach materials on clean vehicles, alternative fuels and the related public health impacts of air pollution and climate change
- Educate a diverse group of constituencies on clean vehicle and alternative fuel choices: corporate fleet managers; school officials; elected officials; consumers; transportation programs; truck drivers; among other constituencies
- Generate positive media coverage on petroleum reduction issues
- Work to increase Alternative Fuel Vehicle (AFV) fleet inventory in public and private fleets



Co-Benefits

- Less money spent on fuel
- Increased fuel choices
- Improved air quality

Local Success

Binghamton University is phasing out gasoline and diesel operated campus vehicles and replacing them with electric vehicles or those that use alternative energy sources. Binghamton University Police have also incorporated the use of electric cars, and bike patrols into their sustainability efforts.

2.2 Accelerate the Transition to Plug-In Hybrids and Electric Vehicles by Supporting the Installation of a Network of Electric Car Charging Stations

Currently New York State has fewer than 10 electric vehicle charging stations.²³ Alternative fuels are essential in achieving Binghamton’s climate change goals. However, the demand for electric vehicles will falter without the necessary infrastructure. Public charging stations will increase the range of electric vehicles (EV) and reduce the amount of gasoline consumed by plug-in hybrid electric vehicles (PHEV). While home owners will usually charge their vehicle in their garage, public charging stations make having PHEVs and EVs more practical and convenient, especially for city dwellers who may not live in single-family homes. Developing charging stations can stimulate the market for plug-in hybrids and electric vehicles. Increasing the numbers of these vehicles will have cascading environmental and economic benefits. When electricity is generated from renewable sources, there are no emissions, and because EVs operate using only electricity, a typical electric vehicle costs \$0.02 to \$0.04 per mile compared to \$0.10 to \$0.15 for conventional vehicles.²⁴

General public charging using DC fast charging (level 2) and it’s applicability in the Binghamton grid should be researched thoroughly with a special focus on highly concentrated areas such as shopping centers, parking lots and garages, hotels, government offices, and businesses. Once an analysis is completed, the City should partner with businesses and real estate developers to gain support for EV infrastructure.



**ELECTRIC VEHICLE
CHARGING STATION**

Co-Benefits

- Improve energy security and enhance energy independence
- Reduce fuel costs for drivers
- Fueling flexibility addresses consumer “range anxiety”



²³ U.S. Department of Energy. Electric Charging Station Locations. Available at: www.afdc.energy.gov/afdc/fuels/electricity_locations.html

²⁴ U.S. Department of Energy. Benefits of Hybrid, Plug-in Hybrid, and All-Electric Vehicles. Available at: www.afdc.energy.gov/afdc/vehicles/electric_benefits.html#savings

Cost Analysis

Installing three stations in a parking lot can cost approximately \$3,200. Installing two street side charging stations can cost approximately \$2,800. Five charging stations in a parking garage can cost approximately \$4,300.

Action Steps:

- Develop a plug-in roadmap to identify and overcome long-term barriers to adopting EVs
- Develop a permitting process for EV charging stations
- Partner with private businesses, real estate developers, governmental agencies and neighboring municipalities to install and commit to purchasing EVs
- Work with car companies to develop projects similar to Better Place's deployment roadmap and rental batteries package
- Purchase EVs for the City fleet and install charging stations at City-owned facilities and popular locations within Binghamton
- Increase High Performance Electric Vehicles (HPEV) and EV visibility with a media campaign and educational programs and events
- Encourage other towns and cities in the region to promote electric charging stations to ensure Binghamton residents can drive their vehicles out of town

Informational Resources & References:

- www.afdc.energy.gov/afdc/fuels/electricity_locations.html
- www.betterplace.com/

Success Story

Better Place has completed its plan for an infrastructure deployment roadmap in Israel, which includes tackling the convenience and affordability barriers to electric vehicle adoption. Drivers buy the electric car without the battery and sign up for a Better Place membership package based on miles driven. By separating the ownership of the car and battery, Better Place is able to remove the driver burdens of cost, acquisition, maintenance, warranty, and residual value concerns. Customers will have access to the installation of a private charge spot, unlimited access to Better Place's network of public Charge Spots and automated Battery Switch Stations, and access to an inventory of batteries with a guaranteed service level agreement. The battery switch process is automated and reinforces the solution to unlimited range.

Possible Sources of Funding:

- Department of Transportation
- Department of Energy
- Ecotality Project
- NYSERDA NYS Truck Stop Electrification & NYSERDA Transportations Infrastructure Research Consortium

3.1 Adopt Land Use Strategies Which Reduce Emissions and Encourage Smart Growth

CO₂e Savings: 10% reduction in vehicle miles traveled per person from 2005 levels

Direct Financial Savings: Costs associated with increased flooding and enlarging the capacity of the storm sewer system would be avoided by minimizing increases in impervious area, as would the cost of extending utilities to new areas.

Indirect Financial Savings: Households will spend less on driving and on utilities.

Smart Growth is an approach to development which incorporates a range of planning strategies to help municipalities achieve more compact, efficient mixed-use development. Its aim is to reduce the cost of municipal infrastructure and services, provide a variety of transportation choices, protect environmental resources, revitalize existing communities, maintain affordable housing and provide a better quality of life. Smart Growth can reduce carbon emissions by reducing vehicle miles traveled, and by reducing the need for the construction of new municipal streets and utilities.

As the Growing Wealthier report by the Center for Clean Air Policy puts it: “These planning and design concepts, and the policies to support them, can help to create communities where people not only can find the homes, neighborhoods and lifestyles they desire, but also accomplish more with less time, energy and investment per person. People can save money while also reducing greenhouse gas emissions.”

Cost Analysis:

Costs will include staff time for a review and modification of development code, training of zoning enforcement staff, planning staff, and commission members, a public education effort and the production of new documents and informational material regarding the planning review process.



Co-Benefits

- Reduced healthcare costs
- Better access to jobs & services
- Increased property values
- Better quality of life
- Preserved natural resources
- Cleaner air and water
- Improved climate for small business

“Smart growth and smart transportation choices can reduce the amount Americans need to drive - as measured in vehicle miles traveled (VMT) - by 10 percent per capita from 2005 levels...”

(2009 study by the Center for Clean Air Policy)

Savings: The City of Sacramento, CA calculated the infrastructure price tag of different development scenarios over the next 50 years and found substantial savings in the cost of providing services such as water, sewer, roads, flood control, drainage, parks, and dry utilities if their Smart Growth scenario were implemented in the place of conventional development.

Payback Period: Both results and payback take some time to realize, as development and redevelopment projects occur in the city.

Action steps:

- Sponsor local workshops on Smart Growth as it might be applied to Binghamton, and encourage development stakeholders such as review board members, land use lawyers, lenders, realtors, design professionals, and public officials to participate
- Adopt a Smart Code in parallel with existing code, to provide the opportunity for local test cases of innovative developments without undertaking the enormous and politically difficult task of completely overhauling city code
- Provide training and education to City Council, Planning and Zoning Commission members, and municipal staff regarding Smart Growth principles and practice
- Refer to *Getting to Smart Growth: 100 Policies for Implementation*, a guide for communities wishing to put Smart Growth principles into practice jointly produced by the Smart Growth Network, the EPA, and the International City/County Management Association, for additional steps

Possible Sources of Funding:

- EPA Smart Growth grant programs
- FHWA programs – Climate Change & Transportation/Air Quality pilot program; Transportation Enhancement Program
- NYS Division of Housing & Community Renewal Main Street funding
- Funders Network for Smart Growth & Livable Communities, www.fundersnetwork.org

Informational Resources & References:

- Growing Wealthier: Smart Growth, Climate Change and American Prosperity, report by Chuck Kooshian and Steve Winkelman for the Center for Clean Air Policy, January 2011. www.growingwealthier.info/about.aspx
- Infrastructure Cost Model, City of Sacramento - www.sacregionblueprint.org/technology/infrastructure-cost-model/DOE
- EPA Smart Growth website - www.epa.gov/smartgrowth/index.htm
- Smart Growth Network, a coalition of organizations working for Smart Growth in the US - www.smartgrowth.org/
- Getting to Smart Growth, 100 Policies for Implementation www.smartgrowth.org/pdf/gettosg.pdf

3.2 Expand Waterfront Development

The Susquehanna and Chenango rivers are the Binghamton region’s most important natural resources and provide opportunities for economic development and an increase in the quality of life for residents. The goal of waterfront development is to reopen the riverfront area in an attempt to re-connect the Binghamton community to the river. Expanding and improving the river trails in Binghamton will create a quality community that promotes public health, mental health, and the environment. A network of multi-use trails along the rivers provides individuals with opportunities to exercise and reconnect with the natural environment. Encouraging greater use of the trails for alternative modes of transportations can decrease traffic congestion and associated automotive emissions while stimulating increased stewardship of the city-nature environment.



The City of Binghamton has committed a significant amount of resources to developing a river trail network along the Susquehanna and Chenango Rivers. In 1999 the Binghamton Metropolitan Greenway Study completed a study that provides a roadmap for a trail system throughout Broome and Tioga Counties²⁵. In 2005, the City worked with the community to draft a plan, funded by the NYS Department of State Local Waterfront Revitalization Program (LWRP)²⁶, to develop policies and strategies to focus development along the rivers and create visual and physical connections to the rivers. The revitalization of the riverfront is a long-term on-going initiative. The development of the river trails is a multi-year project conducted in phases and projects thus far have been funded by grants from various sources including the NYS Department of State and NYS Department of Transportation.

“Many people equate walking and biking trails with quality of life.”

- Richard Lutovsky, Former President of the Broome County Chamber of Commerce

Co-Benefits

- Improve access to and use of public lands and water
- Maintain and enhance visual quality of scenic resources
- Creating amenities for businesses
- Positive impacts on public health

²⁵ Binghamton Metropolitan Transportation Study (1999). *Binghamton Metropolitan Greenway Study*. Available at:

www.bmtsonline.com/files/bmts/pdfs/BinghamtonMetropolitanGreenwayStudy.pdf

²⁶ City of Binghamton (2005). *Two Rivers, One Future*. Available at:

<http://www.nyswaterfronts.com/LWRP/CityofBinghamton/default/City%20of%20Binghamton%20LWRP.htm>

Cost Analysis

The Chenango River Trail Connection will complete the Chenango River east bank trail and connect Cheri A. Lindsey Park to Broome County's Otsiningo Park. This project is in design with an estimated total project cost of \$970,576. The Susquehanna North Bank project will construct a multi-use trail from S. Washington St. Bridge to the Exchange Street Bridge with a total project cost of approximately \$867,920. The completion of these projects will require a significant initial investment, but will create economic development opportunities for waterfront development and create an attractive path along the river that links neighborhoods to the downtown.

Action Steps:

- Encourage mixed-use development that utilizes frontage on the river
- Incentivize residential and local business development along the river trail
- Encourage citizen involvement through additional clean-ups, plantings, outdoor workshops, and athletic competitions
- Link commercial centers and residential areas to parks and existing/proposed trail networks
- Improve signage that identifies links to neighborhoods and events/activity
- Develop multi-use trail loops in existing riverfront parks and publicly owned lands
- Work with the Binghamton Neighborhood Project's Design Your Own Park Competition to revitalize under-used parcels near the river trails
- Strictly control surface parking along the river trail
- Partner with local elementary schools to organize field trips, field day competitions, and after school programs at the river
- Hold community events and festivals such as July Fest along the River Walk

Possible Sources of Funding

- The Transportation Equity Act for the 21st Century
- Department of Transportation
- The Land and Water Conservation Fund
- Community Enhancements Facilities Program
- Environmental Protection Fund

Success Story

The San Antonio River Walk, a 3.2 mile strip located in central San Antonio, is an urban sanctuary with lush landscapes, outdoor art, and relaxing outdoor patios. This lively pedestrian system includes theaters, galleries, shops, and restaurants along the banks of the downtown River Walk while the north and south banks of the river are less commercial. Over 9 million people visit the river walks annually. The economic impact of the river walk is between \$2.4 and \$4.3 million. Recent improvements are expected to create 10,000 new permanent jobs and a \$12.5 million annual tax benefit for the city.

3.3 Consider Greenhouse Gas Emissions in Environmental Evaluations of Planning Scenarios and Individual Land Use Decisions

In New York, the State Environmental Quality Review Act (SEQRA) requires that an environmental impact assessment be undertaken for 1) most projects or activities undertaken by a state or local government agency or 2) projects that require a permit from state or local government agency. The purpose of SEQRA is to identify and mitigate significant environmental impacts of potential projects. The environmental review evaluates a project's impact on air, soil and water quality, as well as on infrastructure and other resources. On August 15, 2009, the New York State Department of Environmental Conservation (NYSDEC) issued a policy document to provide instructions for DEC staff on how to address energy consumption and greenhouse gas emissions in the environmental review process when the DEC serves as the lead agency in the review²⁷. The document is also intended to serve as a guide to other state and local agencies when serving as the lead agency under a SEQRA review. The City of Binghamton should utilize the DEC guide to incorporate an evaluation of greenhouse gas emissions and energy consumption into its environmental review of private projects and municipal projects. The DEC policy does not add any new requirements under SEQRA or establish a threshold for the determination of significance under SEQRA. The focus is to quantify the direct and indirect greenhouse gas emissions from the project and identify opportunities to reduce those emissions.

Action Steps:

- Pass a resolution to adopt a policy requiring SEQRA reviews conducted by branches of City government to include an evaluation of greenhouse gas emissions and energy consumption
- Work with the NYSDEC to provide training to City staff, Planning Commission and Zoning Board of Appeals members on incorporating an analysis of greenhouse gas emissions into the review process
- Provide developers with resources to help them estimate the energy consumption of and emissions from their projects, as well as to make their projects more energy efficient and reduce greenhouse gas emissions

²⁷ New York State Department of Environmental Conservation. (2009). *Guide for Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements*. Available at: www.dec.ny.gov/docs/administration_pdf/eisghgpolicy.pdf

Success Story

The California Environmental Quality Act (CEQA) requires an analysis of greenhouse gas emissions in all environmental reviews under the act. The practice is helping to reduce greenhouse gas emissions caused by new developments.

Informational Resources:

- NYS DEC: www.dec.ny.gov/permits/357.html
- CEQA: The California Environmental Quality Act: www.ceres.ca.gov/ceqa/

3.4 Partner with Other Municipalities and Regional Planning Agencies to Encourage Smart Growth and Sustainable Development Throughout the Region

New York is a home rule state, which means that local municipalities have jurisdiction over land use planning. While land use laws are made respective of local municipal boundaries, human activities and natural processes take place with relatively little attention to the political lines that separate one municipality from another. The increase in impervious surfaces (i.e. parking lots, roofs, etc) in one municipality can lead to poor water quality or increased flooding in another. A new shopping center may cause traffic congestion beyond town lines. Greenfield development in one community may lead to vacant properties and tax base decline in another. As each City and town pursues its own interests through zoning and land use policies, the broader long term effects on the region may be undesirable and actually counteract any short term gains.

More communities and regions across the United States are effectively using multi-municipal planning to promote the shared goals of a region and its local municipalities. Regional cooperation through service sharing, coordinated economic and land use strategies, the revitalization of cities and older communities, open space preservation and sustainable growth is essential to the long term prosperity of a region and the individual municipalities within.

The City of Binghamton has worked with regional planning agencies and other municipalities to develop the Livable Communities Alliance to engage leaders in the Broome-Tioga County region in learning about the benefits of strengthened regional planning with a focus on utilizing Smart Growth and Livability principles (see sidebar next page). The Alliance's May 2011 Symposium, *Creating a Framework for Regional Prosperity: A Livable Communities & Smart Growth Symposium*, brought together a diverse group of over 120 community members gathered to hear national, state, and local experts on the financial impacts of smart growth, retrofitting suburbia, repairing the fabric of communities, the rural perspective to smart growth, and discussions on how to advance smart growth and livable principles in the region.



Success Story

Lancaster Inter-Municipal Committee (LIMC) is a council of governments established to address intermunicipal challenges and concerns in central Lancaster County, Pennsylvania. It encourages and facilitates intermunicipal cooperation, undertakes projects that will benefit its member municipalities, and provides a forum for municipal officials to discuss issues of mutual interest. The LIMC led the development and adoption of *GROWING TOGETHER: A Comprehensive Plan for Central Lancaster County*. This award winning regional plan outlines how the region can facilitate the appropriate kind of development in Growth Opportunity Areas, establishment an intermunicipal transfer of development rights program, provide for the sharing of uses among municipalities, and enable the municipalities to achieve the purposes and goals of multimunicipal cooperative planning set forth in the Pennsylvania Municipalities Planning Code.

Action Steps:

- Continue to work with partners to host educational events on smart growth and livability strategies and the benefits of regional planning
- Strengthen relationships with other local municipalities
- Participate actively in regional planning bodies, such as the Southern Tier Regional Planning Development Board and the Binghamton Metropolitan Transportation Study, and regional coalitions, such as the Livable Communities Alliance and the Strategic Alliance for Health
- Coordinate with partners to develop and implement a regional long term plan. Submit an application with partners to the HUD Sustainable Communities Regional Planning grant program to assist with the development of a unified regional plan that identifies strategies for improving the quality of life for residents, restoring economic vitality, and protecting our environment
- Identify and seek out opportunities to share services with neighboring municipalities to reduce the cost of delivering services
- Partner with Broome County and other municipalities to develop a successful land bank

Multi-municipal planning provides a way for local governments to accommodate the full range of land uses and dwelling types... local governments can join together to create multi-municipal planning regions and allocate land uses within those regions in ways that make sense. Planning and implementing land use controls on a wider, regional level reduces the influence of arbitrary municipal boundaries and allows for land use decisions that are more rational in respect to economic development, fiscal impacts, environmental protection, and quality of life.

~ 10,000 Friends of Pennsylvania, *Plan Regionally, Implement Locally: An Evaluation of Multi-Municipal Planning and Implementation in Pennsylvania*

The Livable Communities Alliance is an open collaborative of diverse professionals, organizations and concerned citizens created to preserve and enhance the quality of life and natural resources of rural and urban communities while strengthening the Broome-Tioga regional economy. The Alliance was formed in late 2009 by representatives from government agencies, local nonprofits, and concerned residents. For more information, visit: www.livablecommunitiesalliance.org.

Possible Sources of Funding:

- HUD's Sustainable Communities Regional Planning Grants: http://portal.hud.gov/hudportal/HUD?src=/program_offices/sustainable_housing_communities/Apply_for_a_Grant
- New York State Department of State, Division of Local Government Services: Local Government Efficiency Program: www.dos.state.ny.us/lg/lge-index.html
- Appalachian Regional Commission Grants: www.arc.gov/funding/ARCGrantsandContracts.asp

3. Waste Management, Reduction, and Recycling

Overview

Co-Benefits

- Increased Lifespan of Landfills
- Job Creation
- Preservation of Materials
- Municipal and private Cost Savings

Although landfill waste is the cause of a relatively small percentage of total greenhouse gas emissions produced by Binghamton, landfills are large emitters of methane, which has a more significant climate impact than carbon dioxide per pound.

The collection of waste adds to the City’s emissions through the transportation of collected waste. The tonnage of waste landfilled has been increasing overall while the percentage of waste that is recycled has been declining (the City of Binghamton began a recycling program in 1991). Recycling not only reduces local emissions of methane, but it reduces emissions as a cause of resource extraction and manufacturing. Thus, it is important to improve recycling in order to reduce GHG emissions.

2025 Objectives	Recommended Actions
1. Increase Binghamton’s municipal solid waste recycling rate to 45% by 2015 and 50% by 2020	1.1 Increase household recycling
	1.2 Require recycling at events on City property
2. Divert other types of wastes from the landfill	2.1 Divert organic wastes from the landfill
	2.2 Reduce and Reuse construction and demolition material waste

1.1 Increase Household Recycling

Achieving a 50% recycling rate would save annually:

CO₂e Savings: over 7,700 tons

Financial Savings: Nearly \$88,500 in tipping fees

Nearly every step in the life cycle of municipal solid waste (MSW) management contributes to greenhouse gas emissions— from the production of the products that eventually become municipal solid waste to its collection and eventual decomposition. In 2006, 14,956 tons of solid waste from Binghamton was landfilled and resulted in the direct production of 7,270 tons of CO₂e. In addition, the Department of Public Works (DPW) fleet accounted for 1,086 tons of CO₂e. Additional emissions result from mining for and processing virgin materials as opposed to reusing materials.

When the City developed its “pay by the bag” end-user-fee program in 1991, the intention was to distribute the cost of waste disposal in an equitable fashion by charging each resident for what they dispose rather than imposing a flat rate across the board. This type of system, known as a “pay as you throw” system, provides residents with an incentive to recycle (as recycling is free) and to reduce their waste. While the program has successfully resulted in an above average recycling rate of 41.2% in Binghamton in 2008, the City’s recycling rate has decreased by nearly 7% from its high of 44.2% in 1998. Furthermore, the revenue generated through City bag sales currently covers only 44.6% of the cost of waste collection. For nearly twenty years, the price of the City bags had not been raised once to match increasing tipping fees, fuel costs, or inflation. Thus, the gap between revenue and expenses continues to widen over the years with increasing labor and fuel costs. As a result, taxpayers have been subsidizing the City’s garbage collection through the general fund, in effect reducing the incentive over time for residents to improve their recycling or to further reduce waste.



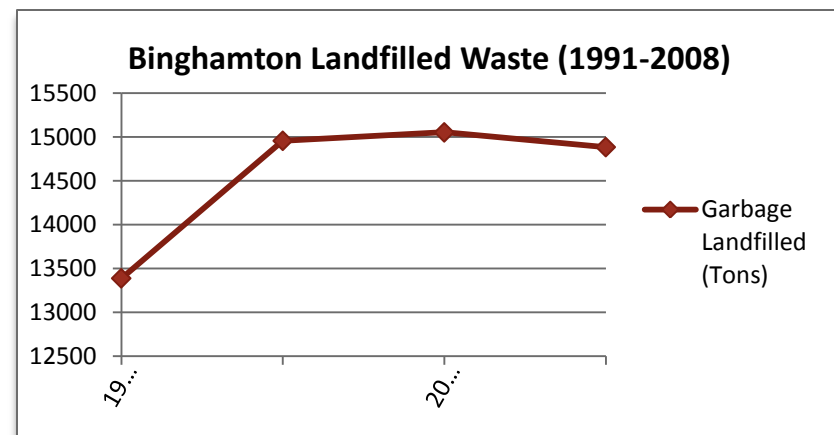
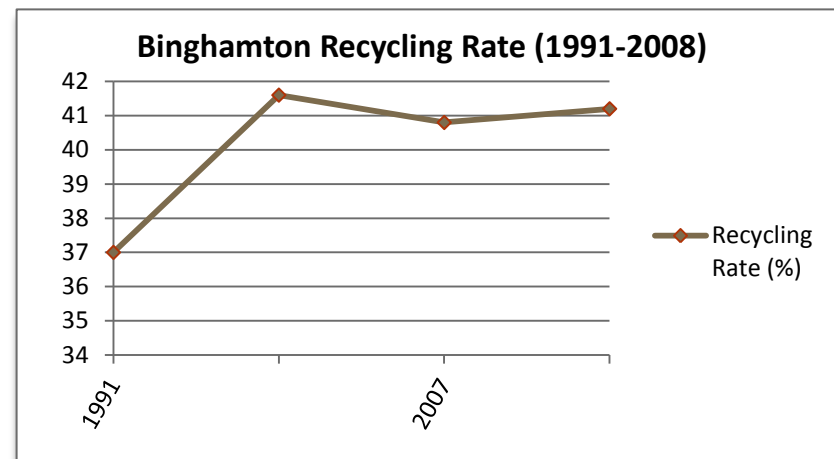
Recycle and save \$\$!	
If you use per week...	You spend per year...
3 Large bags (\$1.35 each)	\$210.60
2 Large bags	\$140.40
1 Large bag	\$70.20
2 Medium bags (\$0.75 each)	\$78.00
1 Medium bag	\$39.00
More Recycling + Fewer Bags = More Savings!	
Please follow the Broome County recycling guide & only put approved items in recycling bins—putting trash in the bin increases recycling costs and taxes!	

In a positive step, the City has begun implementing recommendations from its Commission on Sanitation.²⁸ The City should work to improve household recycling by continuing to implement the recommendations issued by the Commission with the goal of increasing the recycling rate to 45% in 5 years and to 50% within 10 years.

Cost Analysis: Implementation costs will be offset by reduced tipping fees and increased revenues.

Action Steps:

- Gradually increase the price for City bags over the next decade until the price of bags covers the cost of service delivery
- Develop an ongoing education campaign on recycling to inform residents on how they can offset the rise in collection fees by increasing their household recycling
- Strengthen enforcement of proper waste disposal and the collection of fines for violations
- Explore and evaluate alternative methods of collection (i.e. consolidating services with other communities, privatization, innovative recycling intensive programs such as RecycleBank^{®29})
- Develop a collection system for electronics
- Set a more ambitious recycling goal for 2030



²⁸ City of Binghamton Commission on Sanitation (2008). *Midterm Report*. Available at: www.cityofbinghamton.com/Library/pages/Commissions/Commission%20on%20Sanitation%20-%20Midterm%20Report.pdf

²⁹ RecycleBank[®] (www.recyclebank.com/) tracks the amount each household recycles and rewards the household with points they can redeem for rewards, such as gift cards and discounts.

1.2 Require Recycling at Events on City Property

Public events can draw many people and produce a significant amount of waste. In order to use City land for an event, a person must complete a permit process. Permit applications neither require the applicant to address how waste from the event will be disposed nor how recycling, which is mandated by Broome County law, will be encouraged. To reduce waste and increase recycling, permit applications should require an applicant to provide for recycling and other proper waste disposal options during public events. Permits are currently required for events such as auctions, block parties, miscellaneous activities, outdoor fireworks, parades, and weddings in parks. The City should provide portable recycling receptacles for such events for a modest fee and consider implementing a violation fee to encourage compliance.

Other Cities have measures in place already to ensure recycling at public events. For example, Portland, OR currently has a clause in its events permit requirement form which states that free recycling equipment and assistance will be given to anyone hosting a public event.

Action Steps:

- Install recycling bins at City parks as resources allow
- Include a clause in the events permit application which requires recycling at events on City public lands
- Provide additional recycling receptacles for free or at a modest price to facilitate proper recycling practices at public events
- Enact fines for improper waste disposal at public events



Success Story

The City of Pittsburgh has recycling at special events as a main part of their recycling program. Pittsburgh has an ordinance that requires source separation of recyclables during public events and the storage of these recyclables until they are picked up. If there is a violation of this ordinance the City can collect up to \$1,000 in fines plus court fees for a first violation and \$5,000 for each subsequent violation. Pittsburgh also has 100 recycling containers available for loan for events. Pittsburgh also offers to make arrangements for collection of recyclables after an event, however supervision of proper recycling procedures must be provided by event organizers.

2.1 Divert Organic Waste from the Landfill

CO₂e Savings: 33 tons of CO₂e per 100 tons of organic waste diverted.

Financial Savings: \$40 per ton

Although the decomposition of organic waste (e.g. food scraps and plant matter) causes only a small portion of Binghamton’s community sector greenhouse gas emissions, it was by far the greatest emitter of methane for this sector in 2006. Because waste is packed very tightly in landfills, there is little oxygen available to decomposing materials. As a result, organic waste decomposes anaerobically, or without oxygen. Anaerobic digestion of organic waste produces methane, which is a greenhouse gas 21 times more potent than carbon dioxide. Although some methane was captured to be sold or flared off at the Broome County Landfill in 2006, over 100,000 lbs of methane were dispersed in the atmosphere. Landfilling waste from Binghamton accounted for the production of 7,270 tons of CO₂e.

Diverting organic matter from the landfill will not only reduce Binghamton’s greenhouse gas emissions, but it can also create a resource out of what is often seen as waste. Organic matter can be used to create compost, a nutrient rich, soil enhancing substance that can be used as a plant fertilizer. Binghamton should reduce the amount of landfilled organic waste by focusing on consumer education. By encouraging residents to compost at home, the City can reduce the amount of waste generated at the source and decrease the number of trips required by the sanitation vehicles for waste collection, which will further cut emissions through diminished fuel consumption. Though composting can be done both on a Municipal level and at the household level, creating a Municipally-owned and operated composting site is costly and not feasible for Binghamton at this time. Incentives and education for residents can be provided at relatively little monetary cost to the City.

The City should also encourage “grasscycling”, which refers to leaving grass clippings on a lawn after mowing. Grasscycling reduces fertilizer costs for residents (nitrogen, an important soil nutrient, is contained in grass clippings), reduces the time dedicated to raking and collecting leaves, and helps to maintain a healthy lawn. Grasscycling will also reduce the amount of yard waste collected by the City, which will further reduce



Co-Benefits

- Increasing the lifespan of the landfill by reducing waste
- Creating a nutrient dense resource for food production and landscaping

Success Story

A composting collaboration between Binghamton University and Sodexo Dining Services has resulted in the collection of 350 tons of compost since 2008. On average Binghamton University collects from campus alone 2500 lbs of compostable material with a range of 1750 to 5100 lbs six days per week during the academic month year.

fuel consumption for DPW vehicles. Composting can also be incentivized for local food businesses, which can send their food scraps to a private composting facility.

Cost Analysis

The cost of implementing this program would be minimal. The main costs would include those for developing, printing, and distributing educational materials to residents. The payback period would be dependent on the amount of action taken by residents to reduce waste. Out of the 14,956 total tons of waste landfilled, it is estimated that about 18% (based on EPA waste statistics) or 2,692 tons is organic matter. The City pays a fee of \$40 per ton for disposal of solid waste. Thus, if 100 tons of organic waste, less than 4% of what is landfilled currently, were composted, the City would save \$4,000 and decrease emissions by 33 tons of CO₂e.

Action Steps

- Increase educational outreach to residents about waste reduction and eco-friendly practices.
- Encourage residents to compost at home by:
 - Selling compost bins at cost at City Hall and at the downtown farmers' market
 - Making funding available for community composting initiatives which make composting available for residents in community run spaces
- Encourage residents to grasscycle by providing brochures and other educational material about grasscycling and the savings that can be achieved by grasscycling

Home composting is easy to do and won't cause odors or pest problems if done properly. For more information about composting resources in Broome County, visit:

www.gobroomecounty.com/solidwaste/composting

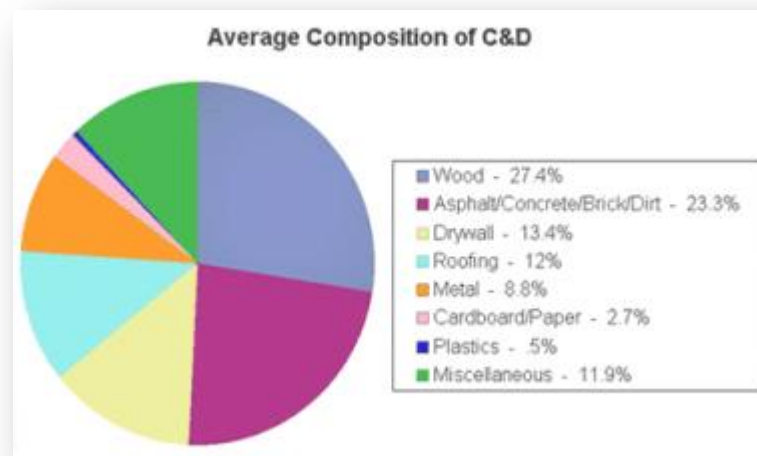
“Compost has been shown to suppress plant diseases and pests, reduce or eliminate the need for chemical fertilizers, and promote higher yields of agricultural crops.”

www.epa.gov/osw/conserv/rrr/composting/benefits.htm

2.2 Reduce and Reuse Construction and Demolition Material Waste

Upwards of 70% of building construction and demolition (C&D) wastes can be reused and recycled. Concrete, asphalt, metals, wood, drywall, asphalt shingles, plastics, tile, carpet, cabinetry, fixtures, and more can be recovered from construction and demolition projects to be reused, recycled, or repurposed. However, estimates from the US Environmental Protection Agency (EPA) indicate that in 2003 only 40% of the nation's 160 million tons of C&D building related materials were reused, recycled or sent to waste-to-energy facilities. The remaining 60% of materials were sent to landfills³⁰. C&D materials made up approximately 11.6%³¹ of the materials disposed of at the Broome County Landfill in 2007 and 25% to 45% the waste that goes to our national landfills annually.³²

Reusing and recycling building materials provides numerous environmental and economic benefits. Diverting materials from landfills can cut demolition project costs by reducing tipping fees, bring in significant revenue for projects through material sales, increase the useful life of landfill space, and supply valuable materials to industry. It also conserves natural resources, decreases greenhouse gas emissions, and stimulates economic development through the creation of recycling businesses and jobs.



Source: San Mateo County Recycle Works:

www.recycleworks.org/con_dem/index.html

Co-Benefits

- Job creation
- Preservation of historically significant architectural elements
- Affordable reused building materials are made available

³⁰ United States Environmental Protection Agency (2008). *Recover Your Resources: Reduce, Reuse, and Recycle Construction and Demolition Materials at Land Revitalization Projects*. Available at: www.epa.gov/swerosps/bf/tools/cdbrochure.pdf

³¹ Broome County Solid Waste Management (2008). *Personal Communication*. The actual percent of C&D materials disposed of at the Broome County landfill may be higher, as C&D waste that is mixed with other waste is not measured.

³² Southeast Environmental Financial Center (2004). *Construction & Demolition Debris Recycling for Environmental Protection and Economic Development*. Available at: cepm.louisville.edu/Pubs_WPapers/practiceguides/PG7.pdf

Success Story

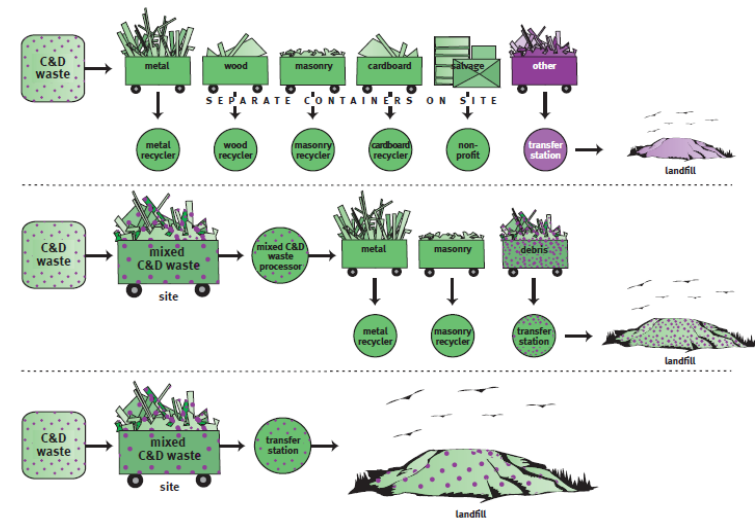
In Nashville, Tennessee, the Nashville Thermal Transfer Corporation waste-to-energy facility was taken down through the process of deconstruction. This high-profile demolition and new building job resulted in a 98.5% diversion rate and a net cost of \$115,000 on a project initially budgeted for \$2.4 million!).

Deconstruction, the process of dismantling a building to remove materials for reuse and recycling, can create new jobs and provide opportunities for job training. In addition, functional or aesthetic features that are not found in new products can be offered by salvaged materials. Currently, there are numerous barriers to contractors and residents reusing and recycling C&D materials. For example, there is neither a C&D mixed waste or centralized recycling facility nor a used building material retail store within Broome County. The City of Binghamton has made steps to promote the reuse and recycling of construction and demolition waste through educational events and a deconstruction pilot project, but further actions should be taken as outlined below in the Action Steps.

Action Steps:

- Adopt and gradually increase waste diversion requirements for construction and demolition for projects receiving City funds
- Develop a construction and demolition diversion ordinance that phases in waste management plan and diversion requirements for construction and demolition projects. This ordinance should be created through a process that allows input and feedback from potentially impacted stakeholders
- Encourage the use of recycled and reused materials within City projects
- Work with Broome County to find ways to support the development of local construction and demolition waste recycling and reuse businesses, including a construction and demolition material recycling facility
- Educate contractors and homeowners about the benefits of and opportunities for construction and demolition waste recycling. For example, the City should provide all Building and Demolition Permit applicants with Broome County's *Reuse & Recycling Guide for Construction*, which outlines the C&D recycling and salvage options available in the county
- Hold educational events for City staff, contractors, and the public on deconstruction
- Promote the practice of deconstruction by implementing model deconstruction projects with funds for City building removal
- Partner with non-profits and other municipal agencies to develop deconstruction based job training programs

THREE CONSTRUCTION & DEMOLITION WASTE PATHWAYS



4. Local Food, Agriculture, and Urban Forestry

Overview

Co-Benefits

- Money Saved on Grocery Bills
- Access to Fresh and Nutritious Food
- Support the Local Economy
- Job Creation
- Food Security

On average, food travels more than 1,500 miles from where it is grown and processed before arriving on our plates. Shipping our food long distances is a practice which requires fossil fuels and creates a large amount of emissions. By promoting local food through community gardens, urban agriculture, and rural-urban market connections, we can eliminate many of the negative aspects of our current food system.

Community gardens, urban agriculture, and urban forestry projects are ways to produce fresh, healthy food in our own backyards, as well as aesthetically enhance our neighborhoods. Such projects will increase access to fresh food, support the local economy, and reduce hunger while increasing property values and providing a wide variety of environmental benefits in our urban neighborhoods.



4. Local Food, Agriculture, and Urban Forestry

2025 Objectives	Recommended Actions
1. Support the development of a sustainable, locally- based, low-carbon food system	1.1 Increase the amount of food produced inside City limits through community based initiatives
	1.2 Encourage gardening and edible landscaping on residential, commercial and industrial properties
	1.3 Support the development of commercial agricultural and food processing enterprises within the City
	1.4 Encourage the consumption of locally produced foods
2. Increase tree canopy coverage and open space creation	2.1 Promote Tree Planting, Landscaping, and the Creation of Green and Open Space that Helps to Restore Natural Processes

1.1 Increase the Amount of Food Produced Inside City Limits through Community Based Initiatives

Our current food system requires a tremendous amount of resources for growing, processing, and distribution. The average supermarket food item in North America travels 1,400 miles from farm to store. Producing food within city limits will cut the cost of packaging and shipping. Growing food in Binghamton will create additional greenspace in our neighborhoods and can contribute to a healthy living environment. Volunteers Improving Neighborhood Environments (VINES) has established five community gardens throughout the city and the Binghamton Urban Farm project in downtown Binghamton, demonstrating that Binghamton residents are interested in growing their own food. As public interest increases, implementing a gardener training program can help educate the public on basic planning and growing techniques suited for the City of Binghamton. School gardens can improve the quality and nutrition of school meals, while fostering an increased awareness of where our food comes from. This will provide even further community involvement through neighbors, volunteers, parents, and local businesses. Training and youth education in integrated pest management, composting, grey-water recycling, and other practices related to urban agriculture will spread the knowledge needed to gain public support.

Cost Analysis:

Expenses will include the cost of mini-loans for environmental/health related education programs, expansion of community gardens, and other tools and resources. Pay back will be reached as food production within the Binghamton region increases.

Action Steps:

- Support the development of community gardens & urban agriculture
- Support local efforts to provide training to residents in farming and gardening techniques through hands-on workshops
- Work with the school district to promote school gardens & garden based education



Success Story

Montreal, Quebec is renowned for its community gardens program. The Montreal Botanical Garden offers courses in areas such as organic gardening, landscaping, and medicinal herbs. Youth garden plots are set aside for horticulture and natural science education. Roughly two-thirds of the gardens are located in parkland zones providing long-term protection from development. Eco-Initiatives works to improve accessibility to food for the elderly and low-income population. They teach people how to garden and coordinate a backyard sharing program. They have partnered with community health clinics to implement projects in pre-natal health, nutrition education and community kitchens.

Informational Resources & References:

- www.vinescommunitygardens.org
- www.farmtoschool.org/index.php
- www.foodsecurity.org

1.2 Encourage Gardening and Edible Landscaping on Residential, Commercial and Industrial Properties

CO₂e Savings: One can save about two pounds of CO₂ for every pound of fruits or vegetables grown at home

Energy Saved: Studies estimate that fresh produce travels more than 1,500 miles before being consumed

Financial Savings: A home vegetable garden can yield a savings of up to \$100 a month

Gardening and edible landscaping boost our food and fuel self-sufficiency by increasing our local food production and decreasing the need for food shipped from long distances. By growing one's own fruits, vegetables, and culinary herbs, one can save money on grocery bills. An edible landscape can be aesthetically pleasing, functional, environmentally sound, and economical all at the same time. This can be done in various settings including residential vegetable gardens, the City planting fruit trees along the streets, and schools planting gardens to teach students where their food comes from.

Cost Analysis: Some limited funding would be required for printing of helpful resource lists and fact sheets.

Action Steps:

- Provide incentives to property owners to add edible landscaping on their land
- Encourage recipients of home rehabilitation loans to include edible landscaping and/or garden facilities and provide helpful resource lists and/or fact sheets
- Provide educational opportunities for residents to teach them to grow fruits & vegetables
- Encourage the use of public and private urban land and rooftops for growing food and remove obstacles to local food production
- Encourage residents to grow food in home and community gardens using methods that reduce greenhouse gas emissions, such as using organic inputs and compost



Co-Benefits

- Aesthetically pleasing landscapes
- Save money on grocery bills
- Access to fresh and nutritious foods

What is edible landscaping?

Edible landscaping is the use of plants that produce food in place of more commonly used ornamental plants. Many of these plants are beautiful and still provide ornamental quality while also producing edible leaves, flowers, nuts, and berries. In this way, edible plants serve “double duty” by creating the outdoor spaces and gardens we love to be in and by giving us local, healthy, and delicious food.

1.3 Support the Development of Commercial Agricultural and Food Processing Enterprises within the City

CO₂e Savings: Growing and transporting 10 percent more produce for consumption in a regional or local food system would result in an annual reduction in CO₂ emissions ranging from 6.7 to 7.9 million pounds.

Energy Saved: The conventional system of food processing and shipping can use up to 4 to 17 times more fuel than regional and local systems.

Financial Savings: Savings would come from reduced transportation and fuel costs. Buying local keeps your money in the local economy.

To truly move toward energy self-sufficiency, we must move towards food self-sufficiency. A large portion of our food is grown and processed elsewhere and shipped long distances, requiring large amounts of energy. By localizing our growing and processing facilities we not only reduce our fuel usage, but we also increase our food security and strengthen our local economy. Food processing enterprises add value to farm products by further preparing food for consumers through packaging, processing, or marketing. Processing our food locally will strengthen the local economy and create jobs.

Cost Analysis:

Limited funding and staff would be required to develop and print fact sheets on how City programs can benefit agribusiness. The City could partner with local job training agencies to secure grant funding for workforce training for food processing jobs. These investments will benefit the City by strengthening our local economy and attracting food processing development to the area.

Action Steps:

- Develop and disseminate a fact sheet on how the Binghamton Economic Development Office and Binghamton Local Development Corporation programs can benefit agribusinesses
- Consider creating an Agribusiness Investment Tax credit and make agribusiness for local consumption a priority for Binghamton Economic Development Office assistance
- Support workforce training for food processing jobs and the development of local food distribution and processing facilities through collaborations with community partners

Co-Benefits

- Strengthen local economy
- Supply jobs
- Decrease food miles

Success Story

In November 2010, NYC Councilwoman Christine Quinn announced the creation of FoodWorks, a program designed to bolster upstate New York farms, increase local food production, reduce dietary diseases like obesity, and promote a greener food system. The FoodWorks blueprint is a “ground to garbage approach,” which includes 59 proposals relating to food production, processing, distribution, consumption, and post consumption. To improve the city’s food processing and distribution, recommendations include helping food manufacturers gain access to energy efficiency programs and also creating a wash, cut, and bag facility to process local produce to be used by the NYC Department of Education.

1.4 Encourage the Consumption of Locally Produced Foods

According to the World Health Organization, food security is defined by “having access to sufficient, safe, and nutritious food to maintain an active and healthy life”. Low-income, elderly, disabled and transit-dependent Americans have difficulty accessing fresh and nutritious food. Transportation and land-use policies attuned to Binghamton’s food security needs can build bridges between family farmers, food retailers, and consumers. Partnering with new markets such as schools, hotels, restaurants, and independent supermarkets will reach a new customer base. This can also make room for creating financial incentives for food retailers to carry local, organic foods.

Cost Analysis: Expenses may include mini grants to community groups working towards expanding farmer’s markets and other food establishments that sell local foods (i.e. a food co-op. Additional costs pertain to the financial incentives and promotion assistance that would be offered to businesses that feature local, organic food.

Action Steps:

- In partnership with business associations and others interested groups, create incentives for restaurants that feature local, organic food
- Promote the purchase of food from local producers for schools, senior centers, after-school programs, and the summer food program
- Improve food access for all residents through the establishment of a food co-op and promote CNY bounty pick up sites
- Promote the Binghamton farmers’ markets and expand to a permanent indoor, year-round facility
- Work with other government agencies to preserve agricultural lands through land use policies and zoning
- Work with the Food and Health Network in its conduction of regional food assessment and in implementing strategies to create a more economically viable, socially just, and environmentally sustainable regional community food system



Co-Benefits:

- Increased Food security
- Economic growth and community revitalization
- Improved individual health, empowerment, and well-being

Locally-produced fresh food is often the best environmental choice, and also helps to support local farming communities. Generally speaking, the greater the distance food has traveled, from paddock to plate, the greater the transport pollution, and the greater the impact on the health of people, the land and the global climate – a concept known as 'food miles.'

Australian Conservation Foundation 2005

2.1 Promote Tree Planting, Landscaping, and the Creation of Green and Open Space that Helps to Restore Natural Processes

CO₂e Sequestered: A mature tree sequesters approximately 50 lbs CO₂e per year (amount can vary widely with tree species, size, health, etc.)

Indirect Financial Savings: US Forest Service study of five small to medium-sized US cities showed that for every dollar spent to plant and maintain urban forests, \$1.67 to \$3.09 is returned in benefits (i.e. from climate moderation, shading effects, etc.)

Plants absorb carbon dioxide from the atmosphere and store it as carbon in their leaves, roots, trunks etc. Large trees sequester the most carbon because of their size and longevity. Trees also filter pollutants and moderate the nearby air temperature and climate, which means that they can reduce the demand for energy by providing shade and reducing demand for air conditioning in summer, and slowing wind speeds in winter. Protecting and expanding the urban forest, other green space, and landscaped areas is a vital part of our necessary response to climate change. A healthy urban forest will also reduce storm water runoff and flooding, improve water quality, recharge local aquifers, and reduce infrastructure and water treatment costs. While the City has the ability to improve the management of trees on public property and right-of-ways, most trees in Binghamton are located on private property. Therefore, to make significant progress in increasing tree canopy coverage and reducing storm water runoff, better tree management and landscaping practices also must be utilized on private properties.

Cost Analysis: Implementing the below action steps will primarily require the time of current City staff and will not require additional funding for new staff or to hire consultants. In fact, long term governmental savings will be achieved through reduced storm water runoff, which reduces infrastructure repair and water treatment costs. In terms of private development, the use of better site design principles often results in significant cost savings to developers as well.³³



Co-Benefits

- Improved air quality
- Trees absorb and slow runoff, reducing flooding and soil erosion
- Reduced heat island effect
- Increased property values and enhanced appeal of the City

³³ State of Virginia Department of Conservation and Recreation (2001). *The Economic Benefits of Better Site Design in Virginia and the Economic Benefits of Protecting Virginia's Streams, Lakes and Wetlands*. Available at: http://www.dcr.virginia.gov/soil_&_water/documents/swmecon.pdf.

Action steps:

- Develop tree canopy coverage targets for different areas of the City and identify opportunities for achieving these targets
- Encourage tree planting on privately owned lots through education, training, and incentives
- Consider adopting City ordinances that:
 - Establish canopy coverage requirements for parking lots
 - Require development and renovation projects to retain or replace large trees if removed, place restrictions on the removal of large or historic trees on private property, and protect existing trees from damage during construction activities
 - Ensure that as development density increases it is accompanied by tree planting and open space enhancements to meet canopy targets
 - Establish standards and guidelines to ensure that ecologically beneficial storm water quality and retention features and water conservation features are integrated into the design of landscaping features on both public and private land³⁴
- Support the development of new community managed open and green space through Design Your Own Park Program and other efforts

Success Story

In 2010, the City of Binghamton implemented a policy which requires land use applications to be sent to the Shade Tree Commission for comment. The Shade Tree Commission has been able to lend its expertise to the Planning Commission by giving detailed feedback on site plans and providing suggestions on how site plans can be improved to increase tree canopy coverage and improve the long term health of the trees.

Informational Resources & References

- Center for Watershed Protection. Approaches to Better Site Design Hand Book and CD, available at <http://www.cwp.org>
- Guidelines for Developing and Evaluating Tree Ordinances - www.fs.fed.us/ccrc/topics/urban-forests/docs/treeordinance.pdf
- Model Tree Canopy Ordinances - www.urbanforestrysouth.org/resources/library/tree-canopy-ordinances/file
- Municipal Forest Benefits & Costs in Five US Cities study – www.fs.fed.us/ccrc/topics/urban-forests/docs/jof_Dec_2005.pdf
- Talking Trees: An Urban Forestry Toolkit for Local Governments - www.urbanforestrysouth.org/resources/library/talking-trees-an-urban-forestry-toolkit-for-local-governments-1

³⁴ See City of Binghamton Commission on Sustainable Development and Smart Growth Final Report (2009). Available at: <http://www.cityofbinghamton.com/departments.asp?pid=5&pm=page&zone=dept-city-council>.

5. Outreach & Education

Overview

Meaningful change to reduce greenhouse gas emissions and improve energy independence cannot occur simply through regulation, but will be the result of proactive mobilization and education. Binghamton residents already care about their communities, their quality of life, and their impact on the planet. Two important steps to consolidate community involvement in the effort to mitigate climate change is through the creation of a Climate Change Task Force and the development of a centralized website to share information.

In addition to digital collaboration, residents will be able to come together through a variety of community outreach events. A Climate Change Speakers' Bureau could provide a platform for experts to share their knowledge on a range of issues, from global climate awareness, to region-specific risks and opportunities associated with rising temperatures. Other stages for community discussion can be provided through the various City of Binghamton Neighborhood Assemblies and groups. Civic engagement might take the form of community garden work days, energy efficiency block parties, teach-ins, music events, and workshops on home energy conservation retrofits.

A significant level of civic participation in climate adaptation will only be possible if the print and electronic media are mobilized. Journalists, broadcasters and weather forecasters all need to be aware of the seriousness of climate change and be cognizant of their role in informing the public. Change can only be made when the community is informed and enthusiastic.

2025 Objectives	Recommended Actions
1. Create an informed and motivated public that is engaged combating Climate Change	1.1 Establish an Energy and Climate Action Task Force
	1.2 Mobilize the Media
	1.3 Mobilize the Community
	1.4 Develop a Centralized Website for Climate Action in Binghamton

1.1 Establish an Energy and Climate Action Task Force

To assist with the implementation of this Energy and Climate Action Plan, the City of Binghamton should create an Energy and Climate Action Task Force through legislative action. Such Task Forces have been developed by many ICLEI partner communities to bring accountability, transparency, and vigilance to the long-term implementation of their Climate Action Plans. The Task Force would have several key responsibilities:

- Serve as an advisory board to City Council and the Mayor on strategies and policies necessary to increase energy independence, reduce greenhouse gas emissions, improve public health, and bolster economic competitiveness within the City of Binghamton
- Oversee the implementation of the strategies outlined in this Energy and Climate Action Plan and progress to achieve the International Council for Local Environmental Initiatives (ICLEI) Five Milestones for Climate Mitigation
- Coordinate with City Staff to develop annual reports on the progress of the Energy and Climate Action Plan implementation
- Raise awareness about the risks and opportunities that climate change poses to Binghamton and our region
- Motivate and mobilize our community to reduce individual and community greenhouse gas emissions
- Create a forum for regular public comment and community involvement in Binghamton Climate Action

A sample resolution with details on the composition of the task force is provided in Appendix B.



Co-Benefits

- Enhances public/private partnerships
- Raises profile for the Climate Action Plan in public domain
- Encourages citizen participation in implementation
- Broadens skills and knowledge base

Success Stories

Many cities have similar task forces, including:

- Brattleboro, Vermont
- Seattle, Washington
- Boulder, Colorado

Possible Sources of Funding:

- Community Action for a Renewed Environment (CARE) – EPA competitive grant for communities (\$90K-\$275K)
- Cool Planets- www.cleanair-coolplanet.org/smallgrants/grant_app2.php/ (\$250-\$2500)
- Regional Foundations and Corporations

Informational Resources & References:

- New York State Department of Environmental Conservation
- New Hampshire Climate Initiative Climate Action Plan
- The City of Portland and Multnomah County present the Climate Action Plan 2009
- How to Set Up a Climate Smart Coordinator or Task Force”, New York State Department of Environmental Conservation:
www.dec.ny.gov/energy/65489.html

To ensure timely management, execution, monitoring, and evaluation of its responsibilities, the Task Force should appoint a five member Committee for Climate Change Education, Outreach, and Engagement. The Committee would be responsible for leading the implementation of the recommendations further outlined in the Community Education, Outreach, & Engagement section of this Energy and Climate Action Plan. Members of the Committee should possess significant knowledge of and interest in the causes and consequences of climate change and of the challenges and opportunities posed by creatively addressing those causes and consequences. They should also possess sufficient standing with governmental, private, educational, and community sectors of Binghamton to ensure the effectiveness and legitimacy of the Task Force.

Cost Analysis: Developing an Energy and Climate Action Task Force will increase the City’s ability to expand its educational and promotional work around climate action without additional costs, and, as such, will be a very cost effective measure to implement.

Action Steps:

- Adopt legislation creating the Task Force
- Appoint Task Force members
- Direct Task Force to develop and implement a plan of action

1.2 Mobilize the Media

The most cost effective way to educate and motivate the citizens of Binghamton is through broadcast and cable television media (both commercial and public) and the print media. The Climate Action Task Force should work to educate local communications organizations on the significance of Climate Change and the science behind it. For example, the Task Force should host an educational seminar on climate change and the media. Invitees should include the General Managers of all area commercial television and radio stations, of the primary cable television franchise, public television and radio, Binghamton University radio station WHRW, and the print media including the editorial board of the Press & Sun-Bulletin. Objectives of the conference should include:

- Providing attendees with appropriate scientific background information on climate change and the potential economic, social, and environmental impacts of climate change for our region's residents, families, and communities.
- Discussion of the opportunities that exist for climate change education during both local news broadcasts and especially local/regional weather forecasts.

The Task Force should seek commitment from area communications organizations to devote resources to informed coverage of climate change and of what the individual and the community can do to address the causes and consequences of climate change. Further commitment should be sought from broadcast and cable television to have their weather forecasters participate in a seminar on climate change. With academic and private sector scientists as featured speakers, the seminar would have two primary functions: 1) to provide weather forecasters with appropriate scientific background information on climate change and its potential impacts and 2) to develop approaches for forecasters to place individual weather events that represent significant departures from "normal" in the context of climate change (i.e. increasing decadal and annual mean temperatures, increased frequency of extreme weather events such as floods, tornadoes, hurricanes, storms, more frequent periods of intense precipitation).

Action Steps: Recruit and select panel of academic and private-sector speakers; invite media persons to seminars,



Co-Benefits

- Helps prepare the community for appropriate adaptive responses to a changing climate

Success Stories—a mobilized media has:

- Helped citizens become more aware of the risks of cigarette smoking
- Helped motivate citizens to the benefits of wearing seat belts

Informational Resources & References:

- Matthew C. Nisbet, Ph.D. American University (2010). *Civic Education About Climate Change: Opinion-Leaders, Communication Infrastructure, and Participatory Culture*. Washington, DC. December 6, 2010

1.3 Mobilize the Community

Capitalizing on the benefits anticipated from the “Mobilizing the Media” effort, the Climate Action Task Force should identify and partner with key community-based organizations to enable these organizations and their constituencies to become informed about climate change and the actions they may take to reduce greenhouse gas emissions.

Action Steps:

- **Create and Publicize a Climate Change Speakers Bureau:** The Bureau will have a roster of speakers with educational and motivational competencies to address a varied set of audiences on climate change issues including: 1) climate change—causes and consequences with special focus on the northeastern United States and this region; 2) opportunities for and benefits of individual, household, governmental, and corporate reduction of greenhouse gas emissions; 3) community-level climate change opportunities for mitigation and adaptation; 4) citizen and community based organization techniques of empowerment to accelerate greenhouse gas reduction. The Task Force will serve as a central contact and coordination resource for the Speakers Bureau.
- **Write, design, print, and distribute an attractive, multi-color climate change and greenhouse gas reduction brochure:** Text and graphics of the brochure will educate and motivate the public about climate change and greenhouse gas reduction. They will also provide information about what each person can do individually, as members of their household, and of their community to become an active “part of the solution”, rather than a passive part of the problem.
- **Create and Coordinate Community Events to Educate and Motivate about Climate Change Opportunities and Benefits of Greenhouse Gas Reduction:** The Task Force will initiate and oversee a series of community-wide and neighborhood specific events such as energy conservation and efficiency fairs, street theater, film, music and art fests, photography contests, among



Co-Benefits

- Better informed citizens influence better public policy
- Model for others (especially regionally)
- Residents are better able to adapt
- Builds social capital and self-reliance

Success Story

To reduce energy costs as well as carbon emissions, Riverside Towers in Binghamton worked with both NYSEG and NYSERDA cut energy costs by one-third in five years. This effort continues as Riverside Towers works with residents to conserve and become more efficient with energy use in their own apartments.

others, each and all designed to inform and motivate climate change action to reduce greenhouse gas emissions.

- **Engage City of Binghamton Neighborhood Assemblies and Associations in Climate Change and Greenhouse Gas Education and Reduction Projects:**

Multiple opportunities exist for Neighborhood Assemblies and Associations and their members to become more informed about and to significantly reduce their “carbon footprint”. Among the opportunities the Task Force should seek to facilitate are:

- Staging neighborhood energy efficiency fairs and parties, workshops, teach-ins, street theater, folk-art, dances, music events, and competitions.
- Block or House Parties where one or more households that has or is in the process of increasing its energy conservation and efficiency efforts invites friends and neighbors to view the up-grades and share information about options, costs, vendor accessibility and reputation.

- **Organize and Staff Home Energy Education, Conservation, and Efficiency Visits to Senior Citizens.**

- **Mobilize the Business Community:** Secure “buy-in” from the business community for action to reduce greenhouse gas emissions. To achieve this objective, the Executive Committee shall initiate and oversee a range of activities, including:

- **Speaker’s Bureau:** As described above, the range of competences on the speaker roster will include those credible to and valuable for various sectors of the business community.
- **Educational Workshops and Seminars on Energy Conservation and Efficiency:** Convened by the Task Force in locations convenient and inviting for the target audience, these workshops and seminars will be well publicized, taught by individuals with recognized and acknowledged competence, and would address energy and climate issues directly relevant to the particular audience. Examples might include: 1) for service sector—reducing energy used in Information Technology record keeping and processing, use of alternatives to physical travel, e.g., teleconferencing, for client cultivation and communication; 2) for retail sector—increasing lighting efficiency without reducing sales, marketing over the internet; 3) for manufacturing—cutting edge technologies for energy conservation and efficiency tailored to the designated manufacturing segment.

Possible Sources of Funding:

- Federal and state agencies
- Regional foundations
- Regional private sector businesses

Informational Resources & References:

- League of Women Voters. Toolkit for Climate Action
- A Step-by-Step Guide: How to Mobilize Your Community on Climate Change. Marcia Youngman, Guest Writer, 7/31/07. www.newwest.net

1.4 Develop a Centralized Website for Climate Action in Binghamton

The many and varied climate change and greenhouse gas reduction education, outreach, and engagement activities described above require a central resource to ensure effective outreach and coordination. Toward that end, the Climate Action Task Force should develop a web-site and a central telephone number.

Information on the website should address the interests and needs of a wide-spectrum of citizens (including owners and renters) as well as small businesses, not-for-profit institutions, and governmental departments. The website should also include hypertext links to climate change and energy conservation and efficiency sites including:

General information about climate change:

www.dec.ny.gov/about/43166.html

www.nyclimatechange.us/InterimReport.cfm

www.epa.gov/climatechange

www.pewclimate.org

www.ipcc.ch

Energy conservation and efficiency tips:

www.nesea.org

www.energysavers.gov/tips

www.energy.gov/energyefficiency/index.htm

www.eia.doe.gov/emeu/efficiency/energy_savings.htm

Carbon calculators:

www.epa.gov/climatechange/emissions/ind_calculator.html

www.terrapass.com/carbon-footprint-calculator

www.mnn.com/earth-matters/climate-weather/stories/the-15-best-carbon-calculators

www.squidoo.com/carboncalcs

Importantly, the centralized website will provide information specific to the City of Binghamton and surrounding region, including current lists of speakers,



Co-Benefits

- Promotes sustainable practices
- Comprehensive and current source of information about climate change, energy conservation and efficiency
- Empowers citizens to control their own energy and climate destinies

Success Stories

See this comprehensive website listing by category the world's top 100 environmental websites:

www.world.org/weo/climate

neighborhood, business, government, and other resources and activities. Finally, in addition to serving as a resource for current, up-to-date information on climate change and energy, when compared with print media, a website would provide one of the most cost-effective ways to reach elementary and secondary school age students (either in-class or at home), university students (many of whom live in the City itself), and others in the 12-45 year old “web-savvy” demographic.

Action Steps:

- Investigate and evaluate existing web resources
- With advice from many sources including university faculty, business and corporate owners and executives, and citizen organizations, select content for the website
- Perform feasibility analysis that would include budgets and recommendations on funding resources as appropriate
- Recruit (preferably volunteer) website master to create and maintain the site

Possible Sources of Funding:

- Federal and state agencies
- National foundations
- Firms offering energy conservation advice, services, and products

Informational Resources & References:

- www.renewbroomecounty.org

6. Government Action

Overview

Co-Benefits:

- Reduced operating expenses & lower taxes
- Improved air quality
- Improved health of residents

The City of Binghamton has a responsibility to lead the way on climate and energy adaptation. Municipal operations are responsible for roughly 2% of Binghamton’s greenhouse gas emissions. Regardless of the low percentage, City administration and staff have an obligation to be role models for change in our community. This section of the Plan outlines action items for municipal energy and resource reduction, from using less paper in city offices, to developing comprehensive plans for more green space and street trees. Municipal energy use can be reduced in many of the ways suggested for the general public, from installing more efficient vending machines to promoting alternative fuels and transportation. Building energy use is the source of nearly 60% of the City’s municipal emissions. Yet even simple steps like replacing Exit sign lights with LED lights can save the City 3.02 tons of CO₂ and over \$1,500 annually. With the proposed creation of a Facilities Management Team, made up of different department heads, energy efficiency retrofits on municipal buildings will become a priority.

The City has undertaken a number of efforts to reduce its energy consumption. The upgrades made to City Hall’s heating and cooling system, the replacement of traffic signal lights with LED bulbs, and the replacement of Police vehicles with hybrids have led to significant cost savings for taxpayers. Further, these actions, amongst others, have helped Binghamton to gain credibility as a green municipality.

2025 Objectives	Recommended Actions
1. Cut City electricity and natural gas use by 30% by 2025	1.1 Develop a Plan for Retrofitting City-owned Buildings to Significantly Reduce Energy Consumption
	1.2 Require LEED Silver Certification for All New and Renovated City-Owned Structures Over 1500 Square Feet
	1.3 Replace All Streetlights with Energy Efficient Bulbs and Fixtures by 2020

	1.4 Replace All Exit Signs in City Government Buildings with LED Bulbs
	1.5 Purchase Only Energy Star Appliances for City Use and Require All New Computers to Have Minimum of EPEAT Bronze Rating
	1.6 Install Vending Misers on All Vending Machines in City Government Buildings
2. Obtain 30% of electricity from renewable sources by 2025	2.1 Source 35% of Electricity for City Operations from Renewable Sources by 2020
	2.2 Advance Energy Independence of the Binghamton-Johnson City Joint Sewage Treatment Plant
3. Reduce consumption of fuel for transportation with City government operations	3.1 Increase Fuel Efficiency of City Fleet by Purchasing Vehicles with a Higher MPG Rating
	3.2 Reduce Vehicle Trips Taken with Municipal Vehicles
	3.3 Enforce an Anti-Idling Policy for Municipal Vehicles
	3.4 Encourage City Government Employees to Utilize Alternative Forms of Transportation in Their Daily Commute
4. Use alternative fuels for City fleet	4.1 Purchase Biodiesel for Use in City Vehicles
	4.2 Buy Electric and Plug-In Vehicles for the City Fleet as They Become Commercially Available and Cost Effective
5. Open Space and Urban Forestry	5.1 Develop an Open Space & Parks Plan
	5.2 Continue to Improve Urban Forestry Management Practices
6. Reduce waste and increase the use of recycled materials within City operations	6.1 Reduce Paper Use in City Operations
	6.2 Require the Use of Environmentally Preferable Products within City Operations

1.1 Develop a Plan for Retrofitting City-owned Buildings to Significantly Reduce Energy Consumption

Similar to the profile for community emissions in Binghamton, buildings and facilities account for a significant portion, approximately 59%, of the emissions from the City of Binghamton's operations. From municipal parking garages to the Water Treatment Plant and from City Hall to the Binghamton-Johnson City Joint Sewage Treatment Plant, City facilities can use a substantial amount of electricity and natural gas to operate, and there are always opportunities for improving energy efficiency. It is essential that the City of Binghamton invest in making its operations more energy efficient to not only reduce emissions but also reduce the City budget, and thus taxes. Furthermore, City government should lead by example and promote energy conscientiousness within the community.

Cost Analysis: The City can finance improvements to government facilities through a variety of avenues: municipal bonds, grants, energy performance contracts, and low interest financing through the New York Power Authority. Each financing option will come with different costs, both in terms of administration and interest expenses. However, it is possible to finance improvements such that the cost will be spread out over a number of years and will be offset by annual savings.

Action Steps:

- Establish a Facilities Management Team made up of Department heads and others who are involved in building and facility maintenance
- Develop a plan that identifies opportunities for energy efficiency upgrades at each building or facility and avenues for funding the upgrades by 2020
- Monitor progress toward this goal annually and assess opportunities for improvement



Success Story

In 2004, the City of Binghamton began a 15 year energy performance contract with Siemens Building cut energy use in City Hall and replace traffic lights with more efficient bulbs. As of April 30, 2010, this project has saved the City a total of \$915,545 and reduced its annual energy consumption by approximately 2 million kilowatt hours, or the equivalent total energy use for 12 homes.

New York Power Authority (NYPA)

NYPA is a public benefit corporation which produces low cost energy and maintain transmission infrastructure. NYPA also promotes energy efficiency by providing low interest loans (the 2011 tax exempt rate is 0.51%) and low cost project management assistance to municipalities.

What is an Energy Performance Contract?

An Energy Performance Contract provides customers with a comprehensive set of energy efficiency, and renewable energy measures and often is accompanied with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project, allowing building owners to finance energy efficiency improvement without having to invest upfront capital.

1.2 Require LEED Silver Certification for All New and Renovated City-Owned Structures Over 1500 Square Feet

Many municipalities across the country—including many cities, towns, and counties in New York (such as Nassau and Erie)—have passed policies and/or ordinances requiring that new municipally funded construction must meet LEED Silver guidelines. The City of Binghamton should establish a comparable requirement by passing an ordinance. This policy will reduce facility operating costs over the long run and improve indoor air quality, which is important for worker health and productivity. The most effective use of LEED-certified approaches is to integrate them into the design process from the outset, rather than to presume that they represent “add-on” costs to the project.

Cost Analysis: While it can be expected that the implementation of LEED Silver criteria will add to the cost of buildings or renovations (some estimates suggest around a 10% cost increase), the most recent studies (esp. by Davis Langdon Inc.) indicate that buildings constructed to LEED silver certification have not been any more expensive than buildings that were not constructed following LEED guidelines. Furthermore, incentives are available through NYSERDA for new, green construction. The financial savings may be 30% or greater in reduced energy and water-use costs, and the payback period can be as little as 2 years for energy savings.

Action Steps:

- Pass an ordinance requiring all City construction and renovation projects involving facilities greater than 1500 square feet to meet at least LEED Silver certification. The ordinance could be passed immediately and allow for a 2-3 year period for the policy to be implemented



Co-Benefits

- Use of recycled building materials
- Improved productivity from better lighting, reduced indoor air pollution

Success Story

A cost-benefit analysis of two LEED-Silver municipal buildings in Seattle, Washington, indicated a long-term net benefit of somewhat more than 1% - translating to as much as \$4.5 million in savings over 25 years.

Informational Resources & References:

- US Green Building Council
- Green City Buildings; report to City of Portland by XENERGY and SERA Architects, 2000
- *The costs and benefits of achieving Silver LEED for two Seattle municipal buildings*, by Bing Tso and others, 2004.

1.3 Replace All Streetlights with Energy Efficient Bulbs and Fixtures by 2020

CO₂e Savings: 346 tons annually after all streetlights are replaced

Energy Savings: LEDs use 50-80% less energy as HPS lights

Cost Savings: Over \$300,000 annually after all streetlights are replaced

The City of Binghamton currently uses High Pressure Sodium (HPS) lights in all 10,000 of its streetlights. Each year these streetlights consume over 5 million kWh of electricity and cost over \$600,000. Light-Emitting Diodes (LEDs) are more energy efficient than traditional lighting, using 50-80% less energy and lasting more than twice as long as HPS lights. The City has already replace traffic signals with LED bulbs, which has resulted in cost and labor savings. The conversion of all City streetlights to LED lights would result in 346 less tons of CO₂e emitted every year, save the City more than \$300,000 in energy costs per year, and reduce maintenance costs.

Cost Analysis: It is estimated that each streetlight will cost ~\$500 to upgrade to LED bulbs. For 8,000 streetlights, the total cost would be around \$4 million. Given a conservative estimate of \$300,000 in savings per year, the payback would be less than 15 years.³⁵

Action Steps:

- Identify the most cost effective financing option for the project (i.e. NYPA funding, municipal bonds, performance contracting) and seek grant funding to provide supplemental financing
- Secure funding and put the project out to bid
- Analyze and publish the result of the program through the Department of Energy's GATEWAY program (<http://www1.eere.energy.gov/buildings/ssl/gatewaydemos.html>)

³⁵ The University of Pittsburgh (March 2010). *LED Streetlights Best Buy for Cities, Pitt Researchers Report in First Cradle-to-Grave Comparison to Common and Emerging Streetlamps*. Available at: <http://www.pitt.edu/news2010/Streetlight-Chart.pdf>.

Ann Arbor's LED Streetlight Program. Available at: http://www.a2gov.org/government/publicservices/systems_planning/energy/Documents/LED_Summary.pdf.



Co-Benefits

- Decreased light pollution
- More even light distribution

Success Story

In March of 2006 the City of Ann Arbor, Michigan replaced an entire block of streetlights with LED globe lights as part of a pilot program. The program was successful and the City estimated that they saved roughly \$100 each year on each light in electricity and maintenance costs-giving the project a payback period of 4.4 years. Ann Arbor then installed over 1,000 additional streetlights and plans to convert all of their streetlights to LED lights in the near future.

1.4 Replace All Exit Signs in City Government Buildings with LED Bulbs

CO₂e Savings: 3.06 tons annually

Financial Savings: \$1,530 annually

Energy Savings: 8,160 kWh annually

LED lights can last up to 10 times longer than incandescent bulbs and are anywhere from 50-80% more efficient, therefore reducing both maintenance and energy costs. They also produce a brighter light than incandescent bulbs, increasing visibility in an emergency situation. Upgrading Exit signs with LED bulbs is a very simple measure to implement.

Cost Analysis: An LED Exit sign upgrade kit costs roughly \$39, and an LED Exit sign saves over \$21 a year in energy costs and \$30 a year in replacement and labor costs. Assuming 30 exit signs, that's a savings of \$1,530 a year. Considering that the exit signs would cost \$1,170 to install, the payback period would be less than 10 months.

Action Steps:

- Inventory exit signs in all City buildings
- Order LED upgrade kits in bulk to reduce costs
- Install LED light bulbs



What is an LED light?

LED stands for Light Emitting Diode. A diode is a semiconductor that only allows passage of electrical current in one direction. Scientist Nick Holonyak invented the LED in 1962 while working at a General Electric laboratory in Syracuse, NY. Originally only used for low-light indicator type applications, LEDs are increasingly used for lighting.

1.5 Purchase Only Energy Star Appliances for City Use and Require All New Computers to Have Minimum of EPEAT Bronze Rating

Electricity accounts for 63% of CO₂e emitted from government operations in the City of Binghamton. Using Energy Star and Electronic Product Environmental Assessment Tool (EPEAT) rated products would help us to meet our goal of reducing city electricity use by 30% by 2020. Energy Star appliances generally use 20%–30% less energy than required by federal standards. EPEAT is a global registry for greener electronics. Products registered in EPEAT must meet twenty-three required environmental performance criteria, including reduction or elimination of sensitive materials, material selection, design for end of life, product longevity/life cycle extension, energy conservation, end of life management, corporate performance, and packaging. Products are then rated Gold, Silver or Bronze based on the percentage of twenty-eight optional criteria they meet. The City typically buys Dell computers, which have twenty eight models rated EPEAT Silver. Although the current Mayor has set an internal policy requiring that computers purchased must be Energy Star certified, this policy should be institutionalized by City Council to ensure that this policy is followed now and in the future.

Cost Analysis:

Typically Energy Star and EPEAT rated products have competitive prices and even when they are a bit more expensive that upfront cost is made up over time in savings from less energy use.

Action Steps:

- Pass a City resolution establishing a policy that mandates the City only purchases Energy Star appliances and EPEAT rated computers
- Become an EPEAT Purchasing Partner (<http://www.epeat.net/Partners/Purchasing/Join.aspx>)
- Implement a purchasing policy that ensures all appliances will meet Energy Star criteria and that computers will be EPEAT registered

Co-Benefits

- Conserve energy and cut costs
- Produce less waste

Success Story

EPEAT is required by all agencies of the US federal government, the State of Oregon, City of Portland, and is now used by Amazon.com to help consumers' select greener electronics on their website.

1.6 Install Vending Misers on All Vending Machines in City Government Buildings

CO₂e Savings: 14 tons annually

Energy Savings: 12,250 kWh annually

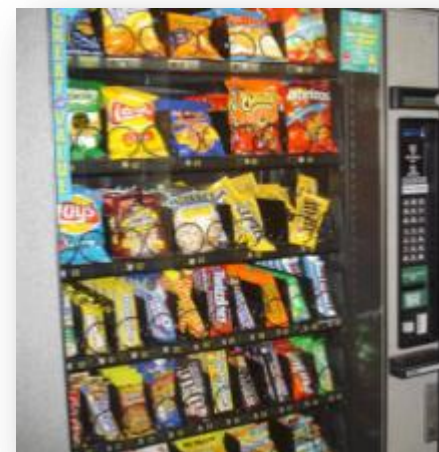
Cost Savings: \$980 annually

Vending misers are permanently wall-mounted devices between the electrical outlet and the vending machine. They have motion detectors that turn off the machine if no one is around for over 15 minutes and the compressor is idle. When someone walks by the lights are turned on and, if necessary, so is the compressor. The miser takes into account the temperature inside the machine and the ambient temperature in the room to regulate compressor use. Vending machines equipped with the misers are comparable in daily energy use to ENERGY STAR certified machines, and misers cost a fraction of the price of a new vending machine. Though this action would provide only a small reduction in energy use in City facilities, it exemplifies one of the many simple, low cost actions that the City, institutions, and businesses should take to reduce their carbon footprint and save money. Undertaking a number of such actions can result in significant savings in money and energy.

Cost Analysis: With 7 vending machines in City Government buildings and a cost of \$165 per vending miser, installation cost will be approximately \$1,155. Assuming an annual savings of \$980, payback period will be less than 15 months.

Action Steps:

- Contact the vending machine company and discuss the installation of the misers. Require the vending machine company to use misers in exchange for the free energy they are provided
- Contact local utilities and NYSERDA to find out if there are any rebates available for the purchase of several vending misers
- Install one or two misers and monitor the energy consumption of those vending machines. If the results are satisfactory equip the rest of the vending machines in City Government buildings with vending misers



Co-Benefits

- Demonstrate best practices businesses and other institutions

Success Story

In 2001, Tufts University installed vending misers on 75 of its machines. They noticed a decrease in energy use of about 50% per machine, a payback period of less than one year, and roughly 2300 less pounds of CO₂ emissions per machine for the year.

2.1 Source 35% of Electricity for City Operations from Renewable Sources by 2020

New York has adopted an aggressive goal of obtaining 30% of its electricity from renewable sources by 2015. Meeting this goal is projected to provide more than \$6.0 billion in direct macroeconomic benefits over the average 20-year life of the new facilities.³⁶ The City should work to achieve the goal of sourcing 35% of the energy used for City operations from renewable sources by 2020. This target should be feasible considering the amount of renewably sourced energy on the electricity grid will be increasing. Additional measures can be taken by the City to ensure this target is achieved without significant costs.

Cost Analysis: The implementation cost will depend on the approach the City takes to achieving this recommendation. However, costs may be offset by grants, innovative financing or leasing options, and efficiencies gained through energy conservation.

Action Steps:

- Determine the amount of renewable electricity currently utilized by the City
- Outline a plan for achieving the renewable electricity target using such tools as:
 - Leasing City rooftops to private companies for renewable energy systems
 - Including renewable energy systems within Performance Contracts for facility energy efficiency improvements
 - Seeking grants to offset the costs of renewable energy system installations
 - Setting a renewable energy goal for purchased electricity

Information and Resources:

- US Department of Energy, Guide to Purchasing Green Power:
 - http://www.epa.gov/greenpower/documents/purchasing_guide_for_web.pdf
- Interstate Renewable Energy Council, Municipal Guide To Purchasing Renewable Energy:
 - <http://www.mass.gov/Eoca/docs/leer/esmart-purchasing-renewable-energy.pdf>



Success Story

The City of Binghamton installed a 49.68 KW solar photovoltaic system at its Water Treatment Plant in the Spring of 2011. The first onsite renewable energy generation system for a City building, this project was funded by a \$320,922 federal recovery grant through NYSERDA, as well as a \$56,635 (15%) match by the City. The system is expected to save taxpayers up to \$560,000 over the life of the system and eliminate more than 23 tons of CO₂ production annually.

³⁶ New York State Energy Planning Board (2009). *Renewable Energy Assessment: New York State Energy Plan 2009*. Available at: http://www.nysenergyplan.com/final/Renewable_Energy_Assessment.pdf

2.2 Advance Energy Independence of the Binghamton-Johnson City Joint Sewage Treatment Plant

Wastewater treatment facilities (WWTF) typically use more electricity than any other facility in local governments and are often the largest single source of greenhouse gas emissions in a community. Utility costs for these facilities have drastically increased in recent years due to rising energy costs and the implementation of plant upgrades largely as a result DEC mandated water quality standards. In 2006, the Binghamton-Johnson City Joint Sewage Treatment Plant accounted for 34% of local government emissions which resulted from the plant's energy use and release of methane. In just 5 years since then, the cost of energy for the facility has doubled from \$629,597 to over \$1.2 million annually.

While WWTF are huge consumers of energy, they are also capable of producing energy through onsite renewable energy systems and the production of biogas (a combination of methane and carbon dioxide produced through the anaerobic digestion of sewage sludge), which can be used to create both heat and electricity. Additionally, improvements in energy optimization and recovery technologies and practices can help WWTFs to reduce their energy needs. The Binghamton-Johnson City Joint Sewage Treatment Plant has already implemented a number of energy savings measures, from installing variable frequency speed drives to capturing biogas to fuel boilers that heat the sludge digesters. The plant operators estimate that the use of biogas reduces their natural gas costs by approximately \$70,000 per year. More, however, can be done to reduce the energy costs of and emissions from the facility. Currently, only a third of the biogas is captured for use in the boilers and the remainder is flared. Approximately 40% of the plant's electricity needs could be met by a 400 kW combined heat and power (CHP) system run



Sludge digesters process sewage sludge to extract methane for energy generation at the Massachusetts Deer Island Waste Water Treatment Facility.

Success Story

The Gloversville-Johnstown Joint Wastewater Treatment Facilities in Fulton County, NY has undertaken a number of projects to reduce its energy needs and to produce renewable energy onsite. Two 150 kW biogas engine generators were installed to co-generate electrical power using biogas. Waste heat is recovered from the engines and exhaust to heat the digester. Approximately 35% of the plant's electrical need is met by the onsite generation of electricity. To evaluate inefficiencies in energy consumption, the plant hired a consultant with funds from the New York State Energy Research and Development Authority. The consultant's analysis revealed that the aeration system, built to treat higher industrial loads, was a major contributor to the plant's energy costs. In 2002 the aeration system was automated to account for fluctuating loads, reducing the plant's energy needs by 30 percent— an annual savings of \$195,000.

off the plant's biogas. Grants have been sought for such upgrades for the plant without success. The City should continue to support upgrades that will reduce the plant's energy needs, which will both reduce emissions and keep costs down for rate payers. Specifically, the City should invest in the plant's capacity to seek grant funds to implement energy reduction best practices.

Cost Analysis: Implementation costs will vary greatly depending on the measures undertaken. However, the best practices recommended by NYSERDA and the US EPA result in overall long term savings and often have short term payback periods. For example, submetering allows WWTFs to be able to directly monitor the energy consumption of individual pieces of equipment or unit processes. According to NYSERDA, every facility that has undertaken this effort so far found opportunities to improve efficiency, reduce energy use, and cut operational expenses—most had payback periods of less than 10 years.

Action Steps:

- Identify and employ strategies that will provide the plant with the resources needed to seek grants for feasibility studies and project implementation (i.e. hire a grant writer for the plant or contract with a consultant for those services)
- Continue to research best practices for energy conservation and onsite power generation and secure funding to implement projects (i.e. NYSERDA's Flex Tech program can help cover the costs of feasibility studies—see side bar). Examples of best practices include:
 - Optimized aeration systems
 - Real time energy monitoring and plant submetering
 - Combined heat and power generation
- Explore opportunities for installing onsite renewable energy generation systems in addition to CHP, i.e. Low-head hydropower (micro hydro turbines can be used to generate electricity from effluent running through the Plant's channels)

Funding Sources:

- NYSERDA Flex Tech Program:
<http://www.nyserda.org/programs/flextech.asp>
- NYSERDA Existing facilities program (for variable frequency drives):
http://www.nyserda.org/Programs/Existing_Facilities/default.html
- State and Federal Funding Resources for Combined Heat and Power Systems: www.epa.gov/chp/funding/index.html

Information and Resources:

- NYSERDA: <http://water.nyserda.org>
 - Wastewater Facility Checklist
 - Best Practice Handbook
 - Payback Analysis Tool
- EPA Combined Heat and Power Partnership:
<http://www.epa.gov/chp/index.html>
- Water Environment Research Foundation, *Energy Efficiency in Wastewater Treatment in North America*:
<http://www.werf.org/AM/Template.cfm?Section=Search&Template=/CustomSource/Research/PublicationProfile.cfm&id=OWSO4R07e>
- US EPA, *Combined Heat and Power - Energy Savings and Energy Reliability for Wastewater Treatment Facilities*:
http://www.epa.gov/chp/documents/wastewater_fs.pdf

3.1 Increase Fuel Efficiency of City Fleet by Purchasing Vehicles with a Higher MPG Rating

A 20% improvement in fuel economy for the City fleet would save annually:

CO₂e Savings: over 500 tons

Cost Savings: over \$84,000

The benefits of developing a more fuel efficient City fleet are numerous. By purchasing and driving vehicles that have a higher MPG rating, the City can significantly decrease greenhouse gas emissions while cutting fuel costs. The City of Binghamton spent \$422,186.00 in 2005 on vehicle fuel. This generated 2,393 tons of CO₂e and equates to 19.2% of all CO₂e emissions for government operations. The initial upfront additional cost of purchasing a more fuel efficient vehicle may be recouped in a very short period of time, as demonstrated in the success story about the City's purchase of hybrid police vehicles (see Success Story). At the same time, the City will improve air quality and thus community health by reducing tail pipe emissions, which can contribute to higher asthma rates in urban areas.

As fuel prices continue to rise, the City should act on improving its fleet efficiency immediately. At 20% fuel efficiency improvement fleet wide would save the City over \$84,000 and cut nearly 500 tons of CO₂e per year. Further savings can be achieved by training City employees on better driving techniques. According to the EPA, "quick acceleration and heavy braking can reduce fuel economy by up to 33 percent on the highway and 5 percent around town".³⁷ By adjusting driving habits in ways that will improve fuel efficiency, drivers will also be employing safer driving techniques, which can reduce accidents and injuries.

³⁷ Environmental Protection Agency. *Many Factors Affect MGP*. Available at: <http://www.fueleconomy.gov/feg/factors.shtml>



Co- Benefits:

- Improved air quality
- Improved health of residents

Success Story

In April 2009, the Binghamton Police Department added three 2008 Nissan Altima hybrids to their fleet. While the long-used Ford Crown Victoria police vehicles achieve 8-12 miles per gallon of gasoline, the hybrids attain 35 miles per gallon and will reduce the amount of gas used per car by two-thirds. The Altimas also have much lower maintenance expenses, given their dependability, and the frequent breakdowns of the Crown Victorias. The Nissan Altima hybrids cost the City only \$1,500 more than the Ford Crown Victorias. The hybrids' fuel-efficiency and reliability will make up the difference in a short amount of time.

Cost Analysis: To understand the benefit of replacing City vehicles with more fuel efficient ones, we can calculate and compare the average annual greenhouse gas emissions and fuel expenses for a common City-owned passenger vehicle, a Chevy Lumina, and a new fuel efficient vehicle, a Honda Insight, which is available through New York State Contract. The fuel expenses and emissions for a Chevy Lumina are roughly twice that of a Honda insight (see calculations in text box). When magnified by achieving similar energy efficiency improvements across a 600-vehicle fleet, the overall reductions in cost and emissions will be considerable.

Action Steps:

- Develop a Green Fleet Action Plan and a Fuel Efficiency Purchasing policy with a goal of achieving a 20% reduction in vehicle fuel use by 2020 and a 30% reduction in fuel use by 2030
- Implement a Vehicle and Fleet Right-Sizing Process to ensure that the vehicle purchased fits the size of the job that is intended to maximum efficiency and to avoid waste
- Continue to track, record, and keep records of all City vehicles and their miles travelled in order to determine a vehicle’s usage, necessity, and performance
- Provide training for City employees on fuel efficient driving techniques

Annual Vehicle Emission Formula

(VMT/passenger vehicle avg. mpg) x CO₂ per gallon x (100/95) /1000 = GHG Emissions per year

Chevy Lumina

$(5,000 \text{ miles}/21 \text{ mpg}) \times 8.8 \text{ kg CO}_2/\text{gallon} \times (100/95) /1000 = 2.21 \text{ metric tons CO}_2\text{e}$

Honda Insight

$(5,000/41) \times 8.8 \times (100/95) /1000 = 1.13 \text{ metric tons CO}_2\text{e}$

Annual Vehicle Fuel Cost Formula

(VMT/vehicle avg. MPG) x Cost of gasoline per gallon= Cost per year

Chevy Lumina

$(5,000 \text{ miles per year}/21 \text{ mpg}) \times \$3.00 \text{ per gallon} = \714.28 per year

Honda Insight

$(5,000 \text{ miles per year} /41 \text{ mpg}) \times \$3.00 \text{ per gallon} = \365.85 per year

Informational Resources:

- BC Climate Action Toolkit: Driving a Green Fleet Program:
www.toolkit.bc.ca/solution/fuel-efficient-fleets
- EPA Clean Vehicles: Clean Fleets Website:
www.epa.gov/oms/stateresources/rellinks/cleanfleets.htm

3.2 Reduce Vehicle Trips Taken with Municipal Vehicles

Reducing the amount of trips made with municipal vehicles will prevent the emission of greenhouse gases and other air pollutants and result in a host of other benefits, such as decreased fuel and vehicle maintenance costs, better employee health, and improved public safety. For example, greater use of police bike patrols has been found to improve the health of officers while reinforcing “a positive image of the police force, creating better relationships and building trust within the community” since officers on bikes come into contact with twice as many people as officers in vehicles.³⁸

Cost Analysis: Implementation costs can be covered by fuel savings, reduced vehicle maintenance, and a reduced vehicle fleet. Bike patrols are extremely cost effective - 10 to 15 bike officers can be fully outfitted for the cost of one patrol car.

Action Steps:

- Encourage employees to walk instead of driving for trips that are ½ mile or less
- Encourage the use of conference calls and video conferencing to reduce the need for off-site meetings
- Expand the use of police bicycle patrols

Informational Resources:

- International Police Mountain Bike Association:
<http://www.ipmba.org/factsheet.htm>
- Kariya, Mark. “How to start a bicycle patrol unit.” *Police: The Law Enforcement Magazine*, May 01, 2004.



Tyler City, TX Police Department Bicycle Unit

Co-Benefits

- Improve air quality
- Promote healthy forms of transportation
- Improve community relations
- Increase ability of police to be able to patrol areas unreachable by car

Success Story

The Los Angeles Bike Patrols for Clean Air Program will reduce driving by about 1.2 million miles per year and associated pollution by almost 1 ton per year. In addition, crime statistics have lowered in areas where police bicycle patrols are deployed. Over 600 bikes are in active patrol city-wide. They travel almost 2.5 million miles per year.

³⁸ Menton, Chris. (2007). “Bicycle patrols versus car patrols.” *Roger Williams School of Justice Studies Faculty Paper*, vol. 80.

3.3 Enforce an Anti-Idling Policy for Municipal Vehicles

Idling a vehicle wastes both money and gas, and the idling of municipal vehicles wastes taxpayer dollars. The idling of any vehicle for more than 20 seconds is less efficient than simply turning the vehicle off and back on again. Idling for 10 minutes per day wastes an average of 26 gallons of gasoline per year and adds engine wear equivalent to driving an additional 10,000 miles per year. The City already has an anti-idling policy in place, but it is not strictly enforced by all Departments. The City should enforce the policy and educate employees in order to dispel myths that encourage idling (e.g. a car should idle before driving to warm it up and idling a vehicle is more fuel-efficient than restarting it).

Cost Analysis: This action item can be implemented at little to no cost, and as such, it will result in cost savings for the City.

Action Steps:

- Adopt a more complete anti-idling policy that contains provisions for vehicles with specialized equipment, such as emergency vehicles, and provisions for extreme weather conditions
- Launch an employee education program concerning idling
- Determine whether any City vehicles have automatic shutoff mechanisms and enable any such mechanisms to shut off vehicles after a certain length of time
- Assess progress on a regular basis
- Improve enforcement of the City's anti-idling policy



Co-Benefits

- Improved air quality
- Decreased traffic congestion

Success Story

Condor Freight Lines, based in Goshen, California, programmed the idle shut-off mechanisms in their trucks to turn off the engine after 3.5 minutes. They noticed idling times reduced by 36% and an increase in fuel economy of 0.2 mpg.

Diesel exhaust contains carbon monoxide (CO), volatile-organic compounds (VOCs), particulate matter (PM), nitrogen oxides (NO_x), and over 40 other chemicals classified as “**hazardous air pollutants**” under the Clean Air Act.

3.4 Encourage City Government Employees to Utilize Alternative Forms of Transportation in Their Daily Commute

CO₂e Savings: Roughly 434 tons annually

Energy Savings: 22,397 gallons of gas

Financial Savings: \$100-300 annually per employee that chooses alternative transportation

Seventy-five percent of Binghamton government employees surveyed drove to work alone, many of whom might carpool or bike to work if given an incentive to do so. Driving alone is inefficient and expensive and results in the emission of hundreds of tons of carbon dioxide every year. There are several ways for the City of Binghamton to incentivize biking, carpooling or taking public transit to work for its employees. Effective methods for incentivizing the use of alternative transportation in employee commuting include developing a carpooling policy and taking advantage of Commuter Check, an organization that leverages tax incentives to help employees save up to 40% of their commuting costs and assists employers in saving up to 10% in annual payroll tax savings.

Carpooling can already be easily arranged through the Broome-Tioga Greenride website. Possible additional incentives include preferred parking spots and decreased parking fees for carpools. Because the City employs over 50 workers, it could enroll in Commuter Check Direct. Eligible employees that bike or take public transportation to work every day could sign up to receive reimbursements that may be used at bike shops or public transit stations to offset the cost of transportation.

Cost Analysis: The average one-way distance to City hall for employees was 4.32 miles, and the average fuel economy of employee motor vehicles was 21.7 mpg. Assuming 210 work days a year, the average City employee travels 1814.4 miles each year, which corresponds to each employee burning 83.6 gallons of gas each year, or all City employees collectively burning 37,626 gallons of gas annually.

Assuming a cost of \$3.75 for a gallon of gas, each employee, on average, spends over \$300 a year on their commute, not including the cost of car maintenance. If employees would bike to work they could save almost the entire cost of commuting,



Co-Benefits

- Reduced parking demand
- Eased traffic congestion
- Increased employee health
- Improved employee productivity

and if they would carpool to work they could reduce their cost of commuting by 50% or more.

Action Steps:

- Implement a carpool policy by completing the following steps:
 - Agree upon incentives for the program which could include preferred parking spots or decreased parking fees for carpools
 - Write a carpool policy that details eligibility, incentives and non-compliance policies
 - Designate carpool spaces if they are agreed upon as an incentive
 - Send out an email to all City employees detailing registration methods
 - Disperse presentations to separate departments for them to show at their staff meetings
 - Promote Broome-Tioga Greenride to employees
 - Make computers available for employees to access the Broome-Tioga Greenride website for those who do not have regular computer access during work
- Enroll in a benefits policy for those who bike or take public transit to work
 - Contact Commuter Check Direct to have an audit performed on the City of Binghamton in order to see how much the program would cost
 - Consider ease of use for cyclists and people who take advantage of public transportation
 - Create an account with the company and advertise it to all City employees through email and presentations, as suggested above
- Ensure that adequate bike storage is available at City work sites to accommodate an increase in bicyclists

Success Story

Cornell University avoided building 2,500 additional parking spaces to keep up with parking demand by raising parking fees. This resulted in approximately 1,370 people participating in 625 carpools. Cornell issues up to two books of 10 one-day parking permits to each person in a carpool in case they need to drive alone some days.

4.1 Purchase Biodiesel for Use in City Vehicles

CO₂e Savings: 166 tons annually if all diesel were to be replaced with B20 (fuel that is 20% biodiesel and 80% petroleum diesel)

Energy Savings: None

Cost Savings: No direct cost savings

Biodiesel yields 93% more energy than the energy invested in its production.³⁹ Biodiesel is produced from agricultural resources and can be used in any diesel engine without any modifications. In addition, the use of biodiesel can increase the lifespan of an engine. The biodiesel industry supports 51,893 jobs in the United States and has the potential to support more than 78,000 by 2012. Biodiesel has added \$4.287 billion to the US Gross Domestic Product (GDP). The City should be sure to purchase biodiesel that is produced and transported in such a way that guarantees that the fuel contributes to emission reductions and does not cause other negative environmental or social outcomes (i.e. deforestation, displacement of indigenous peoples, etc), as has been found from palm oil based biodiesel.⁴⁰

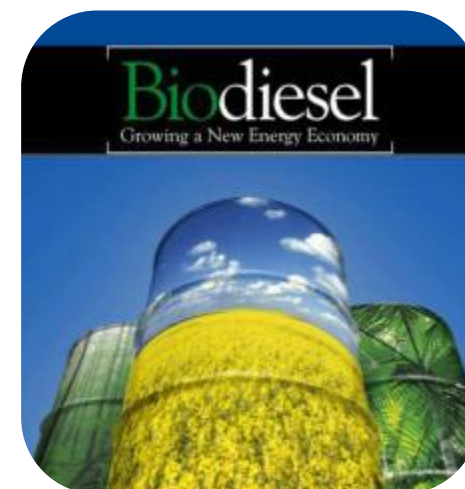
Cost Analysis: B20 costs an average of 15 cents more per gallon than petroleum diesel, but results in less engine wear and increased health benefits from decreased air pollution.

Action Steps:

- Develop an incremental mandate that requires that municipal diesel vehicles operate on at least a 2% biodiesel blend initially and gradually increase the required percentage to 20%

³⁹ Hill J., Nelson E., Tilman D., Polasky S., Tiffany D. (2006) *Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels*. Proceedings of the National Academy of Sciences of the US. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1544066/>

⁴⁰ Koha, Lian Pin et al. (2011) *Remotely Sensed Evidence of Tropical Peatland Conversion to Oil Palm*. Proceedings of the National Academy of Sciences. Available at: www.timecocentric.files.wordpress.com/2011/03/pnas-201018776.pdf



Co-Benefits

- Increased air quality
- Increased employee health
- Decreased dependence on imported fossil fuels

Success Story

The City of Keene, NH switched to B20 Biodiesel in July 2002. As a result, Keene has cut 417 tons of CO₂ per year. Moreover, vehicle operators have stated that they regularly had headaches from operating equipment using 100% diesel but no longer have this problem since switching to B20 because of air quality improvements. Particulate matter in the transfer station air was reduced by over 50% from the fuel switch.

4.2 Buy Electric and Plug-In Vehicles for the City Fleet as They Become Commercially Available and Cost Effective

Plug-in electric vehicles are considerably more efficient than gas vehicles and even hybrids, getting up to 100 miles per 35 kWh, the electric equivalent of one gallon of gasoline. Even when the electricity to charge the vehicle is drawn from grids that get their energy primarily from fossil fuels, an electric car produces as little as one-sixth of the emissions of a gas car.

Cost Analysis: If the City of Binghamton were to replace the vehicles owned by Code Enforcement, Dog Control, Parking Ramps and the PHCD Department with electric vehicles, a total of 9,921 gallons of gas and \$29,764 would be saved every year. The 2012 Nissan Leaf is expected to \$28,500 after federal tax credits. The aforementioned departments own a total of 20 cars, so if all of them were to be replaced with the Leaf it would cost the City a total of \$570,000. The payback period would be nearly 20 years. Clearly, the cost of electric vehicles is too high currently to make this measure cost effective. However, with rapidly advancing technology, this could change in several years.

Action Steps:

- Determine the best locations for the plug-in stations so that they are convenient for City staff to use
- Identify and seek grants for offsetting the difference in cost of an electric vehicle and for installing plug-in stations
- Purchase one or two electric plug-in vehicles when older vehicles in the departments need replacing as a pilot program



Co-Benefits

- No tailpipe emissions, increased air quality
- Reduced dependence on foreign oil

5.1 Develop an Open Space & Parks Plan

As discussed in the *2.1 Promote Tree Planting, Landscaping, and the Creation of Green and Open Space* in the Local Food, Agriculture, and Urban Forestry Section, open space and forests provide important environmental services (i.e. reducing storm water runoff and flooding) and sequester carbon dioxide. In addition, Parks and other open spaces play an important role in the make-up of a vibrant community. Developing a plan for open spaces and parklands for the City of Binghamton can improve urban forest health and long-term sustainability while welcoming new business. The purpose of having a comprehensive parks plan is to guide the future development of open spaces as the progresses in achieving its climate action goals. The plan should examine the existing parks and open space in Binghamton and set goals for expansion and maintenance.

Cost Analysis: The City may develop the plan in house with City staff or seek grant funds to hire a consultant to develop the plan. Additional expenses may include those for printing and supplies for community meetings. Implementing the plan may require funds to develop neighborhood parks and maintain natural areas.

Action Steps:

- Partner with the Binghamton University Urban Ecology Initiative to collect data regarding biological diversity in Binghamton's greenspaces and use data to inform openspace goals
- Conduct a series of community meetings and staff discussions to share information and gather community input on parks and openspace needs
- Create an inventory of open space assets and identify additional potential recreation opportunities within City boundaries
- Formulate goals explaining the overall direction, standards, rationale, and a basis for this plan



Co-Benefits

- Improve health
- Unite community
- Increased property values
- Protect and preserve natural and open space areas

Success Story

The Binghamton Metropolitan Greenway Study was developed by the Binghamton Metropolitan Transportation Study and outlines goals, trail plans, design standards, and cost estimates for developing a 30 miles of trails along the Susquehanna and Chenango Rivers in the Greater Binghamton Region. This document is a good example of how to layout a plan for developing open space projects while partnering with local governments and the private sector for support.

5.2 Continue to Improve Urban Forestry Management Practices

CO₂e Savings: Roughly 50 pounds annually per tree planted

As discussed previously in this Plan, trees not only offset carbon emissions but provide a number of other benefits that can reduce costs for local governments and the private sector while improving property values and creating more livable communities. The City of Binghamton plants and manages street trees (those planted in utility strips along the street) and trees in parks and other City-owned land. For the last four years, tree planting has been a priority of the City, which has received the title of Tree City USA from the Arbor Day Foundation each year since 2007 and a Growth Award for 2010. Through the Shade Tree Commission, a community based advisory board to the City, the City has worked to engage volunteers in its Arbor Day celebrations and to better educate the community about the importance of trees.

In 2010, the City developed an Urban Forest Management Plan which established broad goals and objectives regarding the maintenance of trees and outlined action steps to achieve those goals in the next 5 years. The key message of the Plan is this: before we move forward to significantly increase our tree population, we must first develop systems and procedures that will allow us to properly and efficiently maintain our existing stock. At the same time, it is imperative that the progress made toward increasing the City's tree canopy not be compromised. As such, the City has set a goal within its Urban Forest Management Plan to plant 25% more trees each year than the number removed.

Cost Analysis: The City currently spends over \$140,000 per year on tree management activities. By implementing a number of practices identified in the Urban Forest Management Plan, more can be accomplished with this budget. Additional funding for tree planting and management can be obtained through grants and private contributions through the City's Tree Planting Donation Fund.

Action Steps:

- Develop an internal working team to implement the Urban Forest Tree Management Plan and track the City's progress
- Seek grants and private funding to support tree planting and management
- Continue to make use of the expertise of and volunteer power of the Shade Tree Commission to improve the City's tree programs
- Explore hiring an arborist in cooperation with other municipalities or training an existing staff member to become a certified arborist



Binghamton was one of 12 municipalities in New York State to receive the Arbor Day Foundation's Tree City USA Growth Award for 2010, and one of 500 municipalities nationwide. The Tree City USA title is given to municipalities who demonstrate their dedication to urban forestry by carrying out specific basic best practices, and Growth Awards are granted to those who go above and beyond those basic standards showing environmental improvement and exceptional tree care.

6.1 Reduce Paper Use in City Operations

The U.S. is both the world's largest producer and consumer of paper products in the world. The average office worker in the US uses 10,000 sheets of copy paper each year, which amounts to four million tons of copy paper used annually. Office workers in the US generate approximately two pounds of paper and paperboard products every day.⁴¹ Overuse not only produces excess waste and contributes to deforestation, it is also inefficient in regards to cost and storage requirements. Investing in printers that allow dual-sided printing is a great start in reducing paper consumption and waste. Expanding the use of electronic documents would facilitate information transfers, without actually having to print documents. Other simple techniques such as using scrap paper, reusing envelopes, and shrinking print margins will reduce paper use and costs. The objectives of this recommendation should be considered with those of requiring the use of recycled and reused materials within City projects.

Cost Analysis: Costs will be minimal and should be offset by savings from reduced paper consumption.

Action Steps:

- When buying new printers, invest in those that print dual sided
- Expand the use of electronic documents
- Purchase paper grades of less weight, which is made with less wood pulp, saving trees and costs
- Shrink printing margins to minimize white space
- Reuse envelopes
- Use scrap paper when photocopying unofficial documents
- Eliminate and reduce packaging where possible or use packaging made of recycled fibers



⁴¹ U.S. Environmental Protection Agency. *Frequent Questions*. Available at: <http://www.epa.gov/osw/conserves/materials/paper/faqs.htm>

6.2 Require the Use of Environmentally Preferable Products within City Operations

By recycling one ton of paper (40 cases):

CO₂e Savings: 5,690 pounds of CO₂e emissions

Energy Saved: 460 gallons of oil

Financial Savings: Purchasing recycled paper also helps create markets for recycled paper; thus increasing the value of used paper as a commodity, as an added incentive to recycle paper



The City should adopt an Environmentally Preferable Purchasing (EPP) policy, which will help the City "buy green," and in doing so, use the City's significant buying power to stimulate market demand for green products and services. Environmentally preferable products or services are those that have a lesser or reduced effect on human health and the environment when compared with competing products. The benefits of EPP include improved ability to meet environmental goals, improved worker safety and health, reduced liabilities, and reduced health and disposal costs. Though first geared to help federal purchasers, the Environmental Protection Agency's EPP website (www.epa.gov/epp/) can help local governments, green vendors, businesses large and small, and consumers. The City should consider switching to using paper with recycled content, increasing the use of other recycled and reused materials within City projects (i.e. pallets and shipping crates), and using recycled rubberized asphalt as overlay on City streets.

Cost Analysis

The cost differences will vary by product. In the case of recycled paper, there is about a seven to eleven percent premium over non-recycled paper. According to the New York State Recycled Paper Use Audit, switching to one hundred percent recycled paper would increase costs for the City of Binghamton by \$989 a year¹. This cost could potentially be offset by reducing the amount of paper the City uses.

Action Steps:

- Adopt the EPA's Comprehensive Environmentally Preferable Purchasing (EPP) policy
- Educate City Departments about the importance of the policy
- Develop an action plan to implement the policy

Co-Benefits

- Conserves water
- Saves trees
- Reduces landfill waste
- Reduces pollution

Success Story

The Green Cities California coalition contends that converting their purchases of an aggregate of a half billion sheets of paper to 100 percent recycled paper can save 19.6 million gallons of water, 11.5 million kilowatt hours of electricity, 67,000 trees, and prevent 8.6 million pounds of carbon dioxide (CO₂) emissions.

7. Adaptation

Adaptation strategies and policies provide a complementary approach to mitigation by reducing the severity and damage of climate change impacts. As it was not feasible to fully address climate change adaptation within this Plan, Binghamton should develop a strategy to ensure that residents and businesses will be able to adapt to climate change without significant damage. To better understand why Binghamton should develop adaptation strategies, it is important to understand the potential impacts of climate change for our region.

ADAPTATION: HUMAN SYSTEMS

To minimize the adverse effects of climate change in the Binghamton region, private and public sector institutions and individuals would benefit most were they to engage in *proactive* or anticipatory adaptation, rather than reactively responding to climate change impacts. Proactive adaptation to adverse climate change events or processes means that public and private sector institutions and households in Binghamton would be able to maintain approximately comparable (or hopefully only slightly degraded) levels of welfare and services after adverse climate change events as before those events.

Proactive adaptation requires that human systems in Binghamton (government, business, health care providers, education, households, etc) build redundancies into their operations. That is, all sectors should provide for more than one means or resources to perform any given activity or function in case one part or component of a system fails. Proactive adaptation for the Binghamton region would require public and private institutions and households to be well informed of the increased risks associated with climate change and plan for those changes accordingly. For Binghamton, some of the higher risks include:

- Greater volatility of weather including more frequent periods of intense precipitation both as snow and especially as rain.
- More frequent incidents of severe flooding and thus:
 - Higher risk of disruption to water and sewage treatment facilities
 - Increased property damage



Binghamton-Johnson City Joint Sewage Treatment Plant in Vestal during the 2011 Flood

- Rising costs of flood insurance (or rising unavailability of flood insurance)
- Greater stress on bridges and roadways adjacent to or crossing over existing road systems
- More frequent disruption of traffic
- More frequent intense storms accompanied with high winds and wind gusts and thus more frequent and prolonged power outages as well as more frequent and severe wind caused property damage
- Significant and accelerating rise in the cost of extreme weather-related property damage. Evan Mills of the Lawrence Berkley National Laboratory has noted that in the United States, “insured weather-related losses in recent years have been trending upward much faster than population, inflation, or insurance penetration, and far outpace losses for non-weather related events”.



Lourdes Hospital on Riverside Drive during the 2011 Flood

Among the adaptation strategies advocated by ICLEI are:

- Reduce vulnerability to widespread power grid outages by encouraging distributed generation from multiple renewable sources (solar, wind, biogas, landfill methane, etc.)
- Reduce potential for grid overload and failure by decreasing demand through improved conservation and efficiency
- Enact more rigorous building standards to increase the resiliency of the built environment to high winds, flooding, etc
- Reduce reliance on centralized food systems where commodity production is concentrated in a few locations that may be vulnerable to climate disruptions such as storm damage, pest outbreaks, etc
- Reduce vulnerability to flooding by promoting functional watersheds, including healthy forests and open space
- Counteract urban heat island impacts by planting trees to provide shade and cooling
- Reduce the area that emergency personnel must cover thus making delivery of disaster assistance more efficient (i.e. build more compact communities)
- Make evacuation routes and procedures more visible and efficient
- Reduce the number of miles and cost of repairing or replacing infrastructure (i.e., roads, bridges, electrical and sewer lines)

- Conserve water and provide greater storage capacity and redundancy of that capacity for water so that more is available during more frequent and severe droughts
- Improve early warning systems to increase preparation time and the quality and timeliness of information for households, government, and business
- Ensure that special preparations assist the segments of the population most vulnerable to the weather phenomenon of a changing climate

ADAPATATION: NATURAL SYSTEMS

Human systems by-and-large are “managed systems” and, in theory at least, are better able to adapt and adapt quickly to the stresses of a changing climate. Natural systems, even those “managed” by humans (i.e., corn fields, dairies, and forests) are much less able to adapt and adapt quickly to the stresses of climate change because other animal and plant species cannot as easily change behavior or migrate in response to climate change. We must not forget: impacts faced by natural systems ultimately result in impacts for humans.

While biological systems might accommodate minor (or slowly occurring) changes that occur in a smooth continuous fashion, even minor changes in climate may be disruptive for many ecosystems and individual species. Thus, as the climate of the Northeast changes, we can expect to see significant changes in the species composition and health of our forests. With an increase in very warm summers with more days 90°F and above, many crop yields can be expected to decline with attendant consequences for food availability, consumer prices, farmer income, and civil order. Globally, the International Food Policy Research Institute projects that the yields of many cereal crops in 2050 will likely be lower than they were in 2000.⁴² Education, monitoring and control, increased research and development, combined with greater efforts at behavior-changing outreach to foresters, farmers, health care providers and the public health sector, as well as to all citizens, will be among the adaptive techniques required to minimize the adverse effects of these climate induced changes in the natural systems upon which humans depend.

RECOMMENDED ACTIONS

The City of Binghamton should create an Adaptation Task Force to explore, identify, and recommend proactive adaptation strategies that will enhance the resiliency of the City, its residents and institutions, to the effects of climate change projected for the region through 2100. The Task Force should devote special attention to the development and implementation of measures to predict and reduce the physical and human costs of severe flooding and its associated disruption of transportation and communication infrastructure. Due attention should be accorded to the

⁴² The Economist. February 26, 2011, p. 11. *No Easy Fix*.

design and implementation of effective multi-media extreme weather alert and warning systems (including loud, area-wide sirens) that would inform each and every citizen of impending severe thunderstorms, tornadoes, snowstorms, stream and river flooding and of the actions they should take to minimize risk to themselves, home, and property.

Rapid and substantial reduction in all anthropogenic greenhouse gas emissions (“lower emissions” scenario) would do much to reduce the severity of climate change between now and the end of this century. However, even if all such emissions were to cease tomorrow, the inertia built into the world’s climate system (for example, greenhouse gases already present in the atmosphere, the additional heat now stored in the oceans, *etc.*) will result in a rise in the average temperature of the Northeast by 2100, more volatile weather, and altered human and natural systems.

The inertia of national and global political systems to reduce dramatically greenhouse gas emissions means climate change of significantly larger magnitude. The absence of real mitigation, then, makes the presence of substantial “adaptation” even more necessary. To recap:

- Adaptation is an important complement to greenhouse gas mitigation policies.
- Adaptation to climate change will not be a smooth or cost-free endeavor
- Managed [human] systems will fare better than natural systems
- Proactive approaches to adaptation are more likely to avoid or reduce damages.

Adaptation, as a complement to mitigation, will enhance the capacity of the City of Binghamton and the surrounding region to cope with and respond to the changes projected for the climate of the Northeast by the end of this century.

Success in both mitigation and adaptation will require citizens and their elected and appointed officials to be well informed about climate change and appropriate policy responses. Success will require cooperation between the public and the private sectors. Success will require a willingness and ability to plan for the future and to do so based on the best science amplified with a sense of concern for the common good for this and future generations. Success will also require the prudent expenditure of significant amounts of public time, talent, and money. And, given that we are now in an era of climate change almost unprecedented in human history, success will involve trial and error, failure, and the ability and ingenuity to learn from failure. With strength, determination, and the capacity to learn, the citizens of the City of Binghamton can help lead the way in adapting to the new climate of the 21st century.

VI. Energy and Climate Policy: The National and Regional Context

Binghamton's progress toward mitigating climate change will be influenced by state, federal, and regional policies. At times, these policies may be at odds with local efforts, but, at others, they may also bolster and complement local efforts. Given a number of supportive policies and programs adopted by the federal government, New York State government, and coalitions of state governments in the Northeast, we anticipate that Binghamton will be able to meet and exceed its goal of reducing its greenhouse gas emissions 25% by 2025. We have provided below a brief summary of some of these policies and programs.

Federal Initiatives

There have been many failed attempts to implement policies that would have helped the US to reduce its greenhouse gas emissions and dependence on foreign oil—i.e. failure to ratify the Kyoto Protocol and to pass the American Clean Energy and Security Act of 2009 which would have established a cap and trade system for GHG emissions. However, some progress at the federal level has been achieved. New fuel efficiency standards are expected to raise Corporate Average Fuel Economy for cars to 56 mpg by 2025. Similar efforts are underway for other forms of transportation including light and heavy duty trucks. The EPA sponsors a number of greenhouse gas initiatives to conserve fuels, improve energy efficiency, recover methane, and sequester carbon, including:

- 1) Clean Energy-Environmental State Partnerships—a voluntary federal-state partnership to encourage states to develop and implement cost effective clean energy and environmental strategies;
- 2) Combined Heat and Power (CHP) Partnerships--voluntary program to reduce the environmental impact of power generation through the use of CHP;
- 3) Energy Star—a voluntary labeling program to identify and promote energy efficient products;
- 4) Green Power Partnerships—promote voluntary partnerships between EPA and organizations interested in buying green power;
- 5) Tax Incentives to Reduce Greenhouse Gas Emissions—a provision of the American Recovery and Reinvestment Act of 2009 that provides information on tax incentives to spur use of cleaner, renewable energy and more energy efficient technologies to reduce greenhouse gas emissions; and
- 6) Reforms to enhance the Voluntary Greenhouse Gas Reporting Program.

At the federal level, climate and energy action has been modest, incremental, non-systemic, and, more often than not, reliant on voluntary compliance. Nonetheless, some federal actions will help to reduce emissions in Binghamton through policies that cannot be adopted locally, i.e. fuel efficiency standards for vehicles.

Northeastern Regional Initiatives

As the Pew Center on Climate Changes notes “Regional initiatives, including three cap-and-trade programs, are being developed and implemented among U.S. states and Canadian provinces”. Notable among these in our region are the:

- 1) Regional Greenhouse Gas Initiative (RGGI) was established in December of 2005 and was the first market-based regulatory program in the United States to reduce greenhouse gas emissions. Ten Northeastern and Mid-Atlantic states have capped and will reduce CO₂ emissions from the power sector 10 percent by 2018. States sell nearly all emission allowances through auctions and invest proceeds in consumer benefits: energy efficiency, renewable energy, and other clean energy technologies.⁴³ In New York State, RGGI funds are being used to finance the Green Jobs Green NY program.⁴⁴
- 2) Transportation and Climate Initiative (TCI) in which, as of 2010, eleven Northeastern and Mid-Atlantic states agreed to expand safe and reliable transportation options, attract federal investment, lower transportation costs, improve air quality and public health, and mitigate the transportation sector’s impact on climate change. The group has pledged to create a plan to address the estimated 30% of greenhouse gas emissions on the eastern seaboard caused by the transportation sector.⁴⁵

New York State Initiatives

New York has established a State goal of reducing GHG emissions 80 percent below 1990 levels by 2050 (aka “80 by 50”) with a mid-point goal of a 40 percent GHG emissions reduction by 2030 (“40 by 30”). To achieve these goals, the New York has created the Climate Action Council. The Council also has been tasked to increase the state’s resiliency to rapidly changing climate, i.e., to develop policies for adaptation to a changing climate. The Interim New York State Climate Action Report emphasizes that while advancing clean energy and mitigating climate change, “achieving the 2050 GHG reduction goal will require dramatic change”. Toward this goal, there are policy options tailored for the various sectors of New York’s economy. Within the *buildings and industry sector*, GHG emissions will be reduced and voluntary incentives and aggressive codes and standards will ensure new buildings meet the highest energy performance criteria. In *transportation and land use*, the GHG intensity of fuels will be reduced while vehicular efficiency will be improved; smart growth practices will be implemented as will electrification of the

⁴³ Regional Greenhouse Gas Initiative website: <http://www.rggi.org/>

⁴⁴ NYSERDA’s Green Jobs Green NY website: <http://www.nyserda.org/GreenNY>

⁴⁵ Transportation & Climate Initiative of the Northeastern and Mid-Atlantic States. 2010. Declaration of Intent. Available at: <http://www.georgetownclimate.org/state/files/TCI-declaration.pdf>

transportation system including significant investments in mass transit and high speed rail. In the *power supply and delivery* sector, policies will be implemented to accelerate the introduction of zero-or low-carbon sources of power including renewable and nuclear energy; more aggressive renewable portfolio standards, and expansion of the Regional Greenhouse Gas Initiative as well as tighter GHG emission standards for new power plans. And, within the *agriculture, forestry, and waste sector*, sustainable production and conversion of biomass feedstocks will be promoted as will land management practices that maximize carbon uptake. On farms, renewable energy and energy efficiency will be promoted as will the local production and consumption of food.

Appreciable progress toward these goals, the Interim Report notes, requires that New York “break [its] dependence on finite fossil-fuel resources” and “strategically advance low carbon supply-side policies and infrastructure investments, particularly focusing on policies that provide co-benefits to New Yorkers (e.g., improvements in local air quality, opportunities for economic development, and job creation)”.

Importantly, the NYS Climate Action Plan Interim Report observes that:

To turn climate policy into an engine for economic growth, [New Yorkers] will need to ensure that the State’s economic development policies are focused on emerging growth markets; that State policies foster a robust technology development and commercialization system; that we have a skilled workforce and a dynamic workforce development system; and that public and private sectors are fully engaged as partners.

VII. Conclusion and Next Steps

This plan includes over 50 recommended actions that, when implemented, will allow Binghamton to achieve a reduction in greenhouse gas emissions of 25% below 2006 levels by 2025. In addition, these actions will help to promote energy independence, create jobs, limit taxes, reduce energy expenses for residents and business owners, and develop a more vibrant local economy. Having completed the steps of setting an emission reduction target and creating an action plan, the City should now focus on the last two milestones of ICLEI's climate action process:

1. Conduct a baseline emissions inventory and forecast ✓
2. Adopt an emissions reduction target ✓
3. Develop a Local Action Plan ✓
4. *Implement policies and measures*
5. *Monitor and verify results*

The City's first course of action following the approval of this plan should be to create an Energy and Climate Action Task Force. The Task Force will help bring citizen accountability, transparency, and vigilance to the long term implementation and evaluation of the plan while involving community members in the process.

Carrying out the recommended actions in this plan will require many community partners and a proactive City government. Involvement and feedback from community members, City staff, and City Council members will allow the plan have the greatest possible impact.

To ensure that measurable progress is made, the City of Binghamton should:

- Develop an annual action plan and provide an annual report summarizing the progress toward implementing the Energy and Climate Action Plan
- Evaluate existing actions and identify new actions every three years or as needed
- Conduct a greenhouse gas emission inventory every five years
- Update the Energy and Climate Action Plan every ten years

This plan might seem ambitious for a small city, but certainly great achievements rarely come about without great aspirations. The recommended actions contained within this plan *can* be implemented with support from both City government and the community and have the potential to create a more sustainable and prosperous future for Binghamton and beyond.

VIII. Glossary

Adaptive Reuse – the process of adapting old structures for purposes other than those initially intended, key in land conservation and reducing the amount of sprawl.

Adaptation – ability of a population or ecosystem to prepare for and live with climate change or other environmental disturbances to normal daily routine.

Agribusiness – Various types of business involved with the production of food

Alternative fuels (as opposed to conventional) – Any material or substance that can be used as a fuel or source of energy other than conventional sources, or fossil fuels. Alternative fuels commonly include; biogas, hydrogen, biodiesel, vegetable oil, and biomass.

Anthropogenic Greenhouse Emissions – man made causes for greenhouse emissions into the atmosphere.

Biodiesel – The EPA defines biodiesel as “a renewable fuel produced from agricultural resources such as vegetable oils.”

Bioswale – A technology or design that uses plants and soil/compost to retain and clean runoff

Brownfield – The EPA defines a brownfield as “a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.”

Carbon Footprint – A measurement used to calculate the impact human activities have on the environment. It is measured in terms of the amount of greenhouse gases emitted from each activity, and reported in units of carbon dioxide (CO₂).

Community garden - An area used by several individuals, families, operating in association with each other and under sponsorship by a nonprofit or voluntary organization, for seasonal production of vegetables and other garden produce for primary consumption by the individuals or families directly engaged in such production, or donation to the community.

Compost – Organic matter that has been decomposed and recycled as a fertilizer and soil amendment.

CO₂e – a greenhouse gas currently occurring at an average concentration of about 390 part per million by volume in the atmosphere. Carbon dioxide emissions are generated by burning fossil fuels.

Complete Streets Policy – A roadway that includes room for all modes of transportation which may include, a bike lane, sidewalk, and room for mass transit.

Construction and demolition (C&D) waste – Waste created by construction or destruction of buildings and infrastructure. C&D waste includes concrete, asphalt, metals, drywall, roofing, plastics, tile, carpet, woods, and fixtures.

Edible landscape – Landscaped areas and gardens which contain fruits and vegetables which are intended for consumption.

Embodied Energy – The total amount of energy used to build a building or create a building product, including energy expended in raw materials extraction, processing, manufacturing and transportation. This energy is lost when older buildings are demolished rather than adapted for re-use and building materials are sent to the landfill.

Energy efficiency – Reducing the amount of energy that it normally required of an action, product or service.

Energy rating – Standard systems used to rate the amount of energy that is used by an object. Energy ratings can be used in estimating efficiency and value.

Energy Star – is a government-backed program that defines international standard for energy efficient consumer products.

Food Security – This term refers the availability of healthy food to an individual or family. Food insecurity is defined as not having access to enough food needed to maintain a healthy and active lifestyle.

Fuel economy – A measurement of efficiency of a vehicle. Fuel economy is the relationship between the distance traveled by a vehicle and the amount of fuel it consumed to do so.

Grasscycling – the practice of leaving grass clippings on the lawn when mowing so that they may decompose and return valuable nutrients to the soil.

Greenfields – Previously undeveloped land.

Green Roof – Green space on a building roof that contain living plants in a growing medium on top of a membrane and drainage system.

Heat Island Effect – A dome of elevated temperatures over an urban area caused by structural and pavement heat embodiment and pollution.

Hydropower – Electricity created by generators which are turned by the power of naturally flowing water, such as a river, waterfall, or ocean tides. Hydropower is a completely clean power source.

Impervious area – Any hard surface from which water drains off and is not infiltrated into the ground. Impervious surfaces are common in urban and suburban areas and include, roads and sidewalks, rooftops, and parking lots.

Kilowatt hour (kWh) – A unit of energy, commonly used for billing or efficiency rating. For example, using a 60 watt light bulb for one thousand hours consumes 60 kilowatt hours of electricity.

LEED – Leadership in Energy and Environmental Design, a green building rating system created by the U.S. Green Building Council.

Mix-use development – Zoning and development which allows for the development of different land uses in one area.

Mitigation – reducing climate change by implementing policies to reduce greenhouse levels.

Mothballing – controlling the long-term deterioration of the building while it is unoccupied as well as finding methods to protect it from sudden loss by fire or vandalism.

Multi-municipal planning –The cooperation of different local governments and municipalities to meet the common goals of an area.

On-site solutions – The mitigating of problems directly where and when the problem is created, as opposed to attempting to undo the problem later on.

Open space – Space that is surrounded by development, which is intended to be left undeveloped and to be used for enjoyment, recreation, and aesthetics. Can also be *greenspace*. Open spaces in a community can enhance quality of life and increase property values.

Organic waste – Waste comprised of food scraps and other green waste that decomposes anaerobically. This waste can be used to create compost, which is a nutrient rich, natural fertilizer.

Public goods - Goods that are shared throughout a community. Public goods include health, safety, environmental quality, and aesthetics.

Smart Growth – an urban planning and transportation theory that concentrates growth in compact walkable urban centers to avoid sprawl and advocates compact, transit-oriented, walkable, bicycle-friendly land use, including neighborhood schools, complete streets, and mixed-use development with a range of housing choices.

Sustainable Development – Development that is conscious of current resource source in order to preserve the environment and maintain the availability of such resources for future generations.

Urban agriculture - The use of an urban site for the growing of crops and/or livestock for personal or commercial use

Urban heat island – Generally, more developed, urban areas are significantly warmer than the surrounding less-developed areas. This is a result of large areas covered by dark, impervious surfaces.

Vermicomposting – the product of composting that utilizes various species of worms to create a heterogeneous mixture of decomposing vegetable or food waste.

Vehicle Miles Traveled – the total number of vehicle miles travelled within a specific geographic area over a given period of time.

Appendix A: Climate Change 101

PART I: OUR CHANGING CLIMATE

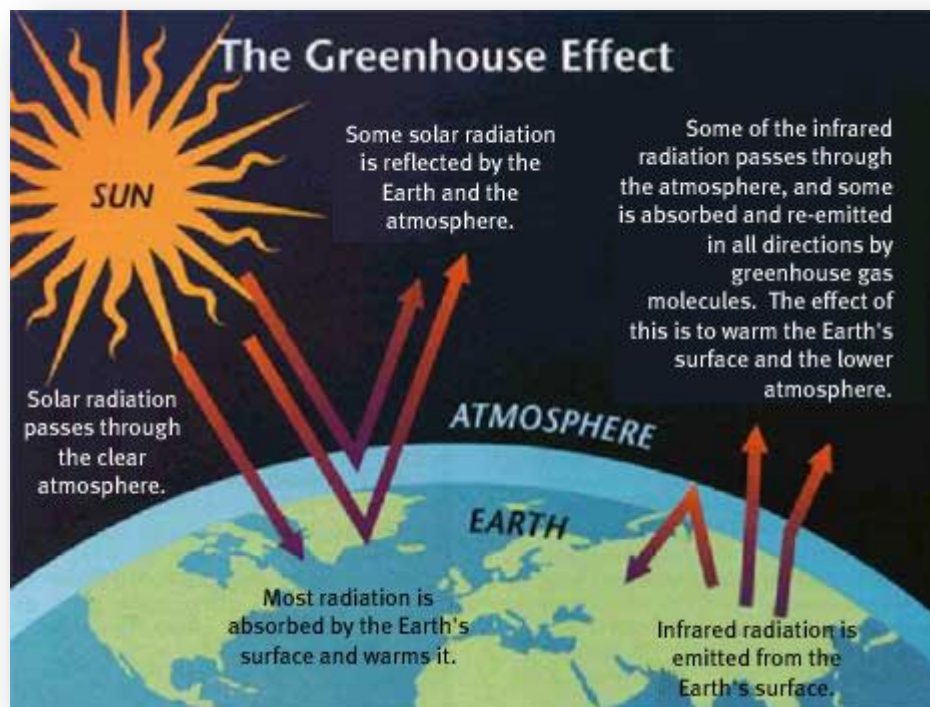
VENUS, MARS AND THE “JUST RIGHT” PLANET EARTH

Noted climatologist James Hansen invokes the story of Goldilocks when comparing Earth with Venus and Mars: “Earth is the only one of the three terrestrial planets that is ‘just right’ for life as we know it. Mars is too cold. Venus is too hot”

Venus is too hot because it is closer to the Sun. Mars is too cold because it is farther from the Sun. Earth is “just right” because it is neither too close nor too far from the Sun. But, there is another and very important reason for why the temperature of the Earth is so hospitable to life: an absence of greenhouse gases in the Martian atmosphere means that much of the Sun’s energy that strikes that planet returns to space. A super-abundance of greenhouse gases in the Venusian atmosphere means that much of the Sun’s energy that strikes that planet is retained within its atmosphere. Earth, however, has just about the “right amount” of heat retaining (or greenhouse) gases in its atmosphere; or, more correctly, it did until the beginning of the Industrial Revolution.

Of the solar energy that strikes the Earth’s upper atmosphere, only about 50 percent is absorbed at the Earth’s surface; about 30 percent is reflected by clouds and the Earth’s surface (especially by the polar ice caps and glaciers) and about 15 percent is absorbed by water vapor in the atmosphere. The sunlight that reaches the Earth’s surface is absorbed by oceans and land and is then re-emitted as longer wavelength (*infra-red*) energy. It is that longer wavelength infra-red energy that is absorbed by atmospheric water vapor and greenhouse gases, most notably by carbon dioxide and methane.

For tens of thousands of years, atmospheric concentrations of those greenhouses gases served as the Earth’s thermostat, giving us an average (or “mean”) temperature of 59 degrees Fahrenheit that has been “just right” for the



development of agriculture and civilization as we know it. However, as climatologist Heidi Cullen notes, “mess with the amount of CO₂ in the atmosphere, and you’re resetting the thermostat of the planet”.

RISING GREENHOUSE GASES AND OUR CLIMATE

And messing with the amount of CO₂ (plus methane and adding other greenhouse gases) is exactly what humans have been doing, especially since the beginning of the Industrial Revolution in the 18th century. The wood that initially fueled that revolution was quickly augmented by and then replaced with fossil fuels, initially coal and subsequently petroleum and natural gas.

When burned (or combusted), fossil fuels emit carbon that, combined with oxygen, produces carbon dioxide, a gas that absorbs or traps much of the infra-red energy that has been reflected from the surface of the Earth. One pound of carbon produces about 3.7 pounds of carbon dioxide. Thus, when you drive your car remember that each gallon of gasoline you burn contains 5.5 pounds of carbon and produces some 20 pounds of carbon dioxide (5.5 X 3.7 = 20.30). When compared per unit of energy produced, oil produces one-and-a-half times as much CO₂ as natural gas while coal emits about two times as much CO₂ as natural gas.

As a greenhouse gas, human generated carbon dioxide (including that from the burning of vast tracts of forests) accounts for about half of all anthropogenic (or human-caused) climate change. Methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆) account for most of the remaining 50 percent of anthropogenic climate change.

Methane is produced by natural and human activities. Natural sources of methane include wetlands, gas hydrates, permafrost, termites, oceans, freshwater bodies, non-wetland soils, and other sources such as wildfires and account for about half of all methane released into the atmosphere. Human sources of methane include rice cultivation; biomass burning; organic and sewage decomposition; and ruminant farm animals, e.g., cows, steer; and the warming of the Arctic permafrost that is rich in both carbon and methane.

In this plan, we use the concept of CO₂e or carbon dioxide equivalent. This is the universal standard for greenhouse gas impact measurement. The ability of a gas to trap heat compared with carbon dioxide is considered to be its GWP or *greenhouse warming potential*. Methane, the second most common greenhouse gas, has a GWP 21 times greater than carbon dioxide. One ton of methane gas in the atmosphere thus traps 21 times the amount of heat as does one ton of carbon dioxide. Converting all greenhouse gas emissions to CO₂e makes it possible to compare total emissions from one activity to another and from one community to another.

Since 1950 annual carbon emissions from fossil fuel combustion have risen from less than 2 billion metric tons where to about 8 billion metric tons per year. One metric ton is 2,205 lb. With continued growth in the global population, economy, and energy use, especially with the expanded construction of new coal fired power plants (China and India add more than two new coal-fired power plants *each week*) carbon emissions are rising about 3% per year.

Today, the Earth's atmosphere contains 390 *ppmv* (parts per million by volume) carbon dioxide, a 40 percent increase over the pre-industrial level of ca. 280. Absent a dramatic reduction in carbon emissions, that level is projected to reach 900 to 1,200 *ppmv* by 2100. One atom of carbon will remain in the atmosphere for an average of 100 years.

CLIMATE CHANGE OVER THE PAST TWO HUNDRED YEARS

Changes in Global Climate

Since 1900 the average (or mean) temperature of the Earth has risen about 1.5 degree F. Sea level, almost unchanged for the past 2,000 years, sea level has risen about 8 inches since 1900 with the rate of increase doubling in the past century. Thermal expansion has accounted for much of that increase because when water is heated, it expands. Increasingly, however, acceleration in the melting of glacial and polar ice sheets will play a bigger role in rising sea level.

Because the oceans are a "sink" for carbon, as they absorb more carbon dioxide from the atmosphere, they have become more acidic, thus endangering the integrity of marine eco-systems, including coral and shell fish and oxygen producing phytoplankton.

Ninety percent of the world's glaciers are retreating, many at an accelerating rate. The Antarctic ice cap is receding. By 2050 much of the Arctic will be free of summer sea ice and open to commercial shipping. The Greenland ice cap is receding and at an accelerating rate.

Warming ocean and lake temperatures have led to an increase in atmospheric water vapor. Higher atmospheric water vapor content has produced an increase in average global precipitation; it also reduces radiative cooling, especially at night. Thus while average daily temperatures have risen, average night-time temperatures have risen even more rapidly.

With the greater energy content of a warmer atmosphere has come an increase in the frequency and intensity of severe storms and storm damage. Because most of the added heat is retained in the greenhouse gas blanketed lower atmosphere, the upper atmosphere has cooled.

All these climate-induced changes, coupled with the increase in human population and the expansion of land used for habitat and food production, is producing a loss of almost 30,000 plant, animal, and insect species each year. This magnitude and rapidity of this loss is so great that Harvard conservation biologist Edward O. Wilson refers to our era as that of the *Sixth Great Extinction*.

Changes in the Climate of the Northeastern United States

The impact of global climate change has affected the climate of the Northeastern United States. As Thomas Karl and colleagues of NOAA's National Climatic Data Center write:

Since 1970, the average annual temperature in the Northeast has increased by 2 F, with winter temperatures rising twice as much. Warming has resulted in many other climate changes, including:

- More frequent days with temperatures above 90F
- A longer growing season
- Increased heavy precipitation
- Less winter precipitation falling as snow and more as rain
- Reduced snowpack
- Earlier breakup of winter ice on lakes and rivers
- Earlier spring snowmelt resulting in earlier peak river flows
- Rising sea surface temperatures and sea level

THE FUTURE: PROJECTED CLIMATE CHANGES

GLOBALLY AND IN THE NORTHEAST

Two methodologies inform climate projections for the remainder of the 21st century. The first is *paleoclimate*—the study of the Earth’s climate history, especially the waxing and waning of the ice ages. *Computer modeling* is the second. Absent definitive and urgent action to reduce global anthropogenic (human-caused) greenhouse gas emissions by at least 80 percent within the next decade or two, both methodologies support, with a high degree of confidence, the following climate projections.

Global Projections to 2100

Studies by the Intergovernmental Panel on Climate Change, the National Climatic Data Center, and other agencies indicate that between 2000 and 2100, there is a compelling probability that the Earth’s climate will experience:

- An *increase* of 2° to almost 12°F in average (mean) global temperature.
- A change in precipitation patterns with higher latitudes projected to receive more precipitation while the dry belt lying just outside the tropics will expand and receive less rain.
- An increase of extreme weather events including hotter summers with extremely hot days and longer lasting heat waves.
- Milder winters, earlier springs, later falls, and hotter summers.
- Continued rise in sea level with more recent projections that include accelerated flow of ice sheets into the sea indicating levels 1 to 2 meters (3 to 6.5 feet) higher than present.
- Northward movement of tropical diseases (e.g., malaria, dengue fever) and disease vectors, e.g., mosquitoes.
- Increased water stress in Asia, Africa, and in the U.S. southwest and northwest as precipitation patterns change and glacial mass and snow pack melt continue to decline.

Northeastern United States Projections to 2100

Karl, *et. al.* in their 2009 *Global Climate Change Impacts in the United States* project that “over the next several decades, temperatures in the Northeast are projected to rise an additional 2.5 to 4 F in winter and 1.5 to 3.5 F in summer. By mid-century and beyond, however, today’s emissions choices, i.e., “business as usual”, no substantial emissions reductions, would generate starkly different climate futures. By late this century, under a higher emissions [business as usual] scenario”:

- Winters are projected to be much shorter with fewer cold days and more precipitation
- The length of the winter snow season would be cut in half across northern New York, Vermont, New Hampshire, and Maine, and reduced to a week or two in southern parts of the region.
- Cities that today experience few days above 100F each summer would average 20 such days per summer, while certain cities, such as Hartford and Philadelphia, would average nearly 30 days over 100 F.
- Short-term (one-to-three month) droughts are projected to occur as frequently as once each summer in the Catskill and Adirondack Mountains, and across the New England states.
- Hot summer conditions would arrive three weeks earlier and last three weeks longer into the fall.
- Sea level in this region is projected to rise more than the global average with more frequent and severe flooding of densely populated coastal areas and cities.
- The livestock industry will suffer from an increase in heat-stress losses experienced by dairy and other farm animals in a warmer world. This could reduce milk production by up to 15 percent—a substantial loss for farmers who already operate on razor thin profit margins.

Words of Scientific Caution

Papers published between 2008 and 2010 in sources such as leading science journals reveal a *rate* of climate change greater than that indicated in many of the projections reported above. This is most notably true for the rate of recession in Arctic sea ice, the Greenland ice sheet, the Antarctic ice sheet, ocean level rise, and ocean acidification.

One reason why data as recent as 2005-07 may have underestimated the rate of climate change is because they failed to capture adequately the effects of the *positive* feedback loops that permeate the climate system and thus amplify the rate of change. One such amplifier is that of sea ice sheet recession. Sea ice *reflects* ~ 80-90% of the sun’s energy the (*albedo* effect) whereas the blue/grey sea *absorbs* and thus retains ~80-90% of that energy. Warmer oceans in turn melt more ice more rapidly and thus amplify the cycle. A second example is the thawing of the Arctic permafrost or tundra. The (until recently) permanently frozen land mass of much of the Arctic region contains vast quantities of carbon and methane. Thawing of this frozen Arctic soil releases large quantities of carbon and methane. Once in the atmosphere, these greenhouse gases amplify global warming thus releasing even more carbon and methane from the tundra and accelerating the rate of climate change. (*See citations in Resources at the end of this paper.*)

PART II: CHANGING CLIMATE AND ECONOMIC CHALLENGES AND OPPORTUNITIES

Responding effectively to climate change is not without cost. Former World Bank chief economist Nicholas Stern estimates the cost of decisive action *now* at perhaps 1 percent of global gross domestic product. If, however, we continue “business as usual” and do not reduce human-caused greenhouse gas emissions substantially by 2030, Stern projects that world gross domestic product could shrink of up to 20 percent.

Carbon conserving or constraining technologies, i.e., “Green technologies” including wind turbines, tidal power, solar photo-voltaic and solar thermal, bio-mass, and geothermal as well as retrofitting buildings for enhanced conservation and efficiency, represent enormous market opportunities. In 2009, the global clean energy market *grew* by more than 15 percent—reaching \$145 billion and it is expected to double over the next ten years.

Although a leader in many technologies, the United States is at risk of losing its edge in many green technologies. In his April 5, 2010 report in NuWire Investor, Kerri Shannon refers to an article from *MoneyMorning* which states that:

*If the United States doesn't take drastic measures to engineer new clean energy policies and investment initiatives, it will continue to take a back seat to China and Europe, which are driving the clean energy market toward a profitable future. * * * In 2009, China overtook the United States in renewable energy investments for the first time ever. China pushed \$34.6 billion into renewable energy projects - mostly wind farms - while the United States only spent \$18.6 billion.*

With its long history of invention, innovation, skilled work force, and with a leading-edge research university and a fine community college, Binghamton is positioned to play a vital role in the emerging 21st century green economy. That the City and the region shall do so will be made more likely with a public that is well informed about the nature and implications of climate change. We turn now to the outlines of a program to educate the City and region about climate change.

RESOURCES

For those interested in learning more about climate change and energy, the following quite readable resources are readily available:

Antholis, William and Strobe Talbott. *Fast Forward: Ethics and Politics in the Age of Global Warming*. Washington, D.C. Brookings. 2010.

Cullen, Heidi. *The Weather of the Future*. New York: HarpurCollins. 2010.

Frumhoff, Peter C., et. al. *Confronting Climate Change in the U.S. Northeast*. Cambridge, MA: UCS Publications. 2007.

Hansen, James. *Storms of My Grandchildren* New York. Bloomsbury. 2009.

Houghton, John. *Global Warming* (3rd. ed.). Cambridge: Cambridge University Press. 2004.

Karl, Thomas P., Jerry M. Melillo, and Thomas C. Peterson. *Global Climate Change Impacts in the United States*. Cambridge: Cambridge University Press. 2009.

Leakey, Richard and Roger Lewin. *The Sixth Extinction*. New York: Doubleday. 1995

National Research Council. *Abrupt Climate Change*. Washington, D.C. National Academy Press. 2002.

Pew Center for Climate Change. (<http://www.pewclimate.org/global-warming-basics/coalfacts.cfm>)

Solomon, Susan, et. al. *Climate Change: The Physical Science Basis*. Intergovernmental Panel on Climate Change. 2007. Cambridge: Cambridge University Press.

Stern, Nicholas. *The Economics of Climate Change*. Cambridge: Cambridge University Press. 2006.

Stern, Nicholas. *The Global Deal Climate Change and the Creation of a New Era of Progress and Prosperity*. New York: Public Affairs Press. 2009.

U.S. Energy Information Administration. *Greenhouse Gases, Climate Change, and Energy*.
<http://www.eia.doe.gov/bookshelf/brochures/greenhouse/Chapter1.htm>

Wilson, Edward O. (ed.) with Frances M. Peter (Associate Editor) *BIODIVERSITY*. Washington, D.C.: National Academy Press. 1988.

Appendix B: Sample Task Force Resolution

A RESOLUTION TO CREATE AN ENERGY AND CLIMATE ACTION TASK FORCE

WHEREAS, on April 20, 2009 the City of Binghamton City Council passed Permanent Resolution R09-042 *A Resolution in Support of the City's Participation in the Cities for Climate Protection Campaign by ICLEI – Local Governments for Sustainability* pledging to undertake the Cities for Climate Protection Campaign's five milestones to reduce both greenhouse gas and air pollution emissions throughout the community, and specifically:

- Conduct a greenhouse gas emissions inventory and forecast to determine the source and quantity of greenhouse gas emissions in the jurisdiction;
- Establish a greenhouse gas emissions reduction target;
- Develop an action plan with both existing and future actions which when implemented will meet the local greenhouse gas reduction target;
- Implement the action plan; and
- Monitor and report progress; and

WHEREAS, the City of Binghamton's Climate Action Plan Advisory Committee presented the 2011 Binghamton Energy and Climate Action Plan to the City Council on _____; and

WHEREAS, the Plan provides strategies for achieving greenhouse gas emission reductions and increased energy conservation and efficiency, generally divided into six categories: 1) Buildings and Energy, 2) Transportation and Land Use, 3) Local Food, Agriculture, and Forestry, 4) Waste Management, 5) Outreach and Education, and 6) Adaptation; and

WHEREAS, the Climate Action Plan Advisory Committee recommended the establishment of an Energy and Climate Action Task Force to bring citizen accountability, transparency, and vigilance to the long term implementation and evaluation of the Plan; and

NOW, THEREFORE, BE IT RESOLVED, that the City of Binghamton City Council hereby creates an Energy and Climate Action Task Force charged with overseeing the implementation of the 2011 Binghamton Energy and Climate Action Plan and measuring progress toward reducing greenhouse gas emissions and promoting energy independence in Binghamton; and

BE IT FURTHER RESOLVED, that the Task Force shall have the purpose and be constituted substantially as outlined in Exhibit A hereto.

EXHIBIT A

PURPOSE

The purpose of the *Energy and Climate Action Task Force* is to identify, mobilize, and coordinate the necessary citizen, governmental, private sector, academic, and funding resources necessary to achieve the eight specific goals defined above. The Task Force will:

- Serve as an advisory Board the City Council and Mayor on strategies and policies necessary to increase energy independence, reduce greenhouse gas emissions, improve public health, and bolster economic competitiveness with the City of Binghamton and of the City of Binghamton with other comparable cities.
- Oversee the implementation of the strategies outlines in 2011 Binghamton Energy and Climate Action Plan and proceed to implement the ICLEI – Local Governments for Sustainability’s Five Milestones for Climate Mitigation.
- Coordinate with City Staff to develop annual reports on the progress of the CAP implementation.
- Raise awareness about the risks and opportunities that climate changes pose to Binghamton and the Southern Tier region.
- Motivate and mobilize our community to reduce individual and community greenhouse gas emissions.
- Create a forum for regular public comment and community involvement in Binghamton Climate Action.

Composition and Term: The Task Force should consist of no more than eleven (11) members who shall serve two-year terms. Members should represent the following sectors of the Binghamton community: the City of Binghamton executive and legislative branches, the business community (i.e., representatives from manufacturing, energy, retail, and service sectors), the communications sector, the educational community (including university, community college, public elementary and secondary schools), organized labor, the faith community, not-for-profits (social justice, environmental, health care, foundations, ethnic and income minorities, others), and other concerned community members.