Making Syracuse Sustainable:

A Blueprint for a Greener Syracuse

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Table of Contents

1. Executive Summary

This report provides a blueprint for the city of Syracuse to use in developing a comprehensive sustainable management plan. It consists of three main sections and a number of appendices. Section 2 provides a brief explanation of the project. Section 3 includes a review of the activities being undertaken by four comparable cities in Upstate New York (Albany, Binghamton, Buffalo and Rochester) and one in Western Massachusetts (Worcester). The Worcester plan is discussed in detail because it provides an excellent step-by-step best-practice guide to the process for developing a successful and ambitious comprehensive sustainability plan.

Section 4 offers nine specific recommendations that Syracuse can act on in the near future and potentially incorporate into a more comprehensive plan that may be developed at a later time. The recommendations are divided into three categories: buildings, transportation and land use.

The recommendations related to buildings are: (1) to implement a PACE bond program to upgrade energy efficiency in existing structures; (2) to expand pre-development meetings to include experts on green infrastructure and green building practices in order to improve efficiency of new structures beyond minimum compliance with building codes; and (3) to update personnel policies to conserve energy use in all municipal buildings.

The recommendations related to transportation are: (4) begin using B20 biodiesel in fleet vehicles to increase the City's consumption of alternative fuels; (5) to establish a bike-share program to encourage alterative transportation; and (6) to adopt new technology that would reduce idling in fleet vehicles.

The recommendations for land use policies include: (7) to increase the urban forest cover by five percent through partnering with community groups; (8) to expand solar use in Syracuse by establishing over-the-counter permitting and clearly defining solar access rights; and (9) to expand the use of permeable pavement by providing education and reviewing possible financial incentives.

Finally, the report includes eight appendices: (A) list of contacts; (B) collection of sustainable management plan briefs from other cities; (C) applicable grants for Syracuse; and (D-H) supporting documents and figures referenced throughout the text.

2. Introduction

As a result of increasing concern over the effects of global climate change, many city governments in the United States have begun to implement sustainability plans (also known as "climate action plans," or CAPs). Syracuse currently has several sustainability initiatives but it has yet to develop a comprehensive sustainability plan. In preparation for beginning work on such a plan, our team was asked by Andrew Maxwell, Director of Planning and Sustainability, to collect and summarize information about the activities being carried out by comparable cities in the region, and to develop a list of specific recommendations that could be carried out by the City in the near term, particularly with respect to energy and greenhouse gas (GHG) emissions.

We carried out the project in two stages. We began by examining and evaluating sustainability plans from cities most similar to Syracuse in order to determine the importance and role of sustainability considerations in the region. This review was also used to determine some of the best initiatives currently in place to reduce GHG emissions. We evaluated sustainability plans from cities in New York, such as Albany, Binghamton, Buffalo, Rochester, and later, New York City. We then expanded our analysis to include city plans from neighboring states, such as Connecticut, Massachusetts, Ohio, and Pennsylvania. During our search, we found three primary areas directly related to energy use and GHG emissions reductions that we felt would be most useful for Syracuse (in order of importance): (1) building energy efficiency; (2) transportation; and (3) land use.

In the second stage of the project, we interviewed public officials and experts, at both local and regional levels, to gauge where opportunities existed to improve energy efficiency and reduce GHG emissions. We also collected data from both local and regional sources to assess the feasibility of various GHG emissions reduction measures. Finally, these interviews, along with the sustainability plans and data we collected throughout the project, were used as the basis for developing nine specific recommendations for sustainable actions that the City can undertake in the near term.

3. Best Practices

3.1 Sustainable Practices in Upstate New York

This section identifies and discusses the key activities related to sustainability that are currently being undertaken by Albany, Binghamton, Buffalo, and Rochester. None of these cities have a comprehensive municipal sustainability plan, but most have narrower plans or programs that address sustainability in some way. Together, they have implemented a diverse set of policies ranging from capital loan programs to purchasing streetlights and their experiences with these programs can provide a useful guide for Syracuse as it moves forward with its own plan.

3.1.1 Albany, NY

Sustainable management plan

Albany does not have a municipal sustainable management plan, two third-party evaluations were completed that focused on sustainability. The first was conducted in 2007 by the American Institute of Architects (AIA) through a Sustainability Design and Assessment Team (SDAT). The SDAT team is composed of architects, engineers, and experts in urban design and transportation. The *Albany SDAT: A Sustainable Capital for the 21st Century* evaluation is a citywide analysis of the economic and environmental sustainability of Albany with the goal of providing a roadmap for sustainable development (SDAT, 2007). Syracuse was also the subject of an AIA SDAT analysis and has a similar report.

The second sustainability evaluation performed in Albany was an action plan for fostering bicycle use called the *Albany Bicycle Master Plan.* The plan is the result of a nine-month study conducted by the Ibi Group that was released in December 2009. The city received funding for the study through the Community and Transport Linkage Program, provided by the Capital District Transportation Committee (CDTC). The city has further collaborated with the CDTC in developing an educational website promoting bicycle safety in the metropolitan area.

Bicycle use

The Albany SDAT analysis identified the lack of "pedestrian connections" as an environmental concern for Albany. In particular, the study found that a lack of bicycle lanes, poorly defined pedestrian zones, and prevalence of highway barriers inhibited city walkability (SDAT, 2007). The report concluded that Albany street conditions discourage the use of alternative forms of transportation and thereby increase fuel use, carbon emissions, traffic congestion, and isolation of residents from green spaces.

The *2009 Master Bicycle Plan* attempts to address many of the shortcomings raised in the SDAT report with an ultimate goal of making bicycle use a, "viable transportation alternative in Albany" (IBI Group, 2009). To achieve this over-arching goal, the plan details five areas for improvement:

1. Bicycle-friendly communities and development sites
   - Albany intends to accommodate cyclists and pedestrians by incorporating bikeway routes, parking, and other end of trip facilities in site plans reviews.
2. Bikeway infrastructure

- The city aims to construct additional bike routes, additional signage along bike paths, and increase crossings of waterways, freeways, and interchanges. The ultimate goal is to construct the proposed "bikeway network plan" over the next twenty years (Figure #1).
3. Bikeway maintenance
   - Albany will update current maintenance and add bikeway routes through construction zones.
4. Encouragement programs
   - Albany expects to provide a web site or page advertising bicycle routes and informing residents on bike safety.
5. Safety and education programs
   - Work cooperatively with the CDTC, the city of Albany is developing a Bicycle Education Campaign to inform motorists and bicyclists about the need to share the road. (IBI Group, 2009)

Figure 1: 20-year Albany bikeway network plan
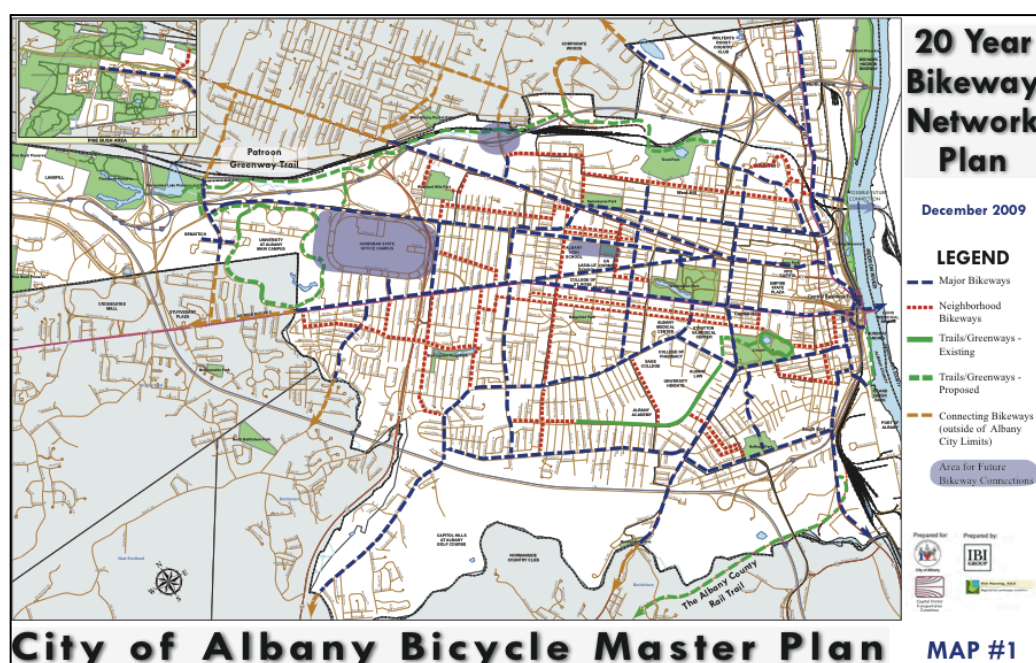
Source: City of Albany, 2009

Although the Master Bicycle Plan was completed recently, Albany has already begun to implement several of its objectives. Specifically, the city is in the process of constructing five miles of additional bike lanes, introducing additional street signs that emphasize the rights of bicycle riders, and is researching new zoning requirements that would mandate that apartment buildings have bicycle racks. The new street signs remind drivers that riders are entitled to share the road with vehicles and use a full lane of traffic on narrower roads. The CDTC has also developed an educational website on vehicle and bicycle safety to encourage ridership. More information can be found at http://www.capitalcoexist.org/.

There are many objectives yet to be implemented, including the incorporation of bike-friendly policies in site plan reviews, the creation of a bike-share program, the construction of

bike crossings, and the designation of all the suggested bike lanes and paths. Yet, the plan lays out an ambitious plan for encouraging bike use as a guiding framework for Syracuse.

3.1.2 Binghamton, NY

Sustainable management plan

The city of Binghamton has not developed a sustainable management plan nor has it contracted an outside organization to develop one. In 2003, however, it commissioned Saratoga Associates to develop a comprehensive plan, which included environmental goals. The plan promotes the development of additional hiking trails, bicycle paths, and crosswalks. The plan also allocates between $800,000 and $1 million for "environmental investigation" and between $9.7 million and $12.125 million for the construction of additional parks and trails over the next twenty years (Saratoga Associates, 2003). However, the plan principally focuses on the economic development of the city.
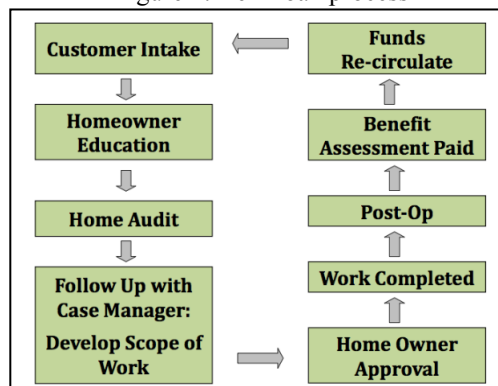
Binghamton has implemented a wide range of sustainable policies that are not detailed in an official plan. Publicized through the website, http://www.capitalcoexist.org/, the city has designed several innovative and ambitious programs in the areas of energy efficiency, energy conservation, and reforestation (City of Binghamton, 2010).

Energy efficiency

The Binghamton Energy Efficiency (Be2) Loan Program encourages capital improvements that increase the energy efficiency of one to two-family homes. The city provides a maximum of $13,000 in initial capital for an energy audit and energy retrofits. The retrofits benefit the homeowners by increasing energy efficiency. They benefit the community by creating jobs, decreasing residential energy consumption, and lowering GHG emissions. Homeowners repay the city through a special tax assessment by taking eighty percent of the utility savings from the retrofit and adding it to the property tax. Homeowners keep the remaining twenty percent of the utility savings. The payback period for the city will vary depending on the cost of the retrofit and the savings to utilities (City of Binghamton, n.d.).

The Be2 Loan Program is an example of a new form of financing for energy retrofits known as "Property Assessed Clean Energy" (PACE) bonds. PACE bonds became legal in New York State in November 2009 with the passage of the municipal clean energy program bill. The bill allows municipalities to create loan programs for energy efficiency upgrades as long as they are funded by federal grant and credit assistance (New York State Assembly, 2009). Binghamton has been awarded $160,000 from the Energy Efficiency and Conservation Block Grant (EECBD) and Community Development Block Grant (CDBG) for the Be2 Loan Program. According to the Sustainable Development Planner Amelia LoDolce, the city has yet to implement the Be2 Loan Program due to anticipation of new legislation that would allow them to pursue non-federal funding, specifically from NYSERDA. The city would prefer to use the existing $160,000 as a loan loss reserve in case of property

Figure 2: Be2 Loan process

Source: City of Binghamton (2010)

foreclosures and use the potential NYSERDA funding to pay for energy audits and retrofits.

Binghamton is the only city in Upstate New York to design a PACE program, but other municipalities nationwide have already implemented programs. In 2008, the Town of Babylon, NY established Long Island Green Homes (LIGH). As of December 2009, LIGH had audited and retrofitted 295 homes at an average cost of $8,262 per home, according to information provided by the city of Binghamton. The benefits of the program include an average cost savings of $1,024 per year for the homeowner, a twenty to forty percent reduction in emissions from energy use, and a 23 percent increase in green jobs in the town of Babylon (City of Binghamton, n.d.). The average payback period of the loans is 8.5 years.

Energy conservation

Binghamton also promotes resource conservation policies in municipal facilities. Mayor Matt Ryan introduced a Resource Conservation Policy in May 2008 to limit energy and resource consumption. The policy outlines a series of behavioral changes requested of employees (Office of the Mayor, 2008):

- Turn off appliances and power strips at the end of the day
- Turn off office lights when absent for longer than fifteen minutes
- Recycle ink cartridges
- Switch to recyclable batteries
- Close blinds and windows at the end of the day
- Share electronic copies and print only when absolutely necessary
- Use double-sided printing
- Reuse paper for notes and scrap paper
- Turn off car when stopped for longer than twenty seconds

The city has also implemented a "Summer Hours" program that changes the hours of operation in municipal buildings to 8am-4pm in the summer, reducing the workday for security staff by one hour and decreasing utility consumption. Estimates suggest this will save the city approximately $4,000 on security costs alone per summer (City of Binghamton, 2010). Binghamton did not encounter any resistance from local unions in establishing the program.

Reforestation

Binghamton has two reforestation initiatives: the Street Tree Planting Program and the Yard Tree Coupon Program. Under the Street Tree Planting Program, the city plants trees in utility strips located in front of private properties at no cost to the property owner. To reduce possible conflict with community members, the property owner must request the tree. The program planted 91 trees in 2006, 162 trees in 2007, and 144 trees in 2008, although Binghamton's sustainable development planner, Amelia LoDolce, believes these are conservative estimates.

The Yard Tree Coupon Program has been less successful. It encourages landowners to reforest their own property by offering a $35 coupon to cover part of the cost of a new tree. The program mandates that the planted tree cost at least $50 to encourage the planting of more mature trees rather than saplings. The trees are available for purchase at four local retailers and the city is responsible for the actual planting of the tree. Only fifteen coupons were redeemed in

2007 and the number fell to seven in 2008. The city attributes the lack of participation to several factors, including the share of the cost that must be paid by landowners and the high percentage of renters in Binghamton. Landlords are reluctant to participate due to the increased maintenance of the planted trees. Although the Yard Tree Coupon Program has struggled, it is a valuable attempt to involve the community in reforesting the urban landscape. This is particularly important for Syracuse, which only owns between six and ten percent of the forest cover (Urban Forestry Master Plan, n.d.).

3.1.3 Buffalo, NY

Sustainable management plan

The city of Buffalo does not have a plan solely dedicated to environmental issues, but its 2001 *City of Buffalo Comprehensive Plan* identifies environmental sustainability as a primary focus. Specifically, the plan calls for investing in, "infrastructure and business development and enhancing the green environment," as a means to revitalize the city (Department of Strategic Planning, 2001). The plan contains a detailed evaluation of the current environmental conditions of the city that include an inventory of emissions with a 1996 baseline and an inventory and map of the city's parks, urban forestry, and green infrastructure. The city also conducted a survey of all of the city's parks and city-owned trees to rate the current condition of each individual park and tree.
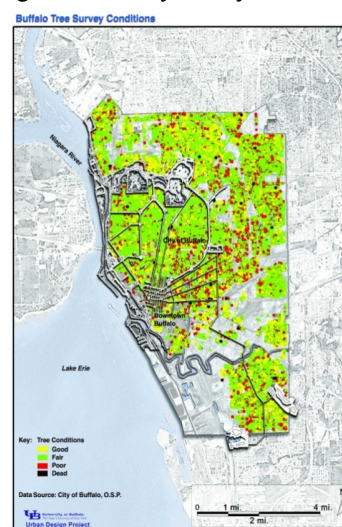
To improve current environmental conditions, the plan establishes an Environment Management System (EMS). The EMS will conduct a comprehensive environmental quality review in addition to what has already been collected and will generate a database for organizing the information. This database will allow the city to set concrete improvement goals regarding environmental quality. The plan also calls for the creation of a brownfield inventory and the pursuit of state grants and tax incentives made available by the 2004 NYS Brownfield Cleanup Program to renovate brownfields in the city.

In addition to the Comprehensive Plan, the mayor of Buffalo, Byron Brown, has produced a website[1] that publicizes current achievements made by the city in the areas of energy use, community health, waste and recycling, transportation, and water use (Office of Mayor Byron W. Brown). The website describes the initiatives and programs being implemented by the city and estimates their potential benefits. The website can serve as a model for Syracuse as a great way to publicize green practices to the community and allow collaboration with surrounding municipalities.

Figure 3: Survey of city-owned trees

Source: City of Buffalo (2001)

Energy efficiency and conservation

Buffalo has made important strides in improving the energy efficiency of city-owned capital. One of the energy

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[1] Buffalo Goes Green:
http://www.ci.buffalo.ny.us/files/1_2_1/buffalogogreen/earthday2010/templates/buffalogoesgreen/homepage.html.html

efficiency measures taken by the city is an energy audit of 56 city-owned facilities in 2009. As a result of this audit, the city projects that short-term upgrades can save the city approximately $492,129 per year in energy costs (Office of Mayor Byron W. Brown, n.d.). The city has plans to regularly conduct energy audits that will eventually encompass all 185 municipal buildings.

The city and Water Board have also made efficiency improvements to the water and sewage treatment plants in Buffalo. The improvements include the replacement of pumps, improved water distribution, and modernization to the plant controls. The project is expected to save the city $350,000 per year in energy costs and reduce an estimated 9.3 million pounds of carbon emissions (Office of Mayor Byron W. Brown, n.d.).

Buffalo is in a unique position regarding its streetlights. The city has purchased the poles of the streetlights, which allows it to save money on maintenance fees charged by National Grid, but does not own the equipment on the poles. Consequently, Buffalo is unable to upgrade to more energy efficient lighting to reduce energy consumption and further savings. However, the reduced maintenance costs to National Grid are substantial. A 2004 analysis by the Center for Governmental Research suggests that municipal ownership of the streetlight poles saves Buffalo one million dollars per year (Zettek, 2004). This conclusion was reached by comparing the city's expenditures on light maintenance to those of surrounding municipalities that do not own any streetlight poles.

Buffalo has taken other initiatives to improve lighting efficiency. As of 2009, the city had switched 95 percent of its traffic signals to LED lighting and had installed motion-activated light sensors in public facilities (Office of Mayor Byron W. Brown, n.d.). Buffalo has also begun retrofitting public housing. The Buffalo Municipal Housing Authority has invested $29.4 million in retrofits that include weatherization, higher efficiency lighting, water efficiency upgrades, and HVAC systems. These improvements are estimated to save Buffalo $1.4 million from reduced energy costs per year (Office of Mayor Byron W. Brown, n.d.).

To reduce fuel consumption and GHG emissions, Buffalo has targeted idling in the city's snowplows. The city is beginning to purchase trucks that can be set to turn off after five minutes of idling to reduce wasteful fuel consumption. The city is also installing a GPS tracking system for plows that will allow idling times to be monitored and discouraged (Office of Mayor Byron W. Brown, n.d.).

In addition to what the city has already accomplished, Buffalo has goals for further expanding energy efficiency in the city:

- Offer incentives for LEED training to increase LEED certified contractors
- All municipal buildings over five thousand sq. ft. will meet LEED Silver Certification
- All municipal buildings will meet Energy Star requirements
- New private buildings over thirty thousand sq. ft. must be LEED Silver Certified
- All new private buildings will meet Energy Star requirements

(Office of Mayor Byron W. Brown, n.d.)

Energy is only one area in which Buffalo has made impressive strides. Other initiatives include a partnership with the community group Re-Tree WNY to increase urban forest cover

and the proposal of a Buffalo "Green Code" to be amended to the current building codes. The partnership with Re-Tree WNY resulted in 1,200 tree plantings in the city in the spring of 2009.

3.1.4 Rochester, NY

Sustainable management plan

In 2005, Rochester developed a Forest Technical Advisory Committee to draft an urban forest master plan. The committee was composed of city residents, landscape architects, NYSDEC members, academics, and city officials. Called "City in a Forest," the plan urged the city to implement policies to reverse the current decline in urban forest cover and to begin planting more trees than are being removed (Urban Forest Technical Advisory Committee, 2005). The plan also urged the establishment of educational programs advertising the public benefits of trees to encourage community involvement.

A second Rochester initiative is "Project Green," a proposal by Mayor Robert Duffy, that would encourage the transformation of vacant property into green space and private development. The project recommends the establishment of a multi-purpose land-bank program that decommissions public infrastructure, purchases vacant lots, and relocates households (City of Rochester, n.d.). The land-bank would then coordinate the redevelopment of the property to achieve goals of economic development, community development, environmental justice, private dispositions, or long-term green infrastructure development. Eligible redevelopment projects include residential housing, private businesses, and public green space such as community gardens. A description of the project is available at http://www.cityofrochester.gov/article.aspx?id=8589941730.

Development of brownfields

In addition to Project Green, Rochester is already implementing several programs to develop brownfields and encourage urban growth in an environmentally friendly manner. Specifically, the city has developed two programs:

The Brownfield Assistance Program, administered through the departments of Economic Development and Environmental Services, provides financial assistance for potential developers to evaluate the environmental impacts of development. The program is funded through competitive EPA grants introduced by the Small Business Liability Relief and Brownfields Revitalization Act. The assistance covers two-thirds of the costs to pay for an assessment of the property's environmental condition (City of Rochester, n.d.). New York State law requires this assessment before development is permitted. Should the environmental conditions prove unsuitable for development, the entire consultation is covered through the EPA grants.

Rochester has also implemented a loan program for redevelopment projects, entitled the Brownfield Cleanup Revolving Loan Fund. The program provides low-cost, fixed-rate loans for projects that contribute to the city's economic development goals or mitigate the release of hazardous pollutants (City of Rochester, n.d.). The NYS Department of Environmental Conservation (NYSDEC) oversees all brownfield redevelopment projects, providing technical oversight and cleanup activities. The loans provide developers with assistance to invest in projects that may not have been affordable otherwise.

Rochester is not limited to brownfield development in its green initiatives. The city has also implemented a program called, "Materials Give Back," that uses recycled materials to provide goods and services for residents. Specifically, the city collects and recycles leaves left along the curb that can be turned into compost (City of Rochester, n.d.). In 2009, Mayor Duffy drafted a, "Climate and Environmental Protection Resolution," to limit the city's GHG emissions.

Conclusion

Upstate cities have undertaken a wide array of policies related to sustainability but none have organized their goals and actions into a comprehensive sustainable management plan. A summary of each plan can be found in Appendix B. Instead, programs and policies are dispersed across departments and generally publicized haphazardly through an array of documents and websites. The absence of unified plans limits the transparency of each city's sustainability activities and impedes collaboration between the public and private sectors.

Syracuse has an opportunity to take a leading role in the region by developing a comprehensive plan. By organizing all of the City's current green policies and future ambitions into one sustainable management plan, and by adopting the best practices of neighboring cities, Syracuse will be well-positioned to achieve its environmental goals. Moreover, it will be able to build inter-municipal collaboration on sustainable practices. These partnerships will allow Upstate New York to combine ideas and resources to achieve more at lower cost than would be possible with each city acting on its own.

3.2 Case study: Sustainability in Worcester, Massachusetts

As discussed in the previous section, no city in Upstate New York has developed and implemented a comprehensive sustainability plan. We examined New York City's sustainability plan but felt that the scale of the plan and the resources at New York City's disposal made it an impractical choice to use as a model for Syracuse.

Thus, in developing our plan and recommendations for Syracuse, it was necessary to expand our search for model plans to cities outside of New York State. We used three main criteria in evaluating a city's comparability to Syracuse:

1. Geographic location and climate
2. Demographics
3. Comprehensive and ambitious sustainability plan

Based on these criteria, we evaluated plans from Connecticut (Hartford and Bridgeport), Pennsylvania (Pittsburgh), Massachusetts (Worcester), Rhode Island (Providence), Ohio (Akron), and Maryland (Baltimore). Summaries of these plans can be found in Appendix B.

Of the cities we considered outside the state, Worcester, Massachusetts best fit our criteria. Similar to Syracuse, Worcester has a continental climate, with warm, humid summers and cold, snowy winters. Worcester's climate is less severe in summer and winter due to its close proximity to the Atlantic Ocean, which more strongly regulates climate patterns. Worcester receives significant snowfall, although not as much as Syracuse, and is the 22nd

snowiest city in the U.S., averaging 67.2 inches annually ("Top 101 cities with the highest average snowfall in a year," n.d.).

As shown in Table 1, Worcester's demographic statistics (as of the 2000 Census) are roughly similar to Syracuse as well. The most notable similarities are in population, population density, per capita income, and education. The most notable difference between the two cities is that Worcester's population appears to be growing, possibly as a result of its proximity to Boston.

Table 1: Key characteristics of Worcester and Syracuse

	Worcester, MA	**Syracuse, NY**
Population	172,648	147,306
Pop. percent change, 1990 to 2000	1.7%	-10.10%
Pop. percent change, 2008 est.	5.8%	-6.30%
Pop. density	4,597/sq mi	5,871/sq mi
Median income per household	$35,623	$25,000
Per capita income	$18,614	$15,168
Education (Bachelors or higher)	23.3%	23%
White	77.11%	64%
Black	6.89%	25%
Hispanic	15.15%	5%
Asian	4.87%	10%
Median age	33	30

Source: 2000 U.S. Census

Historically, both Worcester and Syracuse gained economic prosperity through industry and manufacturing. Today, both economies are now dominated by education and service industries. The University of Massachusetts Medical School is one of Worcester's largest employers, along with Hanover Insurance and EMC Corporation ("Worcester: Economy," 2004). In Syracuse, institutes of higher education like SUNY Upstate Medical University and Syracuse University are the two largest employers in the area ("Onondaga county top 25 employers," 2009).

As mentioned above, institutes of higher education play a large role in the economies of both Syracuse and Worcester. In addition to Syracuse University and SUNY Upstate Medical University, Syracuse is home to a number of institutions such as SUNY College of Environmental Science and Forestry, Le Moyne College, and Onondaga Community College.

Institutions within an hour's drive include Cornell University, Ithaca College, SUNY Cortland, and Colgate University. The situation in Worcester is similar: Along with the University of Massachusetts Medical School, Worcester is home to several other institutes of higher education, such as College of the Holy Cross, Worcester Polytechnic Institute, Clark University, and Becker College.

City of Worcester's climate action plan (CAP)

Worcester has an outstanding climate action plan (CAP) and it is described very clearly in city documents. The first major step the city took to mitigate the effects of climate change was in October 2003, when the city joined the Cities for Climate Protection (CCP) Campaign – a campaign run by ICLEI Local Governments for Sustainability. The city then used the following five-step process, recommended by CCP to help local governments reduce their GHG emissions:

1) Conduct a Greenhouse Gas Emissions Inventory and Report for the entire community as well as municipal operations

2) Set a Greenhouse Gas Emission Reduction Target

3) Develop a Local Climate Action Plan

4) Implement the Local Climate Action Plan

5) Monitor Emission Reductions

(City of Worcester Climate Action Plan, 2006, p. 11)

In February 2006, the city manager then appointed fourteen representatives from municipal departments, utilities, businesses, universities and environmental organizations to an Energy Task Force (ETF). Using the five-step process described earlier, the ETF was responsible for creating a step-by-step plan to reduce energy consumption, reduce greenhouse gas emissions, and increase the use of clean, renewable energy in a cost effective manner in the city of Worcester (City of Worcester Climate Action Plan, 2006, p. 32).

Phase 1: GHG emissions inventory

Using CCP guidelines, the city completed a GHG emissions inventory to show where GHG emissions originated and where reductions could be made. To find out how many tons of GHG emissions Worcester emitted, data for the following fuel types were collected:

- Electricity
- Natural gas
- Heating oil
- Gasoline
- Diesel
- Waste

Fuel data were collected from each of the following sectors:

- Residential

- Municipal
- Commercial / Industrial
- Waste
- Transportation

Once the amount of fuel used annually by the various sectors in the city was known, this data was input into a computer software program called Clean Air Climate Protection Software (CACPS),[2] a product created by ICLEI to assist local communities with the CCP process. The software can be used to track progress as reduction measures are implemented and to update the emissions inventory. CACPS has been developed for and is supported by ICLEI to allow local governments to meet the CCP milestones. The input data included:

- kWh of Electricity
- Therms of natural gas
- Gallons of heating oil
- Thousand gallons of gasoline and diesel
- Million vehicle-miles traveled (VMT) per year
- Tons of waste incinerated
- Tons of waste composted
- Tons of waste in place

The input fuel data were then converted by the CACPS to calculate the annual GHG and criteria air pollutant emissions generated. The data output is the amount of equivalent carbon dioxide (eCO2) emitted, the amount of energy consumed, and in some cases the total cost of the energy. Also included in the data output were the emissions of the five criteria air pollutants nitrous oxides (NOX), sulfur oxides (SOX), volatile organic compounds (VOCs), carbon monoxide (CO), and particulate matter with a diameter of ten micrometers or less (City of Worcester Climate Action Plan, 2006, pp. 36-37). Figure 4 below shows key results from Worcester's 2004 GHG emissions inventory:

Figure 4: Worcester GHG Emissions in 2004
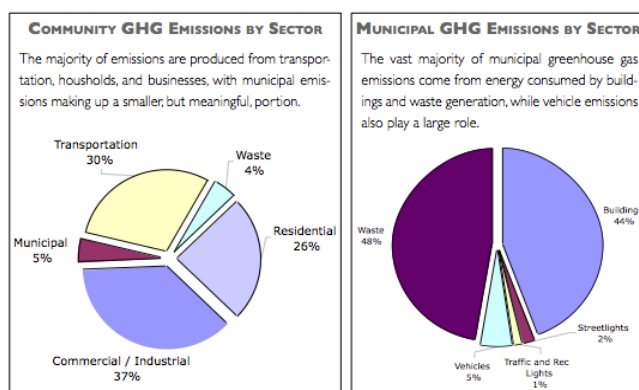
Source: City of Worcester Climate Action Plan, 2006

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[2] ICLEI has since released an updated, web-based software tool, Harmonized Emissions Analysis Tool (HEAT), which has more capabilities than CACPS.

The analysis revealed, "the majority of emissions were produced from transportation, households, and businesses, with municipal emissions making up a smaller, but meaningful, portion," (City of Worcester Climate Action Plan, 2006, p. 12). When considering municipal GHG emissions, the analysis found that the vast majority came from energy consumed by buildings and waste generation, while vehicle emissions also played a large role. The analysis further found that of all municipal buildings, schools were the largest contributors of GHG emissions.

Phase 2: Setting a reduction target

After evaluating the GHG emissions inventory, a specific reduction target should be established that will serve as the benchmark to measure the success of a CAP. According to the 2006 City of Worcester CAP:

> The purpose of setting a reduction target is to create a goal that will encourage people to strive for emission reductions while still remaining attainable. There are two types of targets that can be set in a Climate Action Plan: a municipal target, which refers to the GHG emissions generated only by the municipal operations; and a community target, which refers to all emissions generated by the city.
>
> The Energy Task Force suggested Worcester set a municipal GHG emission reduction target of 11% by 2010 based on 2002 emission levels. The suggested target translates into a 7% emission reduction of 1990 levels by 2010. This target was chosen because it aligns with the first step in the Kyoto Protocol of reducing emissions 7% from 1990 levels by 2010-2020, and because the task force believes it to be an achievable target.
>
> (City of Worcester Climate Action Plan, 2006, p. 42)

Phase 3: Emission reduction measures

Once a reduction target is established, measures for reaching the target are proposed. Figure 5 outlines the key proposed measures Worcester will take to achieve its municipal reduction target of eleven percent below 2002 GHG emission levels by 2010. These measures are grouped into five categories: Energy efficiency, Renewable energy, Vehicle fleet and transportation, Waste, and Energy Manager. Figure 5 below summarizes the key reduction measures in Worcester's CAP:

Figure 5: Summary of policies used by Worcester

Measure	Estimated Implementation Cost	Est. tons eCO$_2$ Reduced Annually	Est. Annual $ Savings	Payback Period	Estimated Fuel Saved/yr	Page #
Energy Efficiency						
Upgrade 200 Exit Signs From Incandescent Lights to LEDs	$3,000	23	$7,972	< 5 months	61,320 kWh	52
Co-Benefits: Reduces 243 lbs/yr of criteria air pollutants. Longer life of LEDs reduces maintenance costs.						
Upgrade to More Efficient Lights in the Pearl/Elm Garage	$44,280	89	$31,387	1.4 years	241,440 kWh	54
Co-Benefits: Reduces 957 lbs/yr of criteria air pollutants. Longer life of fluorescents reduces maintenance costs. Better light quality.						
Change-A-Light Campaign	$190,527 ($3/household)	2,424	$1,042,376 ($16.41/home)	.2 years	6,541,427 kWh	55
Co-Benefits: Reduces 25,925 lbs.yr of criteria air pollutants. Educates the community on energy use and shows the City's dedication.						
Renewable Energy						
Promote Clean Energy Choice	To be determined	16,455	$324,124	Unknown	44,400,605 kWh	63
Co-Benefits: Provides funding for municipal clean energy projects. Reduces criteria air pollutants by 175,971 lbs/yr. Educates the community on renewable energy and the City's dedication to the future of its residents.						
Purchase RECs	$25,000	309	0	0 (Immediate)	833MWh offset	67
Co-Benefits: City recovers all cost from MTC. Reduces 3,301 lbs/yr of criteria air pollutants. Helps reach 20% by 2010 goal.						
Install Hydro Power at the Water Filtration Plant	$300,000	292	$63,072	4.8 years	788,400 kWh	70
Co-Benefits: Reduces 3,125 lbs/yr of criteria air pollutants. Helps reach the municipal goal of 20% by 2010. Reduces electrical demand.						
Solar Heat at Schools	$2,788	1	$341	8.2 years	217 therms	72
Co-Benefits: Reduces 5 lbs./yr of criteria air pollutants.						
Solar Hot Water at the Water Filtration Plant	$24,000	7	$1,456	16.5 years	18,194 kWh	74
Co-Benefits: Reduces 72 lbs.yr of criteria air pollutants. Helps to reach the municipal goal of 20% renewable electricity by 2010.						
Install a Wind Turbine at Crow Hill (site of the new North High)	$1,000,000 ($500,000 w/funding)	148	$52,000	19.2 years (9.6 w/funding)	400,000 kWh	75
Co-Benefits: Reduces 1,584 lbs.yr of criteria air pollutants. Helps to reach the municipal goal of 20% renewable electricity by 2010. Provides an educational resource for students and the community. Potential partnership with the Ecotarium.						
Solar Power at Vocational School	$8,000	1	$390	20.5	3,000 kWh	77

Vehicle Fleet and Transportation						
Enable 5-minute Shut-off in Trucks	$0	671	$130,150	0 (Immediate)	63,180 gallons	83
Co-Benefits: Reduction of 16,748 lbs/yr of criteria air pollutants. Less headaches and health problems for vehicle operators.						
Increase Fuel Efficiency of Gasoline Vehicle Fleet	Variable	224	$36,738	Unknown	21,739 gallons	85
Co-Benefits:						
B-20 Pilot at Hope Cemetery	To be determined	4	-$1,218	NA	1,965 gallons	90
Co-Benefits: Cost may be less from a different supplier or with credits applied. Less headaches and health problems for vehicle operators.						
Increase Employee Carpooling	To be determined	4.742	$1,063,920 (for employees)	NA	443,471 gallons	94
Co-Benefits: Reduction of 1,375,158 lb/yr of criteria air pollutants, including a large reduction in ground level ozone creating pollutants. Lower percentage of employee paycheck being spent on traveling to work. Opportunity to lead by example for other businesses in Worcester.						
Waste						
Encourage Recycling at Apartment Complexes	To be determined	12,048	Unknown	Unknown	3,393 tons trash	103
Co-Benefits: Prevents emissions from incineration. Reduces energy needed for new products. Educates the community on waste and energy.						
Increase Residential Recycling Rate	To be determined	30,407	$312,776	Unknown	8,565 tons trash	106
Co-Benefits: Prevents emissions from incineration. Reduces energy needed for new products. Educates the community on waste and energy.						
Implement Recycling at Schools	To be determined	14,813	$152,376	Unknown	4,172 tons trash	107
Co-Benefits: Provides an opportunity to teach students about the importance of recycling and sustainable living.						
Energy Manager						
Hire a Full-time Energy Manager	$70,000**	346,989*	$1,111,564*	**Unknown**	NA	46
Co-Benefits: Provides the opportunity to designate the City as a leader on issues of the environment, energy and sustainability.						

* Represents the potential municipal cost and pollution savings of the proposed reduction measures that the Energy Manager would assume responsibility for. **Includes benefits.

Source: City of Worcester Climate Action Plan, 2006

Phase 4: Plan implementation

The city proposed that the ETF evolve into an advisory committee and also hire a full-time energy manager who, with the help of the ETF, would be responsible for overseeing the plan's implementation, finding sources of funding, creating new reduction targets, and enlisting citizen support. The energy manager could also complete an annual GHG emissions inventory to monitor energy use and the effects of emission reduction actions, as well as author an annual progress report on the status of measures that have been implemented and measures planned for the next year (City of Worcester Climate Action Plan, 2006, p. 121). More specific actions are outlined below:

The Energy Task Force should meet on a bi-monthly basis to support continued development, implementation, evaluation and progress towards the goals in the Climate Action Plan, with subcommittees meeting as needed. In addition to the three current sub-committees on transportation, energy efficiency, and renewable energy, sub-committees may be formed to support outreach and education, funding, data collection, solid waste, and green space. Individual members can be assigned coordinating roles depending upon the relevance of the strategy to the particular sector that member represents (City of Worcester Climate Action Plan, 2006, p. 121).

Phase 5: Monitoring and evaluation

In order to ensure that the CAP is implemented effectively, a method for monitoring and evaluating the plan must be established. The *2006 City of Worcester Climate Action Plan* recommended the following:

It is proposed that membership of [the ETF] expand to include more members of the business community and local universities/colleges operations. As previously mentioned, the success of this Plan will require participation from all sectors of the community at large, including the residents of Worcester. The ETF recommends including at least the following representatives:

- Five from different municipal departments
- One each from Assumption College, Clark University, Holy Cross, Worcester Polytechnic Institute, Worcester State College
- One each from National Grid and NSTAR and WRTA
- Three from the residential population and community groups
- Two from the local business community

The Energy Manager (EEM) should continue to facilitate the meetings and work of the Energy Task Force. Without a full-time EEM the task force will lose its momentum and guidance, and emission reduction measures may not be implemented properly, may lack funding, or may not be implemented at all.

The Climate Action Plan can be reviewed on an annual basis in the form of an annual Progress Report and Work plan. This report should include updates on existing measures, successes from the past year, obstacles, and goals for the coming year. Emphasis should be placed on identifying the specific funding and support needs of City departments and Worcester community members in order to achieve emission reduction goals in the coming year. Reports on specific measures and an overall forecast as to how the reduction target is being met should be produced utilizing the ICLEI software and included in the annual revision.

As individual goals and measures are met, the Energy Task Force can assist members of the Worcester community and City staff in:

- Assessing which measure(s) will be acted upon next
- Evaluating progress and developing new municipal and community reduction targets and goals
- Assessing what resources and support are needed to support members of the community and City staff in implementing Plan goals
- Assisting in efforts to obtain needed resources and support
- Enlisting citizen support for implementing Plan goals

(City of Worcester Climate Action Plan, 2006, pp. 121-122)

A table outlining specific sources of this data can be found in Appendix E.

The future of sustainability in Worcester

In just a few years, the city of Worcester has effectively taken responsibility for its contribution to climate change through its 2006 Climate Action Plan. Based on discussions with John Odell, manager of Worcester's Energy Efficiency and Conservation Program, "we've made significant reductions, but have not yet calculated exactly how much reduction in GHG emissions the city has achieved."

Based on our analysis of Worcester's CAP and Worcester's comparability to Syracuse, we believe it provides the best model in the Northeast of a process that Syracuse could apply to develop a plan for sustainability. Many of the GHG emissions reduction measures used in Worcester's plan could likely be implemented in Syracuse and would put Syracuse on the right track for reducing its contribution to climate change.

4. Recommendations

4.1 Buildings

In the United States, buildings consume approximately forty percent of the nation's energy, are responsible for 39 percent of the emissions, and consume fifteen percent of the water. Nationwide, strategies are being deployed that enhance buildings' energy efficiency, simultaneously reducing U.S. demand for energy and generating millions of American jobs.

Syracuse has many opportunities to improve the efficiency of its buildings. The city's aging infrastructure has now become a significant contributor of greenhouse gases. Various measures can be taken, some more challenging than others, that transform the way buildings are constructed, maintained, and operated, allowing them to be more environmentally friendly. These buildings will continue to contribute to emissions well into the future unless actions are taken. Furthermore, new buildings in Syracuse can be designed to improve comfort and move beyond traditional energy consumption.

Current Progress

The city of Syracuse has already made great strides in building efficiency.

Buying Green: The Purchasing department procures green office supplies and equipment, furniture, and cleaning supplies whenever there is an adequate product without a large cost differential. Except for some cleaning supplies, the City has found adequate and cost-effective green products for all of these areas. The City uses the New York State purchasing contracts to ensure that it gets the best prices on effective, green products.

Utility Budget Risk Management: Despite very volatile price swings, the City has effectively budgeted its utility costs. Judicious decisions regarding when to accept or decline fixed-price bid offerings have saved the City millions of dollars in electric and gas expenses. Oversight and attention to detail has enabled the City to recover over $100,000 caused by inadvertent utility billing errors.

Energy Benchmarking: Historic energy use has been collected and archived for current and future use. It is currently being used as part of the criteria required to obtain membership in the Chicago Climate Exchange. In addition, the data indicate that Syracuse has reduced its energy consumption 11.3 percent from 2002 to 2008, not including the street lighting accounts.

Policy Proposals

1. *PACE program*: It will be advantageous for the city to develop a PACE framework
2. *Green building education*: Outreach to builders can increase green building
3. *Sustainable personnel policies*: Simple changes to daily behavior can reduce energy consumption in city offices

4.1.1 Pace program

<table>
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Recommendation

Implement a PACE program to finance energy retrofits in buildings

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Overview

As described in the discussion of the Be2 Loan Program, a PACE (Property Assessed Clean Energy) program is a municipal financing mechanism that helps property owners cover the upfront costs of energy efficiency improvements or renewable energy projects. Property owners pay off the projects through an incremental charge on their property taxes, thus attaching the costs of improvements to the property and not the individual borrower. If the house is sold, financing is transferred to the new owner. The programs are generally designed so that property owners come out ahead on a cash flow basis. The reductions in utility bills resulting from PACE projects exceed the accompanying property tax increases.

PACE programs are meant to accelerate energy retrofits of homes and buildings by improving the economics of energy efficiency improvements. PACE bonds are enabled by state legislation and began in 2008 in California. They have subsequently spread to Colorado, Vermont, Ohio, and New York.

PACE programs benefit all those involved in the following way:

- *Municipality:* Green job creation and little default risk
- *Property owner:* Positive cash flow and no upfront investment
- *Mortgage lenders:* Property value increases and borrower cash flow improves
- *Lender:* Limited risk because a PACE lien is senior to mortgage debt

Examples of Successful Programs

- Boulder County, CO: $10 million of projects with an average loan size of $17,000.
- Babylon, NY: *Long Island Green Home* program saves 725 tons of CO_2 yearly
PACE in New York State

In November 2009, New York legislature enacted the *Municipal Sustainable Energy Loan Program.* The bill authorizes municipalities to establish PACE programs. A contractor certified to standards set by NYSERDA must perform energy audits or renewable energy feasibility studies in order for property owners to qualify for loans.

Currently, the bill specifies that municipalities can only fund these programs using federal grants. However, Senate Bill 7683, which is pending in the NYS Legislature, would amend the law to allow broader sources of funding. NYSERDA will likely begin to provide financial and technical assistance to municipalities running a PACE program. Multiple sources interviewed for this project were confident that the legislation will quickly pass, including Lee Klosowski, Onondaga County's Director of Energy Sustainability, Amelia LoDolce,

Binghamton's Sustainable Development Planner (and initiator of Binghamton's PACE program), and Mark Thielking, Bedford's Director of Energy Resources (who runs a PACE pilot program).

Further implementation will depend on passage of the bill. Described below is a blueprint for how to move forward, should this occur.

Implementation

Syracuse will be in an advantageous position if it can develop a framework for a PACE program prior to the passage of legislation. The city will then be prepared to immediately deploy the program and pursue grant funding. Organizations have begun to emerge that specialize in the implementation of PACE. It is estimated that it will take between 6 and 12 months (RAEL, 2009).

Steps for successful implementation of PACE program

1. *Obtaining authorization:* Receive permission to implement program from NYS and/or NYSERDA.

2. *Building a team:* Establishing and administering PACE requires staff time and commitment. These employees must be flexible since this is a new program and will need continual adjustments. The team should consist of various members ranging from a general manager to a bond financier. Many functions may be contracted to partner organizations that can perform administrative and financial functions. Roles include:

   • Marketer: Raises public awareness among local residents
   • Administrator: Processes applications and oversees bond transactions
   • Property Tax Assessor: Levies assessment and has relevant legal knowledge
   • Program Evaluator: Maintains database and analyses effectiveness

   These roles can be performed by one dedicated employee or may require a larger group depending on the size of the program. It may be useful to team with a regional coalition of municipalities or Onondaga County to pool resources or create a countywide program. Syracuse can serve as a pilot program for Central New York and its model could be replicated by neighboring communities. Such collaborations have been successful in other contexts: Bedford, NY, for example, initiated a 14-community consortium with NYSERDA.

3. *Specifying clear goals:* The overarching goal of PACE legislation is to help local governments advance their goals of reducing greenhouse gases in their community by lowering energy use (RAEL, 2009). There are other benefits as well, including lower energy bills, job creation, pollution prevention, and higher property values. However, setting a clear target—such as a specific reduction in carbon dioxide emissions—is a transparent and widely-understood measure that sends a clear signal to the public of the city's goal.

To achieve these goals, participant and project must meet firm eligibility criteria:

- *Contractors:* As previously mentioned, contractors must be certified to NYSERDA standards to perform energy audits or renewable energy feasibility studies (Sussman, 2010). They can also be performed by a local government under standards at least as stringent as those developed by NYSERDA.

- *Building owners: Borrowers must meet the following requirements*
    o Must have clear title to the property and be located within financing district
    o Estimated property value must be in excess of property owners public and private debt on the property including the PACE assessment.
    o Property owner should be current on property taxes and should not have been late on payment within last 3 years.
    (DOE, 2010)

- *Projects:*
    o Audits, feasibility studies, renewable energy systems, and energy efficiency improvements are usually included in PACE programs. Syracuse has the option of expanding or contracting them. Municipalities commonly "prioritize projects by requiring that more cost-effective energy efficiency improvements are conducted first before homeowners are allowed to use the PACE money to install more expensive renewable energy systems" (Sussman, 2010). Administrators should also keep in mind that NYSERDA's criteria for energy efficiency improvements states that they must not exceed 10% of the property's value.
    o *Expected Saving-to-Investment Ratio (SIR) Greater Than One*: A SIR is the estimated savings over the life of the assessment (generally 20 years for a PACE loan) discounted back to present value and divided by the amount financed (DOE, 2010). Only funding cost effective measures that pay for themselves protects both participants and mortgage holders. Energy efficiency improvements will usually be chosen before or coupled with renewable energy projects because they are more cost effective.
    o *The Assessment Should Be Appropriately Sized*: PACE assessments should not be above 10% of a property's estimated value or below approximately $2,500 because of the administrative requirements (DOE, 2010). Additionally, the amount of financing should be net of any expected cash rebates.

4. *Data Collection*: To evaluate the efficacy of the program, administrators should collect data including installed measures, investment amount, default and foreclosure data, expected saving, and actual energy use before and after the retrofit (DOE, 2010). To screen applicants further data should be collected included property ownership, property-based debt and valuation, and the property owner's ability to pay.

    A record of suitable contractors would be useful. Furthermore, clear procedures should be established that assist administrators in determining which projects should qualify.

5. *Securing financing:* Currently, municipalities in New York State may only fund their programs using federal grant assistance or federal credit support mechanisms including

direct loans. Legislation aiming to expand the funding mechanisms for PACE programs so that municipalities can issues their own bonds and have more flexible means to secure financing for their programs is pending in the New York State legislature. This will attract major lenders to the program as backers for bonds (Sussman, 2010). Sources of capital for energy efficiency projects have historically been banks and utilities. Governments with large reserves are capable of financing PACE loans, so that they essentially become part of their investment portfolio (RAEL, 2009). The table below offers a chart with the program elements organized by categories discussed in this section with the most common elements of Energy Financing Districts highlighted.

Table 2: Elements of Energy Retrofit Financing Programs

SOURCES OF CAPITAL	FINANCING MECHANISM	COLLECTION MECHANISM	ENHANCE-MENTS	ELIGIBLE MEASURES	UNDERWRIT-ING CRITERIA	SECURITY INTERESTS
Banks	Personal loan (secured or unsecured)	Amortized payment bill	Reduced interest rates	Energy efficiency	Debt to income ratio	Unsecured
Public benefit charge or added to rate base	Mortgage / home equity (secured to real estate)	Lease payment	Stretched underwriting criteria	Renewables	FICO score	UCC fixture filing
Utility general funds	Line of credit (secured or unsecured)	On utility bill	Guarantees	Other home improvements	Utility bill payment history	Mechanics lien
Federal, state or local govt funds	Lease	On property tax bill	Loan loss or late payment reserves		Tax payment history	Other lien on real estate
Municipal bonds	Retail installment contract	Performance contract bills	Rebates		Other	Lien on other property (car, boat, etc)
Manufacturers	Special tax or assessment levied	Buy kWh or therms	Tax credits			Disconnection for non-payment

Source: RAEL, 2009

6. *Adoption process:* Syracuse will need to adopt an ordinance in the city code formally creating the assessment or energy-financing district for the purpose of the installation of energy efficiency improvements or renewable energy systems (Sussman, 2010). Within the energy-financing district, or special tax district, the municipality is authorized to levy special taxes on properties. The addition of the special tax or assessment on the property tax bill is backed by a senior lien on the property, making it very secure (the special taxes are paid before a property's first mortgage in case of foreclosure). This district can encompass the entire city or just a portion of it. The city then authorizes the issue of bonds payable from the special taxes (RAEL, 2009). These steps are often specified in the enabling legislation. For example, to establish a PACE program in California under AB811 a municipality must submit the following:

- A map of the territory within which properties may be assessed
- A draft contract between a property owner and the city
- A plan for raising capital to finance the improvements
- The amount of fees that will be charged

7. *Launch program:* This stage will involve marketing and outreach campaigns to educate and engage the public. Marketing materials should include information on expected energy savings (cost and kWh), greenhouse gas emissions, health benefits, and financing details. Public awareness is crucial to program success because administrative and other fixed costs drop with economies of scale. Therefore, Syracuse must have an estimate of the number of properties that will participate (this step will also be crucial in determining how much money to raise via the bond issue). This may seem like a daunting task because of numerous variables but municipalities can begin to get a handle on this by learning some relevant information.

- *Demographics*
  - Number, age, and condition of residential and commercial stock
  - Number of rental properties where the tenants are responsible for the utility bills (these properties will not be loan recipients)
- *Expected Benefits*
  - Quality of buildings, energy prices, and regulations
  - Syracuse residents will have greater opportunities due to extreme weather
- *Outreach and Education*
  - Level of interest and knowledge of energy options and climate change
  - Identify existing means within community to disseminate public

The city of Berkeley conducted a web survey to understand these qualitative factors. Once this data is collected, Syracuse can partner with contractors to market the program.

The final details of the program will depend on the outcome of pending legislation. However, existing legislation, combined with the experience of other communities around the country, provides a workable initial framework for the initial development of a PACE program. A successful Syracuse program could serve as a model for similar cities.

4.1.2 Building Permits and Private Sector Construction and Renovation

4.1.2 (a) Building permits

Recommendation:

In 2013, adopt the International Code Council's enhanced green building code

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Overview

The Permit Department of the City of Syracuse ensures that the new and heavily renovated buildings meet the basic building code standards. Every year, the Permit Department reviews over 10,000 permits and certifications. In 2009, 60 new buildings were built in the City of Syracuse. The Permit Department is currently operating very efficiently and processes most

permits in about a week. Thus, although expedited permitting for green building projects has been a popular regulatory change in other cities, it is not relevant in Syracuse.

The City of Syracuse adopts the New York State building codes. Although cities and towns are allowed to petition the state to implement more restrictive local standards, most cities and towns across the state also adopt the State's building codes. Since 2000, outside of New York City, the majority of more restrictive local standards have regulated sprinklers and pyrotechnics (http://www.dos.state.ny.us/code/mrls.htm).

In consultation with officials from across the state, the state has adopted the International Code Council's 2007 building codes and the 2010 energy conservation codes (IECC), to meet the requirements for American Recovery and Reinvestment Act (ARRA) funding. City officials are preparing to adopt these codes and expect to have fully implemented them by January, 2011. These codes will increase the energy efficiency of all new buildings and heavily renovated buildings in the City of Syracuse.

In 2013, Syracuse expects to follow the state in adopting the International Code Council's (ICC) first green building codes (IGCC). The IGCC will require a dramatic increase in the energy efficiency and environmental sustainability of new and substantially renovated buildings. In addition to energy efficiency, these codes include regulations regarding land use, material resource conservation, water conservation, indoor air quality, and building operations and maintenance. The IGCC will allow the city to require developers to report the CO2e emissions or the energy consumption of applicable buildings, which will assist the City as it tracks the implementation of its sustainability goals. Finally, the IGCC will actually include two separated codes: a prescriptive code and enhanced code. The prescriptive IGCC will require a minimum level of efficiency and sustainability adapted to local conditions. The enhanced code will require greater levels of efficiency and sustainability, also designed in response to local conditions. Thus, to ensure the greatest impact of these codes, the City should prepare to adopt the enhanced code.

Implementation

The Permit Department does not expect either the current transition or the transition in 2013 to significantly disrupt its work. Similar to previous code updates, in 2010, the City will transition to the new code throughout the year and finalize the transition starting in October. Since the new codes are designed to expand on and clarify the existing building codes, it should be straightforward for builders and architects to adapt to them.

In preparation for the 2013 updates, the City is participating in a state-wide panel reviewing the new code. The City should use its position on the panel to encourage the state to adopt the more stringent enhanced IGCC codes. Once the state has adopted the IGCC, the City can adopt the enhanced IGCC code. However, by taking a leadership role on this panel, Syracuse can ensure that the entire state takes a significant step towards reducing green house gas emissions.

The updates to the City's building code will have an impact on energy use and environmental sustainability in Syracuse and should be considered to be a significant part of the City's sustainability plan. The table below shows the impact of the new codes, the 2010 codes,

the 2013 prescriptive codes, and the 2013 enhanced codes, on a typical building's energy use. The ICC arrived at these figures by comparing the expected energy performance of buildings meeting the new codes with the energy performance of the buildings meeting the 2007 codes, which the City is currently using (Mechanical Topics in the ICC Green Code: Safe & Sustainable By The Book).

Table 3: Effects of Building Code Revisions on Energy Efficiency

	2010 IECC	IGCC Prescriptive	IGCC Enhanced
Compared to 2007 IECC	23% more efficient	30%	37%
Compared to 2010 IECC		10%	18%

Source: Mechanical Topics in the ICC Green Code: Safe & Sustainable By The Book

4.1.2 (b) Stormwater management in private sector

> *Recommendation:*
>
> *Use the existing pre-development meeting process to educate builders about multiple green stormwater management strategies.*

Overview

While building codes are one method that the City can use to achieve its sustainability goals, it also has an opportunity to use its regulatory process as an education and outreach tool to encourage builders to build to standards above and beyond existing regulations. The City has an excellent opportunity to educate builders on green building practices through its current regulatory structure and with the help of local organizations and experts.

To facilitate development in the city, Syracuse holds pre-development meeting to help developers and homeowners identify and respond to potential regulatory problems. Representatives from the Zoning, Public Works, Public Safety, Fire, Engineering, Economic Development, Water, and Planning and Sustainability Departments participate. These meetings are typically requested early in the development process when architects and developers are still in the planning stages, and are thus able to make significant changes to their plans. In the past few years, the City has hosted between 25 and 30 such meetings annually. Thus, the City had an early opportunity to influence the design of approximately 50 percent of the City's new buildings.

Implementation

Site conditions are the most frequent concern raised by city officials in these meetings, particularly regarding storm water management because of the county's court-mandated improvements to the storm water management system. The City currently uses these meetings to recommend that developers use permeable pavement whenever possible, as it is a cost-effective

and sustainable method of stormwater management. As discussed in section 4.3.3, there are additional green infrastructure methods that could be used. These methods include planting trees and establishing rain gardens and other catchment strategies. To more fully address issues of sustainability, the City should also recommend these green infrastructure strategies during pre-development meetings. While permeable pavement is an effective method of reducing stormwater runoff into the sewer system, other green infrastructure strategies can be more effective, longer-lasting and have other positive social benefits associated with increasing the number of trees in the City.

4.1.2 (c) Private sector construction and renovation

> **Recommendation:**
>
> *Invite the local chapter of the US Green Building Council, or other local experts, to participate in pre-development meetings to educate builders on LEED certification and cost-effective green building strategies with the goal of encouraging builders strive for LEED Silver certification.*

Overview

Expanding on its education strategies for storm water management, these pre-development meetings offer the city an opportunity to educate builders on a broader array of green building strategies. The Permit Department has noted that many builders and architects have limited awareness of LEED certification, the US Green Building Council (USGBC) and green building practices in general. Additionally, the Permit Department noted that developers have been open to using permeable pavement once the cost- effectiveness of these products has been demonstrated to them. Lastly, the Permit Department expects the builders would be similarly open to learning about the costs and benefits of other green building strategies.

Implementation

Syracuse currently has an ordinance requiring that all new municipal construction meet LEED Silver certification, which the airport renovation is on target to meet. LEED Silver certification requires that buildings are 30% more energy efficient than current building codes require. The City should encourage developers to work towards this target as well. This will allow the City to achieve the energy efficiency standards that will be required by the IGCC prescriptive codes in 2013 three years earlier.

To provide the necessary information to developers, the city should invite a representative of the local chapter of the USGBC or a similar expert to participate in pre-development meetings with the permission of the developer or homeowner. During interviews carried out in the course of this project, the Permitting Office, the Economic Development Office and the USGBC have all expressed interest in trying this strategy. Alternatively, the Planning and Sustainability staff could take responsibility for providing information to developers on the resources available at the local chapter of the US Green Building Council, the US EPA's Environmental Finance Center, the Syracuse Center of Excellence, or from other local experts. Worcester has implemented an outreach and education program, providing brochures and educational material to builders and homeowners that could be used as a model for Syracuse.

4.1.3 Personnel policies and conservation in the municipality

Cities in Upstate New York and throughout the country have incorporated a number of personnel policies into their sustainability plans. From these examples, there are two major policies that the City can adopt over the short and medium term. First, in the short-term, the City should adopt a Municipal Conservation Policy that educates current and new employees about practical actions they can take to increase sustainability at work. Second, in the long-term, the City should include telecommuting and flexible work hours in future collective bargaining negotiations and in the contracts of non-unionized workers.

4.1.3 (a) Municipal resource conservation policy

> *Recommendation:*
>
> *Draft and distribute a Municipal Resource Conservation Policy*

Overview

A Resource Conservation Policy (RCP) is used by governments and the private sector to educate and encourage employees to take concrete, everyday actions that reduce resource and energy consumption without disrupting workflows. These actions create cost savings by reducing the need to purchase goods and energy and by reducing the waste management costs.

Implementation

While many city officials and departments already practice energy and resource strategies, developing and publicizing a unified Municipal Resource Conservation Policy (MRCP) will demonstrate the Mayor's support for conservation and educate employees about strategies available to them. The City can include this new policy in the material that the personnel office distributes to all new employees. Additionally, the policies should be shared with current employees through a short memo, similar to the Binghamton policy outlined below. The memo should include brief directions on what actions to take and why those actions are important. The City will need to monitor implementation to calculate its overall cost savings. The City may be able to collect this data by requesting monthly estimates from each department.

Syracuse can adapt Binghamton's strong MRCP to meet its needs (the full 2 page policy is attached in Appendix D). The Binghamton policy includes the following strategies that are relevant to Syracuse:

- Computer Policies:
    - Turn off computers, speakers, adding machines, and printers at the end of the day.
    - Set computers to enter standby and monitors to enter sleep mode after 15 and 5 minutes respectively.

- Computer Policy Energy and Cost Savings:
    - Binghamton estimates that turning off computers and monitors save 400 kWh and $14 annually per computer, but at current energy prices the city could actually expect $59 in savings. Energy and cost savings can be estimated using the U.S.

Department of Energy's typical wattage estimates. For example, a desktop computer and monitor on sleep mode uses 60 watts per hour or 350 kWh annually (60 watts * 16 hrs * 365 days divided by 1000 W per kW).

- o Changing the power management settings one desk top computer can save 746 kWh and $110 annually. Energy and cost savings estimates can be calculated with the EPA's Low Carbon IT Savings Calculator available at http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_mgt_computer_w ebinars

- Power Saving Policies:
  - o Turn off the lights when you will be gone for more than 15 minutes.
  - o Shared equipment, such as printers and photocopiers, and lights in common areas should be shut off by the last person to leave the office at night.
  - o Turn off power strips when you leave for the day.

- Power Saving Policies Cost Savings:
  - o The EPA estimates that consumers spend $100 per year per piece of equipment "to power devices while they are off (or in standby mode)". See: http://energystar.custhelp.com/cgi-bin/energystar.cfg/php/enduser/std_adp.php?p_faqid=5493&p_created=12260796 64

- Recycling Policies:
  - o Recycle ink cartridges.
  - o Conserve and recycle paper.
  - o Switch to rechargeable batteries and recycle single use batteries.
  - o Recycle all other eligible materials, such as bottles, cans, plastic containers and cardboard.

- Recycling Policies Energy Savings:
  - o The energy savings of recycling a product are largely dependent on the energy intensiveness of its production. Recycling aluminum cans, carpets, computers produce, and office paper products create significant energy savings (Choate et al, 2005).

- Window Policies:
  - o Close window blinds at the end of the day to cut down on heat loss in the winter and to avoid the heat gain of direct sunlight during the summer.

- Window Policies Energy Savings:
  - o The Department of Energy estimates that blinds and draperies can reduce heat gain in the summer by up to 33 to 45 percent. In the winter, draperies can reduce heat loss by 10 to 25 percent. See: http://www.energysavers.gov/your_home/windows_doors_skylights/index.cfm/m ytopic=13500

4.1.3 (b) Flexible work hours policy

> *Recommendation:*
>
> *Develop a flexible work-hours policy and include flexible work hours in future collective bargaining negotiations.*

Overview

Government and private sector employers have instituted flexible work hours to decrease commuting time and increase employee morale. Flexible work hours allow employees to vary their arrival and departure times, while still working 40 hour weeks or 80 hours in a two week period. According to the U.S. Department of Labor, 30% of U.S. employees have a flexible work schedule.

To meet its sustainability goals, Syracuse University has instituted a number of flexible work policies for full-time employees.[3] In addition, Syracuse University instituted a green days/holiday policy, which limits energy use on campus around scheduled holidays when fewer staff members are in the office. The University provides two to four additional paid days-off during the winter holidays and encourages staff to avoid commuting to campus on those days. The University asked departments to track approximately how many miles of commuting and gallons of gas are saved on those days with a simple spreadsheet. Through its green days in 2009, the University estimates that it reduced GHG emissions by over 200,000 CO_2e and employees saved a significant amount of money through the commuting reductions alone (http://insidesu.syr.edu/2010/05/10/2010-2015-holidaygreen-days-schedule-now-available/).

Implementation

Syracuse has collective bargaining agreements with 10 public employee unions. Thus, the City must negotiate with each union to incorporate flexible work hours and green days into the City's employment policies as each contract comes up for negotiation. Drafting a flexible work policy prior to these negotiations will facilitate the negotiation process. The Department of Labor and the Office of Personnel Management have detailed resources on how the Federal government has instituted such polices. The County of Loudon, VA successfully negotiated flexible work hours with its public employee unions and could be model for Syracuse.

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[3] A detailed list of these policies can be found at http://humanresources.syr.edu/worklife/fws.html

4.2 Transportation

Municipal transportation is an essential component in of a comprehensive sustainability plan. Reducing the amount of CO2 emissions, through better fuel efficiency, a lower carbon fuel, or multimodal transit, is a critical piece of an environmentally sustainable, transportation agenda. Last year, the City of Syracuse used 908,335 gallons of gasoline and diesel throughout its municipal fleet. This fuel emitted 18,687,990 pounds of CO_2 and cost the city $1,964,618 (Department of Energy, 2010). Syracuse is on pace to consume a similar amount of fuel for 2009-2010, according to recent fleet statistics (Sackett, 2010). Reducing the amount of petroleum-based fuel used within the municipality will lower the City's CO_2 emissions and improve the region's sustainability.

Current Progress

The City of Syracuse has taken recent steps towards reducing the amount of petroleum fuel it burns. Last year, the Department of Fleet Operations purchased three, alternative-fuel vehicles. Furthermore, the Clean Cities Coalition of New York granted Syracuse $1 million this year to purchase 18 additional alternative fuel use vehicles in the future. These 21 vehicles utilize either compressed natural gas (CNG) or electric energy, both of which will greatly reduce total carbon-dioxide emissions.

This year, the Syracuse Common Council voted unanimously for the redevelopment of the Connective Corridor. Part of this redevelopment plan is the creation of a "Bike Bodega" (Office of Community Engagement and Economic Development, 2010), which is meant to connect the Near Westside to the Connective Corridor, which in turn connects the University Hill area to Downtown. The Bodega project is intended to encourage more bike riding as a means of travel along the Corridor; furthermore, these bodegas are expected to discourage the amount of single occupancy vehicle travel, which will further decrease total CO2 emissions.

Policy Proposals

The following section of the report proposes three additional policy recommendations that will further reduce the City's of carbon-dioxide emissions.

1. *Implementation of B20 fuel into the municipal fleet*: B20 is a Biodiesel fuel that burns cleaner and is more sustainable than conventional diesel fuel.
2. *Municipal bike sharing program:* This program is meant to encourage the use of bikes over single occupancy vehicles for short commutes.
3. *Idling reduction technology:* This equipment limits the amount of fuel burned by emergency vehicles when idling for long periods.

4.2.1 Biodiesel use in municipal fleet

> *Recommendation*
>
> *Diesel-powered vehicle should shift to using 20 percent biodiesel (B20)*

Overview

Environmental Degradation: Diesel fuel does significant damage to the environment and is a major contributor to climate change. It has 2.778 kilograms of carbon per gallon and creates 22.2 pounds of CO_2 for every gallon burned (compared to gasoline's 19.4 pounds). Diesel emissions by Syracuse's municipal fleet are a significant component of the City's total greenhouse gas emissions (Coe, 2005)
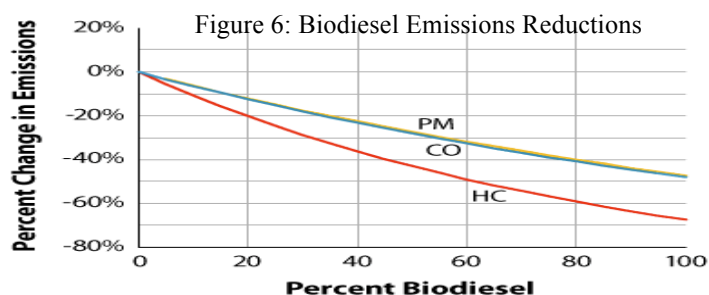
Health Risks: The use of diesel can causes severe health problems as well. The breathing of diesel exhaust has been linked to multiple health effects including lung cancer, asthma symptoms, respiratory infections, and impaired lung growth in children (Haren, 2009). Exposure to diesel exhaust in the workplace has even worse health risks due to the close proximity of employees to pervasive airborne contaminants.

Energy Security: New York State imports 91% of its petroleum compared to a national average of 68% (Morelli, 2010). Imported petroleum is prone to supply disruptions, which cause prices to fluctuate dramatically. Moreover, a significant portion of the imported fuel originates in geopolitically unstable regions where export earnings from petroleum sometimes support oppressive regimes with interests at odds to those of the United States.

Biodiesel is an alternative fuel that could displace petroleum diesel and would address these issues. Biodiesel is a renewable fuel produced from agricultural resources (OTAQ, 2009). It is primarily made from soybean oil, canola oil, sunflower oil, recycled cooking oil, and animal fat but complex feedstocks such as algal oil and cellulosic plant materials are advancing at a rapid rate.

Key benefits of biodiesel

Emission Reductions: Biodiesel emits significantly less greenhouse gases than traditional diesel. As shown in Figure 6, as the percent of biodiesel blended into diesel fuel increases, the amount of unburned hydrocarbons (HC), carbon monoxide (CO), and particulate matter (PM) decreases substantially. Using only B20 (20% biodiesel and 80% petroleum diesel) reduces carbon dioxide emissions by 15% (EE&RE). Emissions are further reduced because the growing of biofuel feedstocks sequesters carbon dioxide. Using recycled vegetable oil as a feedstock reduces CO_2 by 90% (B100).

Figure 6: Biodiesel Emissions Reductions

Source: NBB, 2006

Environmental/Public Health: Biodiesel not only reduces emissions, but also decreases the health risks associated with those emissions. Substituting biodiesel for traditional fuel decreases the levels of polycyclic aromatic hydrocarbons and nitrated polycyclic aromatic hydrocarbons (both reduced by 75-90%), which have been identified as potential cancer causing substances (National Biodiesel Board). Biodiesel is nontoxic and biodegradable, meaning it would cause no environmental harm if spilled, making it safer to store and transport. Furthermore it has a higher flashpoint (150° compared to petroleum diesel's 52°) making it less combustible (EE&RE).

Energy Security: Biodiesel is produced domestically and can utilize marginal agricultural land and unused industrial production facilities. Domestic production will lessen reliance on foreign oil and have the additional benefit of stimulating the growth of domestic green jobs. Currently the market price is approximately $1 higher than petroleum diesel but this will be offset by a $1 federal blender's credit that expected to be implemented this summer. Even without government incentives, buying large volumes increases purchasing power and can reduce the price.

Performance: Biodiesel is a cleaner fuel, which results in better engine performance and lubrication. It can be blended with petroleum and used in existing fleets without engine modifications (National Biodiesel Board). Biodiesel meets all federal fuel standards and certification boards exist that verify quality. B100 (100% biodiesel, no petroleum diesel) has been shown to gel in cold weather but lower blends have not experienced this problem.

Table 4: City Diesel Usage

	Fiscal Year 07-08	Fiscal Year 08-09	Fiscal Year 09-10*
Total Diesel (gallons)	401,057	380,815	320,553
Total Cost	$1,224,555	$721,983	$710,214
Average Price	$3.05	$1.90	$2.22

*Does not include May 2010 or June 2010. Also does not include aviation usage after October 2009

Source: Sackett, 2010

Implementation

A transition to B20 is not difficult due to biodiesel's technical similarities to petro-diesel. It can be used in any diesel vehicle, dispensed through existing fueling stations, and stored in the same tanks without modification. Furthermore, there are virtually no material compatibility issues with B20 and the use of this fuel does not create any warranty issues. Occasional winterization problems have been documented, but using B20 with higher cold flow properties or switching to B10 or B5 during the winter mitigates this concern. Cold flow properties are simply the conditions under which specific blends of biodiesel gel in different weather conditions. Any blend higher than B20 would require the purchase of biofuel compatible parts and would not be covered under existing warranties. Some municipal fleets that have converted to biodiesel include White Plains, NY, Brookhaven, NY, and New York City.

Syracuse's switch to biodiesel will be made easier by procuring diesel from New York State contracts. This will lower the price and expedite the process. New York State agencies have been mandated to use B10 and have had success in using blends up to B100 for over 10

years according to Russell Patton, Biodiesel Purchasing Office for the New York State Office of General Services (NY OGS). Patton went on to explain that New York State has had tremendous success using the biodiesel, built mutually beneficial relationships with local distributors, and has viewed this policy as a way to support local farmers who grow the feedstocks. He also mentioned that the fuel has improved the performance and elongated the lifetime of the engines in which it is used.

Phasing in biodiesel is a good idea for fleets that have not used biofuels in the past. Syracuse can begin by having just one department or a certain number of vehicles fuel with B5 (5% biodiesel, 95% petroleum diesel). Barry Carr, Central New York's Clean Cities Coordinator, recommended phasing it in along vehicle service intervals, such as putting the first tank load just prior to an oil and filter change. He also mentioned that biofuel-compatible filters should be used to avoid rapid filter degradation which may occur with standard filters. Operators should pay careful attention to whether there are any mechanical problems, especially gelling in the winter months. After this trial period, more departments and vehicles can start using blends up to B10. Eventually all municipal vehicles will be fueling with B20.

Table 5 shows the prices of biodiesel for the date 5/28/2010. B20 is costs approximately 60 cents more per gallon than petroleum diesel (using Syracuse's average diesel cost for Fiscal Year 2009-2010). As previously mentioned, Syracuse may purchase biodiesel through competitively bid New York State contracts. NY OGS's Procurement Service Group updates contract fuel prices weekly by county on their website. Onondaga County's biodiesel distributor is Ascent Aviation Group, Inc. located in Parish, NY.

Table 5: Price of Biodiesel

Fuel Type	$ Per Gallon
Ultra Low Sulfur Biodiesel (B5)	2.7270
Ultra Low Sulfur Biodiesel (B20)	2.8146

Emissions

The primary purpose of using biodiesel is to cut greenhouse gas emissions. Since it is an indication of overall GHG emissions, carbon dioxide serves as a measure of emissions. The following table shows emissions if the city used B20 in FY 2008-2009:

Table 6: Municipal fleet B20 emissions

	Actual Emissions	B20 Emissions
Pounds of CO_2	8,454,093	7,185,979
Emissions Reductions		*15%*

These calculations assume that diesel emits 22.2 pounds of carbon dioxide per gallon and that the use of B20 reduces emissions by 15%. Furthermore, emissions can be greater depending on the feedstock used to make the biodiesel. Using B5 reduces emissions by approximately 4%.

Funding

A biodiesel tax credit, which makes biodiesel cost-competitive with regular diesel, is still pending in Congress. Therefore the use of biodiesel will be more costly than regular diesel. However, it is likely to be less expensive than other alternative fuels because there is no requirement for additional fueling infrastructure, new vehicles, or specialized technicians. Furthermore, climate and energy legislation that is currently being debated in Congress might raise the cost of regular diesel substantially, making biodiesel relatively more attractive. Finally, cities need to take into account the additional health care costs that are incurred due to hazardous diesel costs. That is especially important in urban areas such as Syracuse where children are exposed to diesel exhaust and have an elevated risk of developing asthma.

Clean Communities Coalition: According to Barry Carr, Syracuse received $1 million in funding to assist in the purchase alternative fuel vehicles and build alternative fueling infrastructure. Due to fiscal difficulties, not all of this funding was spent. Approximately $300,000 remains unallocated and will be only available for a limited time. This money could be spent to cover 100 percent of the incremental cost of using B20. If the city used B20 in its entire fleet for fiscal year 2009-2010 instead of diesel, it would cost $193,750 more than conventional diesel (using current diesel prices of $2.22 per gallon and B20 at $2.82 per gallon).

Conversion Schedule

Below is a timeline that documents specific milestones for changing to B20:

Table 7: Conversion schedule of Syracuse municipal fleet

Milestone	Start Date	Added Department
10% of City uses B5	August 2010	Water Department
31% of City uses B5	November 2010	Street Cleaning
42% of City uses B10	February 2011	Sweeping & Flushing
64% of City uses B10	March 2011	Sanitation
72% of City uses B20	April 2011	Design & Construction
81% of City uses B20	June 2011	Sewers & Streams
100% of City uses B20	August 2011	Remaining Departments

Technicians should closely monitor engine performance at the beginning of each phase. Drivers should not be notified which specific vehicles will be using biodiesel to avoid biasing their assessments of vehicle performance. Procurement policies may need to be adjusted so that fuel is delivered closer to when it is consumed to avoid biodiesel gelling in outside tanks. However, implementing a just-in-time purchasing policy will have the additional benefit of allowing purchasing to become more timely.

Future actions to consider

Growing Biofuel Feedstocks: Syracuse has the opportunity to develop underutilized properties within the city into urban agricultural sites. These sites could potentially grow plants that go into the production of biodiesel such as soy, camelina, and jatropha. Providing biofuel producers with feedstocks would lower the costs of biofuels to the city.

Harvest Algae from Wastewater Treatment Plants: The most promising biofuel feedstock is algae due to its unlimited growth potential and high oil content. Alga thrives in wastewater, which makes Syracuse's various wastewater treatment facilities perfect locations for algae cultivation. Again, this would lower the costs of biofuel to the city.

4.2.2 Municipal Bike Sharing Program

> ***Recommendation***
>
> *Establish a municipal bike sharing program to encourage greater bike ridership for short distance travel.*

Overview

Bike sharing programs commonly feature a network of bikes available for short term rentals at bike docking stations across the city. Bike sharing in these programs is a process very similar to checking a book out at the library. Users begin by paying a membership fee that provides them access to the city's entire bicycle network. Users identify bike stations in their neighborhood and use a membership card or a credit card to unlock the bikes from the system. These bikes are then returned at a bike docking station near the final destination.

Bike sharing programs are used to promote rides that are 30 minutes or less in duration or 3 miles or less in length. Users who exceed this time period pay incremental fees in the same manner as returning an overdue book (DeMaio, 2010).

Program goal

The primary goal of a public bike sharing program is to encourage bike ridership as the primary means of travel for short distances in the city. The program is open to all residents of the city. Participation may be partially subsidized by federal tax credits that provide employers up to $20 per employee, per month, for costs associated with bicycle transportation (IRS Publication 15B - Employers Tax Guide to Fringe Benefits). This federal tax incentive is available to all employers, but the city could provide early support for the bike sharing program by being the first local employer to utilize it. Moreover, the financial services firm Accor Services USA, of Watertown, Massachusetts, can provide assistance in filing the necessary IRS paperwork to obtain these tax credits.

Implementation

Municipal Bike Program Models

There are a number of municipal bike sharing programs operating across the United States in areas as geographically diverse as Irvine, CA, Normal, IL, and Keane, NH. The most notable example, and the subject of this analysis, is Washington, DC. Washington is a good example for a case study because it has utilized the two main bike sharing program models used throughout the world: the SmartBike Model and the Public Bike System Company Model (commonly known as BIXI, and which began in Montreal). The primary differences between

the two are the size and scope of the bike network, and the source of the upfront capital needed to establish the system.

SmartBike DC

A partnership between Washington's Department of Transportation and Clear Channel Outdoor Inc, SmartBike DC was established in August 2008. The program consists of 120 bikes that are available at 10 unmanned bike stations spread throughout the urban core, as indicated in Figure 7 (SmartBike DC Fact Sheet, 2009).

Figure 7: SmartBike DC Rental Map
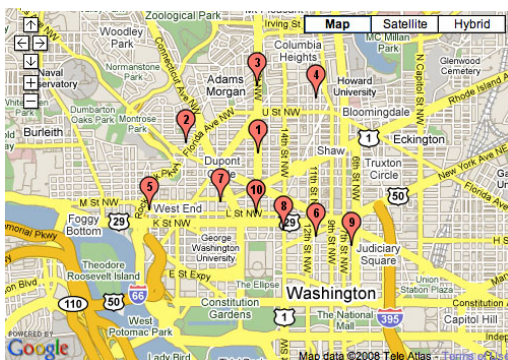
The SmartBike business model is founded on the complete outsourcing of all assets and daily operations to a for-profit company. The city assumes little financial risk and works with the contracting company to determine where these bike stations should be established. Washington receives all of the program's annual membership revenue, which is $40 per person. For assuming most of the program's financial liabilities and its daily operation, the contractor receives exclusive outdoor advertising rights to all of the city's bus shelters (Alpert, 2010)

BIXI

The SmartBike program has been a clear success and has reached maximum capacity. As a result, Washington announced plans to replace it with a much larger BIXI program in the fall of 2010. The BIXI Program, known as Capital Bikeshare in Washington, provides more bikes at more locations across the city than the SmartBike program. Although no maps of the provided services are available, the Washington Transportation Department announced that 1,100 bikes will be available at 100 bike stations across all of the city's eight wards. Capital Bikeshare will also include 14 stations in nearby Arlington County, VA, making it the first American bike sharing program to include urban and suburban bike coverage (District of Columia and Arlington Launch Regional Bike Sharing Program, 2010).

The BIXI program model requires the city to provide the capital funds to establish the entire bicycle network. Although the city will own all of the program's assets, daily operation is outsourced to a private contractor. Since membership fees play a more prominent role in the economic viability of the program, the city can adopt more flexible membership options: Individual annual memberships can be purchased for $80, monthly memberships at $30, and daily memberships at $5 (Goodman, Expanded Bike Sharing Program to Link D.C., Arlington, 2010)

While the city is responsible for bearing the capital, operation, and maintenance costs of this program, outside grants are available to reduce the financial burden. More information on the US Transportation Department's $600 million *Transportation Investment Generating Economic Recovery (TIGER)* II grant program can be found in Appendix 1. The Syracuse Common Council approved funding in early June for the first phase of construction in the city's

Connective Corridor. Among the projects that will move forward in the Corridor are plans to install a small bicycle repair shop to improve bike ridership in the corridor (Tanui, 2010).   The Connective Corridor's willingness to provide funds in bicycle improvement may lend itself to future funding opportunities to establish bike docking stations in the area.

Both the SmartBike and BIXI programs stress the importance of preventing theft and vandalism.   In Montreal, Michel Philibert, a spokesman for Stationnement de Montreal, which runs the BIXI system, states the while they occasionally received damaged bikes covered in graffiti or having broken brakes, "none has been damaged so much that it couldn't be repaired" (Rida, June 22, 2009). He also noted that BIXI bikes are designed to be unique and recognizable, incorporating parts that, if removed, cannot be used on other bikes.

The primary advantages and disadvantages of these programs are listed below in Table 8:

Table 8: Comparison of SmartBike and BIXI Programs

SmartBike

Pro	Con
Low upfront costs	Few bike docking stations
Early test of public support	Does not incorporate larger bike plans
Revenue to city with little financial risk	

BIXI

Pro	Con
Potentially large source of revenue	Large upfront costs
Large network spanning entire city	Dependant on large public support
May incorporate larger bike plans	

Financial Analysis

The financial analysis outlined below looks to provide the city with a baseline cost estimate on constructing and maintaining a municipal bike sharing program.   This analysis is based on two primary assumptions. First, the city has not obtained outside funding to establish the program and second, the program will be financed entirely by annual memberships.   Alta Bicycle Share, a bicycle consulting firm based in Portland, OR, provides financial consultation on municipal bike sharing programs, and may provide more region specific information.

Two primary costs have been identified in the municipal bike program: Initial bike station construction and bike purchases, which costs $35,000 per station, and annual maintenance costs of $155 per bike (Alpert, 2010).

To identify the number of memberships needed to breakeven, we will utilize the following equation: N membership costs – operation costs = discount rate (construction costs). Using this equation, we find that **364 annual** bike memberships must be purchased at a rate of $80 per membership.

Program Benefits

A municipal bike program will provide a number of environmental and social benefits to the city of Syracuse and its residents.   If municipal employees utilize the program, it will help reduce the city's carbon footprint. For example, if 75 employees used a bike sharing program to commute to work five days a week for six months a year, the city's carbon dioxide emissions would fall by 26-44 tons per year, depending on the size and type of cars being replaced and the length of a participant's commute (Bike Commute Calculator, 2010).

The program will produce other social benefits. By contributing to the fitness of the participants, the program may result in fewer health insurance claims.   It may also reduce premiums for employees in health insurance plans that provide incentives for healthier lifestyles. Traffic congestion may be also be reduced by taking cars off the road, particularly during rush hour.

Lastly, this municipal bike program may lay the groundwork for more bicycle and pedestrian friendly development policies across the city government. It would also facility multimodal transportations policies, by for example, proving a more convenient means for commuter to travel between bus terminals and their homes work places. It may also spur the city to begin phasing in implementation of the *2005 Syracuse Metropolitan Transportation Council's Bike and Pedestrian Plan,* particularly in its establishment of more bike lanes throughout the city.

4.2.3 Anti-idling program

Recommendation

Run a 1-year trial for the IdleRight Fuel Management System


Overview

Idling vehicles create significant and avoidable fuel costs for the City. Vehicles with emergency often run idle for extended periods of time. Marked police cars are good examples: these cars must idle with their emergency lights flashing as part of service calls (Syracuse Police Department, 2010). However, according to the Havis-Shields Corporation, every hour a marked police vehicle idles produces the same engine wear and fuel consumption as driving, 33 miles. According to the Syracuse Motor Equipment Maintenance Garage (Garage, 2010), a police vehicle has between 20 to 45 minutes to make a service call. If 24 hour), marked police car were

to average one of these service calls per day, it would need to idle at least 2 hours weekly. This annually costs the City $877 per vehicle (see Table 9).

The IdleRight Fuel Management System from the Havis-Shields Corporation is an idling reduction technology designed to address this problem. The system is small and consists of a two-pound universal control module and a one-pound vehicle specific interface kit. It activates once an emergency vehicle parks and turns on its emergency lights. The system shuts down the engine and uses the vehicle battery to power the lights. When the battery drains to a specified minimum level, the system turns the engine back on to recharge the battery. When the battery is full, the system shuts off the engine and repeats the cycle. Engine wear, fuel consumption, carbon dioxide emissions, and other air pollution due to idling are all reduced substantially. The system lasts the lifetime of the vehicle and can be one vehicle to another at any time if needed.

In 2008, Havis-Shields Corporation ran an experiment to assess the performance of the IdleRight Fuel Management System (Havis-Shields Equipment Corporation, 2009). The company idled a 2004 Ford Crown Victoria police vehicle without and with the IdleRight system in place for multiple 12-hour trials. The vehicle had its emergency lights flashing during the entire period for each trial. According to Havis-Shields, the amount of fuel consumed during idling with IdleRight was approximately 94% lower than burning fuel without IdleRight (See Figure 9).

Figure 9: 2008 Trial of IdleRight equipment
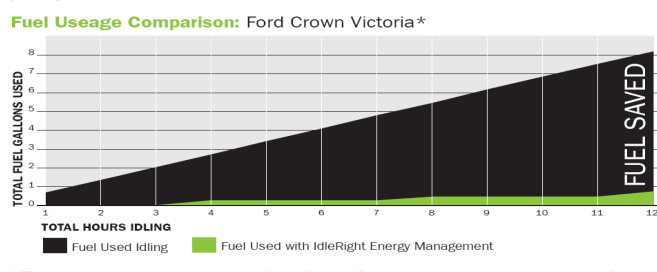
Source: Havis-Shields Equipment Corporation, 2009

Implementation

The City of Syracuse Police Department should install the IdleRight Fuel Management System to one of its 2009 Ford Crown Victorias for a full year. The 2009 Ford Crown Victoria in the City Fleet is a perfect vehicle for a trial because it requires the same IdleRight kit that the 2004 Ford Crown Victoria used in the Havis-Shields experiment (Havis-Shields Equipment Corporation, 2009). This allows a clear comparison to be made between the lab results obtained by Havis-Shields and real-world performance of the system in the field. Moreover, provided the system performs satisfactorily, the long working life of the system means the initial investment will produce long-term as well as short-term savings. Costs of the program include the purchase price of the equipment and labor time to install it in the vehicle, and a small amount of training for vehicle operators. The equipment itself costs less than $520(including shipping) and it could save more than $820 per year in fuel costs. This equipment will save the vehicle approximately

$300 per year. The payback period is likely to be 1-2 years depending on the system's real world performance.

The Havis-Shields Corporation estimates that 31 miles per hour of idling is saved with the IdleRight Fuel Management System in place, a 94% reduction (see Table 9).

Table 9: Costs and benefits of IdleRight program

Miles Idled Per Week	66
Annual Miles Idled	3,432
Per Vehicle MPG	8.5
Annual Idling Gallons	404
Per Gallon Fuel Cost	$2.17
Annual Idling Costs	$877
Annual Idling Miles Saved	3,226
Annual Idling Gallons Saved	380
Idling Savings	$825
Cost of Equipment	$525
Net Benefit	$300

4.3 Land Use

Land use policy is important to Syracuse because it involves the development of its natural resources into human built projects. Such land use changes occur in the municipality when a parcel of land's zoning is changed, and with these changes come a set of ordinances which determine usage rights for the parcel. In the US, land-use changes have historically led to environmental problems such as deforestation, urban sprawl, and an increase in greenhouse gases. These changes have caused many harmful effects to cities similar to Syracuse, including impacts on the soil, water, and animal habitat quality. Land-use impacts many different sustainability topics within public and private sectors such as architecture, sustainability departments, GIS, public works, water departments, transportation, demographics, population trends etc. Attempts to develop solar infrastructure have also been affected by land-use policies and ordinances. In order to build solar projects on buildings for example, obtaining building and electrical permits is required.

Current Progress

The City of Syracuse researched and recommended long-term land-use planning in its 2025 land-use plan which was initiated 2005. The plan identified changes in demographics related to housing, water, sewer and road infrastructure that resulted in the need for land use changes. The plan also mapped 20 classifications for planning, and gave an assessment of the City landscape and design guidelines. When the Onondaga Citizens League and other community groups reviewed the plan, there were a number of unresolved questions found regarding the classification process and zoning changes.

Another plan is the Onondaga County 2010 Development Guide which "provides general goals and policies that guide municipal and County officials who are making land use and economic development decisions that ultimately affect the community at large" (http://www.ongov.net/planning/plan_2010.html). There have been a number of narrower land use studies conducted by SUNY ESF, Cornell Cooperative Extension and other organizations, mainly regarding Syracuse urban forestry and tree inventories. Syracuse has also initiated programs in cooperation with Onondaga County regarding land surrounding Onondaga Creek on the Southwest side and focused on developing ways to use green infrastructure to control stormwater.

Policy Proposals

This report addresses three specific policy recommendations related to land-use:

1) To increase Syracuse's urban tree canopy cover by five percent, mainly obtained by implementing the Urban Forestry Master Plan.
2) To establish solar energy zoning ordinances in the City Charter to encourage residential and commercial renewable energy production.
3) To increase the use of permeable pavement and collect data on its performance relative to other types of green infrastructure.

4.3.1 Increase Tree Canopy

Recommendation

Increase tree canopy by at least 5% by implementing the Urban Forestry Master Plan

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Overview

A 2008 Brookings Institution report entitled **"**Shrinking the Carbon Footprint of Metropolitan America**"** found that Syracuse's carbon footprint ranked worse than nearly two-thirds of the nation's 100 largest cities. Syracuse's carbon output of 2.68 tons per capita exceeds the national average of 2.6 tons, and is much larger than similar upstate NY cities, as well as the City of Los Angeles. Reasons for this include the limited use of public transportation, high levels of auto-transit on I-81 which bisects Syracuse, and high residential and commercial energy use. In addition to having a high carbon output per capita, Syracuse also suffers from stormwater management problems, which can also be partially addressed with urban forestry.

One issue that is apparent in Syracuse is the combined sewer overflow (CSO) problem. Combined sewer systems convey residential, commercial, and industrial waste and stormwater runoff to treatment plants. During periods of especially high precipitation they can exceed the capacity of their treatment plants, which results in discharges of untreated sewage into lakes and streams. New combined sewer construction was banned in 1972 with the passage of the Clean Water Act, but combined systems still comprise about 50 percent of Syracuse's sewer lines and pose a liability threat under the Clean Water Act's Water Quality Standards (Baptiste and Lane 2004). Onondaga County and the City of Syracuse share responsibility for reducing the frequency of CSO events, and the County was forced to develop a plan to mitigate overflow after a 1988 lawsuit by the NYS DEC and the Atlantic States Legal Foundation (ASLF). The plan eventually called for five treatment facilities, the largest of which was the Midland Avenue Regional Treatment Facility. These proposed facilities caused great concerns in the City including social issues such as allegations of environmental racism stemming from the site selection process and evictions in low income neighborhoods; pressures on the County to buy City land; and economic and environmental concerns.

These concerns led to the consideration of new "green infrastructure" alternatives that could make the Midland facility unnecessary, such as increasing the tree canopy and using green roofs, rain gardens, and porous pavement. The City also began to develop projects like a "creek walk" along Onondaga Creek that incorporated the use of trees for the benefits they provide.

Benefits of Trees (From Greening New York's Cities 2004):

- Sequester CO2 and reduce GHGs
- Reduce stormwater and its management cost and prevent need for many treatment plants
- Lower summer cooling and winter heating costs
- Reduce air pollution
- Improve water and soil quality, and decrease pollution remediation costs for water and soil.

- Prevent erosion
- Decrease violence
- Increase property value (and tax revenue)
- Block wind and noise
- Provide aesthetic enjoyment and relaxation
- Decrease the effect of urban heat islands
- Turn brownfields into recreational sites
- Create wildlife habitat

The tree cover in Syracuse has decreased from 39,030 trees in 1979 to 34,165 trees in 2000 (USDA Syracuse UFMP 2001). This decrease can be attributed to factors such as disease, property development, unusually strong storms, and relatively few new plantings. In 2004, the total tree canopy coverage was 26.7%, or 4,374 acres out of 16,438 total acres in the City (Greening NY's Cities 2004). That amount of tree cover removes 289,226 pounds of air pollutants per year (CO, Ozone, NO2, SO2, particulates combined) (Greening NY's Cities 2004). The value of this natural service is $733,810 per year, the avoided cost of removing that amount of pollution with other techniques (Greening NY's Cities 2004). That amount of tree cover also reduces stormwater run-off by over 24 million cubic feet. The value of the storm water mitigation provided naturally by the tree cover is $49 million, the avoided annual cost associated with building and maintaining conventional stormwater facilities (Greening NY's Cities 2004). Increasing the tree cover by 5 percentage points would provide Syracuse with $54,360 more of air quality benefits per year, and a total annual economic value of $575,674 per year (Greening NY's Cities 2004). Existing tree cover is valued at $3 Million for carbon storage (163,000 tons) and $71,500 a year for carbon uptake from using a value of $20.30/metric ton as the social cost of CO2 emissions (USDA Urban Forestry Master Plan 2001).

Trees can also reduce heating and cooling costs. There is greater potential to reduce heating costs in northern states that experience colder weather. One 25 ft tall tree adjacent to a 2-3 story building can reduce heating costs by 5% (by providing reductions in wind) and cooling costs by 3% (due to increased shade) on average annually in northern cities with similar weather conditions to Syracuse (McPherson 1993). For both effects, the best location for trees is the west side of buildings. Improperly located (east facing) trees, cut cooling savings in half for this type of building, and dramatically raise heating costs.

The economic, environmental, and aesthetic benefits increase with each year of growth as the tree diameter increases. Compared to small trees, fully grown trees store 1000 times more carbon, remove 70 times more carbon from the atmosphere, remove 50 times more air pollution and are much more heavily prized by land owners. In contrast, the capacity of a conventional wastewater treatment plant is relatively fixed when it is built. Moreover, conventional facilities have a limited life span, are expensive, decrease nearby property values, and do not harness the stormwater for replenishing the natural water table.

The number of trees required to increase the tree cover by five percentage points is around 207,000, with an estimated 20,700 trees needed on City property. One can also make the observation that the vast majority (>90%) of trees are not owned by the City, but they do provide the City with a valuable service. It is possible to identify locations in need of planting, estimate the cost of planting trees, and find ways to encourage non-municipal land owners to plant trees.

Figure 10 below depicts the percent tree cover in each of the eight Tomorrow's Neighborhoods Today (TNT) sections which were created as neighborhood planning. "TNT is a neighborhood planning effort that brings together neighborhood stakeholder groups to improve the quality of life in Syracuse (USDA Urban Forestry Master Plan 2001)." Figure 9 shows areas where there are many opportunities of high priority (as identified by TNT) which are depicted in red on the map. High priority areas are mostly along water courses and areas of steep slope. There are also about 34,165 street trees (trees located in the strips of land between properties and the street), 70 percent of which are located in residential areas. Street tree density is lowest in TNT Areas 2 (Westside), 3 (Southside), and 8 (Lakefront). Areas 2 and 3 suffered significant tree loss and damage from the Labor Day Storm of 1998.

Figure 10: Percent tree cover in Syracuse by TNT area
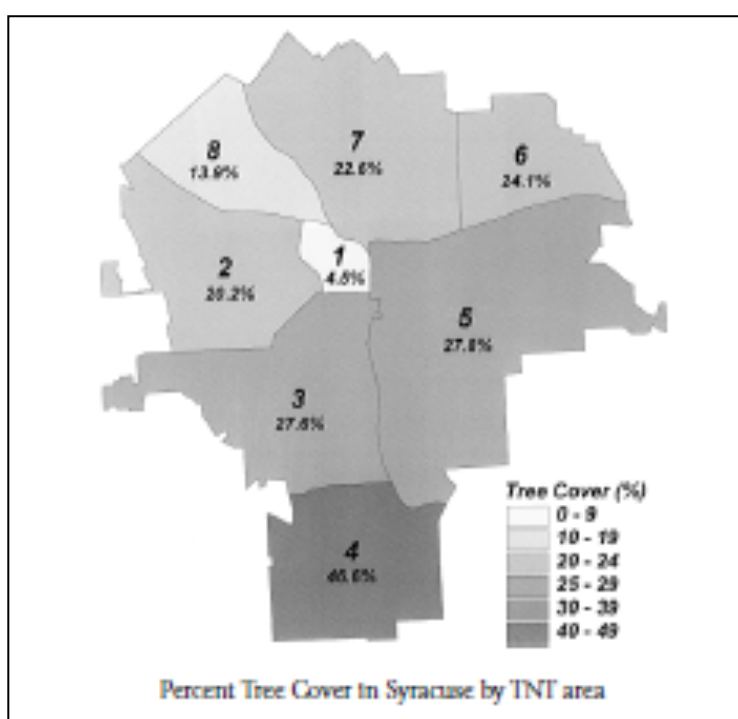
Source: (Urban Forestry Master Plan 2001)

Figure 11: Land use opportunities in Syracuse
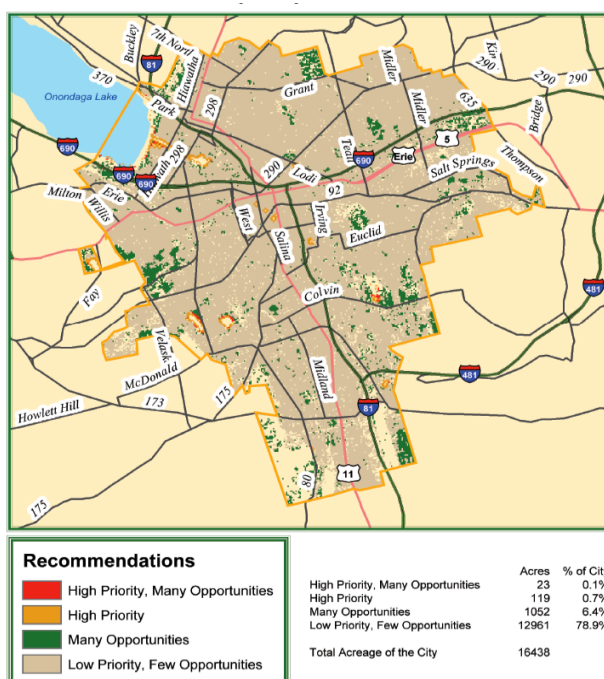
Source: (Greening New York's Cities 2004)

A survey conducted by James Palmer from SUNY ESF showed that residents in all TNT areas favored more tree plantings (Urban Forestry Master Plan 2001). Less than two percent of residents (on average in all TNT areas) believed there were too many street trees. "Respondents were asked to read a list of tree characteristics and effects and rate the importance of these properties (Urban Forestry Master Plan 2001, pg 17)." The survey also reflected some of the most important perceived benefits and barriers to residential tree planting in the minds of community members. For benefits, providing cleaner air and providing cool shade in the summer were the top two desirable characteristics of trees. The least desirable characteristics reported by respondents were related to the potential of trees to do damage (cracking sidewalks, trees falling over, trees damaging wires leading into houses etc.). Cost, maintenance, liability issues, and social desirability are additional concerns.

Implementation

Preserving the urban forest is goal 13 in Syracuse's Comprehensive 2025 Plan. This can be done by implementing the Urban Forest Master Plan and making sure it is updated every five years. Increasing tree canopy also indirectly addresses some of the other goals in the plan including providing recreational activities, beautification and tourism, enhancing aesthetics of neighborhoods, and protecting air and water resources.

The Urban Forestry Master Plan provides two specific recommendations for increasing tree canopy: (1) To increase street-tree stocking to a minimum of 60% in residential areas of each TNT area; and (2) to facilitate tree planting on private properties to help the City attain an overall tree cover of 30 percent or more. The first of these would require 195 new street trees to

be planted by the City per year for 15 years. The City should develop an Urban Forest Action Plan to meet these goals that include five components as described in the American Forest Greening New York's Cities report of 2004. These components are: (1) to designate trees as a public utility during the budget process; (2) to establish a tree canopy goal that is considered in every growth, development, and maintenance project; (3) to create a formal process for tracking tree cover and utilizing Geographic Information Systems (4) to adopt public policies, regulations, and incentives to increase and protect green infrastructure; and (5) to develop public participation and education programs with citizen groups.

According to the Urban Tree Master Plan, the most prevalent types of trees in Syracuse are maples. The Plan also identifies the best recommendations for trees to be planted based on a variety of conditions (small and large street side width, presence of overhead wires, park and lawn space, heavy street use). The best species identified for most or all conditions are hawthorn (all), hedge maple (all), and honeylocust (most but with no overhead wires or <5 foot strip width) because they are resilient to salt spray, and are quick growing. Oak trees are recommended for areas with larger space. It is important to increase the diversity of trees species in Syracuse because residents find this an important issue, being mainly concerned with the threat of disease.

The cost of a single tree can range from $10-$40, and with added labor costs, the planting of one tree can range from $130-$300. Sample costs from Chicago IL, are listed in the table below:
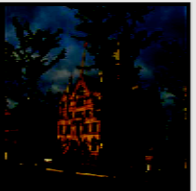
Table 10: Costs of trees in Chicago

Cost category [a]	Tree location				
	Park	Yard	Street	Highway	Housing
Planting					
Cost per tree (dollars)	470	250	162	250	150
Pruning					
Cost per tree (dollars)	160	196	97	150	160
Frequency (# in 30 yrs)	4	1	5	3	4
Tree removal					
Cost per tree (dollars)	900	504	658	312	900
Frequency (% removed)	80	100	100	60	80
Stump removal					
Cost per tree (dollars)	110	140	108	91	110
Frequency (% removed)	80	50	100	100	80
Waste disposal					
Cost (dollars per ton)	40	na	na	na	na
Infrastructure repair (dollars per tree per year)					
Walk, curb, gutter cost	0.62	0.62	2.49	0.25	0.62
Sewer and water cost	0.38	1.15	0.76	0.12	0.76
Litigation and liability					
Cost (dollars per tree per year)	0.01	0.50	1	0.75	0.07
Inspection					
Cost (dollars per tree per year)	0.19	0	0.35	0	0.19
Program administration					
Cost (dollars per tree per year)	0.94	0	0	2.63	32.78

Source: Chicago Urban Forest Ecosystem McPherson 1993.

There are additional maintenance costs which are harder to assess, such as temporary fencing, watering, fertilizer application, and the removal of debris. However, the net present value of each tree, estimating all present value cost and benefit categories (maintenance, program etc.), is nearly double the original investment over 30 years, and it takes 9-17 years to break even (McPherson Gregory et al. USDA 1993).

Lack of understanding costs and benefits by stakeholders that influence tree programs is one reason why there is limited tree planting in Syracuse. Ways to reduce costs would be to purchase trees in bulk and to use bare root trees. The City should also increase cooperation with volunteer groups and non-profits, which can decrease labor costs by more than half and also increase citizen involvement, a key part of any urban forestry plan. Increasing citizen involvement spreads awareness, decreases perceived risks, and increases cooperation of citizens with city officials. Cooperation with entities like the Syracuse Parks Conservancy, ASLF, TNT, Re-Leaf Syracuse, and the Partnership for Onondaga Creek can decrease costs and other concerns, and increase the amount of trees planted. For example, the youth-oriented Onondaga Earth Corps, created on the Southside in 2004, partnering with the adult volunteers of the CommuniTree Steward Program, planted hundreds of trees in Syracuse's neighborhoods last year. The Steward Program' 2006 informational brochure is shown in Figure 12:

Figure 12: CommuniTree steward program brochure

Source: Cornell University, n.d.

Onondaga Earth Corps includes the following description of its purpose on its website:

A youth development and employment program for young people on the South and Near West Sides of Syracuse. As youth work on community and environmental service projects, they learn valuable job and life skills, community based problem solving skills, civic engagement, an environmental ethic and technical skills in urban forestry and other urban green infrastructure. Onondaga Earth Corps members restore urban forests and beautify their own neighborhoods. The work of OEC is hard and technical but it is also rewarding. Corps members make a difference! OEC members will work as a team under the leadership of a crew supervisor and perform a variety of environmental service projects in their community including planting and caring for street trees, providing quality lawn care and beautifying vacant lots. Corps members attend a three-day overnight orientation and receive training on leadership, environmental education, technical and life skills. Projects are almost exclusively outdoors and involve strenuous physical labor in all weather conditions. Corps members will also be required to identify and complete a volunteer project. The Corps will go on field trips to state parks, forests, and other natural habitats throughout Central New York to increase their knowledge about and interest in the natural environment and environmental careers. Your crew will participate in setting goals for how much work you will accomplish during the summer. You are expected to work hard and to give feedback to make the program better.

(Onondaga Earth Corps, n.d.)

During the winter of 2008/2009 Onondaga Earth Corps began a series of workshops designed to develop and prepare a new crew of youth on the Near Westside in the spring of 2009. The workshops provided necessary information to train new staff and youth with job readiness skills, watershed management skills, urban forestry skills, safety awareness and financial literacy (www.giffordfd.org/Initiatives/OnondagaEarthCorps/tabid/1814/Default.aspx).

Mostly stemming from better leveraging volunteer labor from entities like OEC, the City of Buffalo was able to plant almost fifty times the amount of trees that Syracuse planted (2,100 versus 40) in 2008 (Anderson 2009) with the aid of volunteers from Re-Tree WNY. Syracuse currently does have a forestry department website, which includes tree specifications, and City ordinances. Citizens must obtain a permit, and adhere to set standards to legally plant trees on their property. Unlike Buffalo however, there is inadequate planting information and no public tree database. Creating an online database exportable to PDAs and cell phones would be of use in the field for citizens, trained volunteers, government officials, companies, and community groups. Syracuse has a limited database that is currently not available to the public, so it should model future efforts after cities that do have a publicly accessible database, such as New York City. NYC also has undertaken its MillionTreesNYC program which is a public-private program with the goal to plant and care for one million new trees across the City's five boroughs over the ten years. More information is available at: http://www.milliontreesnyc.org. There are also other cities in New York that have useful programs.

The city of Binghamton, NY had a program in 2009 that provided $35 coupons to encourage private citizens to plant trees. This program was put on hiatus, partly resulting from the lack of participation noted by officials in Binghamton. Coupon programs in general are largely ineffective because the cost of planting is much higher than the amount of the coupon.

Coupon programs are often underutilized by the public because of lack of awareness. Coupons programs also must find funding sources, and so far they have been relatively ineffective at increasing the tree cover. Often outreach programs are less costly and more effective. Another problem noted by this capstone team concerning Binghamton was that a significant portion of residents are renters, and landlords may be unwilling to bear the costs of additional trees. Binghamton also has a program similar to Syracuse's which lets citizens request trees be planted for no charge in the utility strips bordering their property, but Syracuse's program is not as well advertised to the public as Binghamton's and both cities must first determine the feasibility of tree placement in the requested area.

A sample application for the coupon program from Binghamton's website is included in Appendix F.

Funding

In addition to increasing public awareness with brochures, direct participation in tree inventories (accurate inventories essential to planning) and Arbor Day activities, Syracuse could create funding opportunities using public-private partnerships and grants. Global ReLeaf, The US Forest Service, NYS DEC, and HUD are all important sources of urban forestry grants in other cities. In addition, National Grid's "10,000 Trees and Growing" Program reimburses municipalities $30 per tree for trees planted under the company's utility lines. The program includes a partnership with Cornell Cooperative Extension to provide education and technical assistance, and to encourage municipalities to develop better management practices (Greening NY's Cities 2004). Buffalo and Re-Tree WNY have received more than $100,000 from National Grid since 2006. Other case studies with successful urban forestry initiatives, as indentified in Greening New York's cities, include the cities of Salem (Oregon), Charlotte (North Carolina), and San Antonio (Texas).

A final recommendation regarding urban forestry is to ensure that the City's sustainability plan acknowledges that it can be a productive activity that supports jobs and businesses, not just a passive means of reducing pollution. For example, urban forestry could create tree nurseries and urban gardens. ASLF is experimenting with transforming vacant land sites on the Westside to do just this. Food can be produced locally, teaching valuable skills at the same time. Biomaterials can be harvested to support and grow local industries, create green jobs, and manufacture construction materials (linoleum, for example) that save money and are better for the environment. Biofuel can also be created as a productive resource from the certain types of local plants such as willow, which SUNY ESF is already working on.

In any sustainability plan, a systems approach must be applied, and it is less useful just to narrow the focus single areas for improvement. Instead, one must identify issues concerning the socio-ecological metabolism of the city being studied. For example, Urban Forestry is often studied as a way of reducing the outflow of pollutants into the surrounding environment, but not enough emphasis is placed on studying how a city could reduce the demand for resources and energy which causes this pollution in the first place. Often social barriers that discourage green infrastructure are more common in cities as well. SUNY ESF has recently obtained funding though a National Science foundation grant called ULTRA-EX (Urban Long-term Research

Area exploratory award), which will enable ESF to study these overarching goals in cooperation with the City to determine implementation strategies.

4.3.2 Solar ordinances

4.3.2 (a) Over-the-counter permitting system

Recommendation

Encourage solar energy installation through an over-the-counter permitting system

Overview

The City of Syracuse does not have any formal permitting or zoning guidelines for installing solar energy equipment anywhere in the City Charter. Many American cities have sought to establish such guidelines, but have had a difficult time identifying where to begin this process. This recommendation will focus on two implementation areas to consider in establishing solar energy guidelines, and will incorporate information from other cities to illustrate potential policy options. Two areas of implementation include the establishment of an "over-the-counter" permitting system for solar energy installation and the establishment of clear solar access rights in the City Charter.

Implementation

Establish an over-the-counter permitting system

In order to install grid-connected solar photovoltaic (PV) systems on private property, the owner typically must obtain building and electrical permits from the city. Building permits are used to ensure that a roof can support the weight of a PV system and "that the PV system's rack and roof attachments are water tight and meet wind-load requirements" (Pitt, 2008, p. 18). Additionally, an electrical permit is required to ensure that the system does not pose any undue fire, electrocution, or power surge hazards (US Department of Energy, 2009, p. 44). Both permits are used to ensure the safety of these systems but obtaining them is often a long and cumbersome process which may discourage prospective users from applying. To establish a permitting system that is quicker and easier to use, there are several issues the city may consider.

Minimize the necessity of building permits under certain conditions

In many cases, modern building codes are able to support the minimum building permit guidelines used to install solar energy systems. For example, the city of Santa Cruz, CA does not require building permits for solar energy systems that do not extend beyond 12 inches from the roof or are visible from a public thoroughfare (Pitt, 2008, p. 17). San Jose, CA has taken this a step further by stating that residential solar PV systems are not needed ***unless*** they meet one of the following criteria:

- Total panel weight is greater than 5 pounds/square foot
- Maximum concentrated load at each point of support exceeds 40 pounds

- Maximum weight above the roof surface exceeds 18 inches   (Pitt, 2008, p. 58)

Establish fair and consistent fee structures for solar energy permits

Permitting fees are often only a small part of solar energy installation costs, but are the first costs and can play a disproportional role in decisions by building owners. Establishing fair and consistent fee structures is a straightforward method of encouraging solar energy production. There are two general approaches to setting fees:

1. Establish flat permitting fees that do not incorporate the size of the PV system.

Proponents of a flat fee suggest that this system will not implicitly discourage the production of larger solar energy systems. However, to avoid discouraging small installations, the fee must be set at a low level which means they are often greatly subsidized and may result in a financial loss to the city. For example, Portland, OR has established fees under $100 for the entire solar energy permitting process (US Department of Energy, 2009, p. 45).

2. Establish size-specific permitting fees.

Proponents of size-specific permitting fees contend that having fair and straightforward permitting costs are enough to encourage solar energy production. These fees generally reflect the true costs of permitting, or a slight profit to the city. For example, a 2006 report from Pace University Law School outlined fee guidelines that correspond to the size of the PV system, which include the following:

- $75-$200 for small PV systems up to 4 KW
- $150-$400 for large PV systems up to 10 KW
- $15-$40 per KW above 10 KW (US Department of Energy, 2009, p. 44)

Provide training to educate building and electrical inspectors about solar technology and installations

Solar electricity technology has improved rapidly over the last decade and an enhanced permitting process will make it is necessary to have properly trained municipal inspectors. The city may opt to have formal training or certification sessions, or consider utilizing training materials freely available on the web.

Attending a formal training session does not require city officials to leave New York State. In October 2009, the US Energy Department established a program providing support for solar energy training, certification of solar installers, and distribution of best practices for training programs. Hudson Valley Community College of Troy, NY was given funds to establish a solar PV training facility that will support instructor solar energy training in the region (Solar Instructors Training Network, 2010).

There are also a number of resources available on the Internet that provides guidelines and best practices in solar energy permitting.   The most notable resource is Pace University Law School's *Inspector Guidelines for PV Systems* (2006), which was funded by the US Energy Department. This report provides a framework for permitting and inspection of PV systems and

helps city officials better evaluate and inspect PV systems. The Florida Solar Energy Center's Procedures for Photovoltaic System Design Review and Approval (2010) is a more updated but less concise report on the topic.

4.3.2 (b) Solar access rights in the city charter

> ### Recommendation
>
> *Protect solar access rights through new solar access ordinance*

Overview

Another method of encouraging solar energy production is to establish formal rights for property owners to have access to sunlight.   To establish such rights, the city would need to require that new building construction and major renovations take into account how the shadows cast by the buildings affect the sunlight available to nearby and adjoining properties.

The most common form of establishing solar access rights are through solar setback ordinance. This ordinance seeks to maximize solar access during the winter solar heating hours to existing or potential buildings by requiring buildings to be constructed as far south on their \lots as possible. The goal is to assure that no structure casts a shadow across the northern property line greater than would be cast by a 6 foot tall fenced located at the northern property line (City of Bend, OR, 2006, pp. 6-7). This six foot figure has been commonly used in solar setback ordinances in cities such as Ashland, OR and Boulder, CO. Specific setbacks lengths are based on the shadow that will be produced by a building at 12 PM on the Winter Solstice, when the sun is at its lowest angle.

Implementation

Ashland, OR was one of the first American cities to establish a comprehensive solar setback ordinance, and it provides a template for how Syracuse could establish such a policy. A solar setback length for residential property is calculated using the following formula:

$SSB = (H-6 \text{ feet})/ (A + S)$, Where H is the height of the highest shade-producing point which casts the longest shadow beyond the northern property line; A is the angle of the sun at noon on the Winter Solstice; and S is the slope of the property lot (City of Ashland, OR, p. 5). This formula can be completed using the following steps

Step One: Identify the Northern Lot Line

The northern lot line is the northernmost point of a property that adjoins to an unbuildable area, such as a street or parking lot. This line may be measured by measuring the angle of a line drawn from east to west at the property's northernmost point, which can be found in Figure 11 (City of Ashland, OR, p. 3).

Step Two: Calculate the Average Lot Slope

The slope of the lot is measured at the end points of a line drawn parallel to the north lot line through the midpoint of the north/south lot line, which can be found in Figure 12 (City of Ashland, OR, p. 4).

Step Three: Determine the Shade Producing Point

This step determines where the height of the highest shade producing point is located. For example, a roof with a pitch of 5 ½ in 12 has a shade producing angle of 25 degrees. If the pitch is greater than 25, the shade producing point will be the roof, while if it is below 25 degrees it will be on the northern wall (City of Ashland, OR, p. 5).

Syracuse has a unique opportunity to encourage residential and commercial solar energy installation through the recommendations outlined above. An over-the-counter permitting system with clearly defined fees may remove many of the disincentives individuals face when considering solar energy installation. Properly trained city inspectors and planners will ensure that the permitting and installation process is seamless. Lastly, having clearly defined solar access rights in the City Charter will help build public support for solar energy installations.

4.3.3 Permeable pavement

> *Recommendation*
>
> *Increase the use of permeable pavement, research connection to other green infrastructure*

Overview

Nearly 50 percent of the City of Syracuse's land cover is comprised of impervious surfaces (Greening NY's Cities). Impermeable pavement does not allow water to pass through and enter the soil, and such pavement increases runoff and contributes to combined sewer overflows. Asphalt is the most commonly used pavement material due to its wide-spread use, familiarity, and low cost of about $1 per square foot. In areas with a large amount of asphalt and concrete such as roadways, or parking lots, specialized and costly drainage systems (pipes, retention ponds) must be constructed to convey the water to the sewage system. Large areas of asphalt and concrete also increase the urban heat effect. Finally, asphalt and concrete can collect pollutants which are discharged into surface waters and the surrounding soil during rain storms. The figure below demonstrates the sheer amount of impermeable surfaces in the Southwest side of Syracuse.

Figure 13: Permeable vs. impermeable surfaces on the Westside, Syracuse
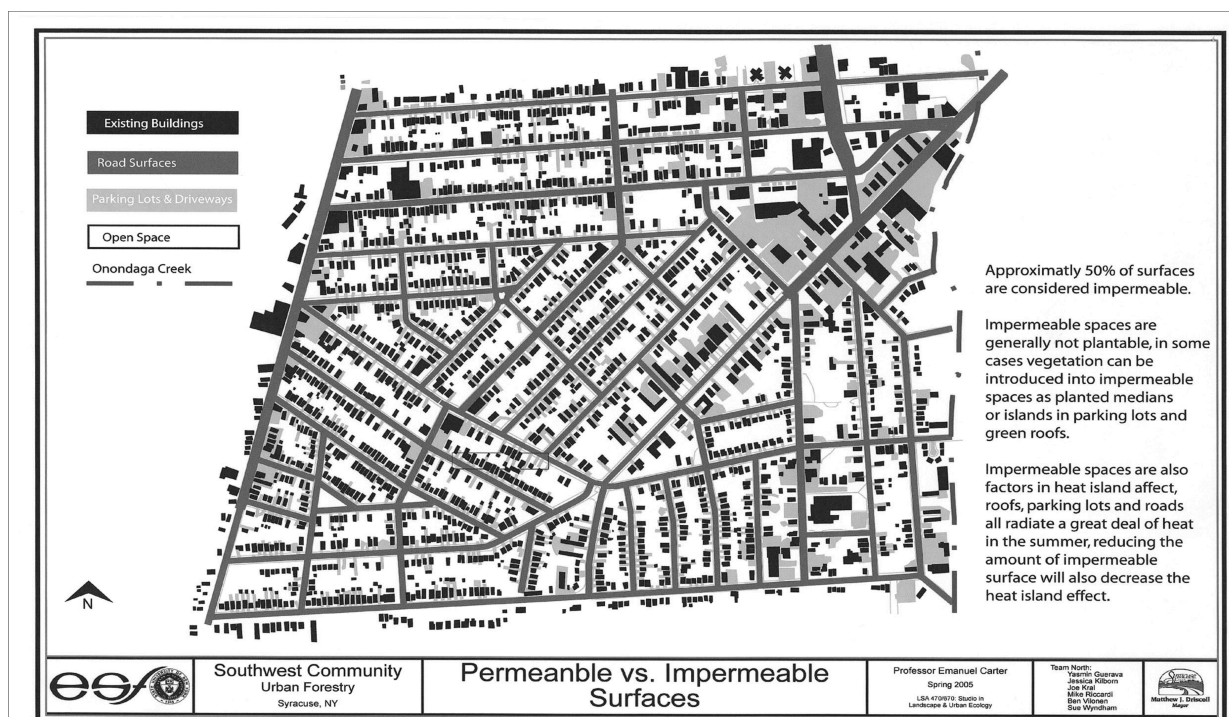
Source: Emanuel Carter Urban Ecology ESF Presentation, 2008

Implementation

The problems created by impermeable surfaces could be alleviated by greater use of permeable pavement in construction of city projects, especially in combination with urban forestry and other types of green infrastructure for the best effect. According to the Charles River Watershed Association permeable pavement can:

- Improve water quality and reduce pollution (see Table 11).
- Reduce the need for more costly stormwater facilities, and the workload on existing facilities
- Reduce erosion
- Reduce the need for salt use resulting from increased air circulation
- Reduce runoff volume and temperature

Source: Charles River Watershed Association, n.d.

Table 11: Pollutants removed by permeable pavement

Pollutant	Pollutant Removal (%)
TSS	95
Total Petroleum Hydrocarbons (TPH)	65
Nitrogen	82
NOx	NA
Metals	98 - 99
Bacteria	NA

Experimental Site: USDA NE Watershed Research Center, University Park, PA

Source: Permeable Pavment Factsheet stormwater.net, 2009

Permeable pavement has limitations, however. Some site limitations include:

- The underlying soil must meet certain permeability specification (inches water/hour).
- The site must have little or no slope
- Permeable pavement can only be used in low-traffic, low-speed limit areas
- Porous pavement should be located at least 2 to 5 feet above the seasonally high groundwater table, and at least 100 feet away from drinking water wells

Permeable pavement's use has not been widespread in Syracuse and there is little available data on its performance over long periods of time. Syracuse engineers have been recommending the use of permeable pavement over rain gardens recently, but its use was originally hampered by a Common Council ordinance mandating sidewalks be constructed with gray impermeable pavement (Anderson 2009). Permeable pavement has been slated for use in the Onondaga Creek Walk project, as well as for a number of driveway installations in homes that are being rehabilitated in poorer neighborhoods.

Drawbacks

Installation cost: $6-15 square foot versus $1.00 per square foot with asphalt.

Maintenance: Permeable pavement can clog with material such as road salt, and de-clogging requires using specialized vacuuming machines.

Weather Damage: Several types of permeable surfaces suffer from freeze-thaw cracking, and road salt related damage. Using pavement with high recycled rubber content can increase expansion properties and decrease damage.

Table 12: Maintence schedule for permeable pavement

Activity	Schedule
• Avoid sealing or repaving with impervious materials.	N/A
• Ensure that paving area is clean of debris. • Ensure that paving dewaters between storms. • Ensure that the area is clean of sediments.	As needed
• Mow upland and adjacent areas, and seed bare areas. • Vacuum/sweep to keep the surface free of sediment.	As needed
• Inspect the surface for deterioration or spalling.	Annually

Source: Watershed Management Institute, 1997

Below are a figure and a table listing possible green infrastructure recommendations for a residential block in the southwest side of Syracuse. It includes permeable paving and compares costs and water capturing capabilities of different types of green infrastructure. The report from the figures are obtained also contains infrastructure recommendations for other sites around Syracuse including a public housing development, and Skiddy Park.

Figure 14: Comparison of green infrastructure on the Westside, Syracuse

Fig. 27: Residential Study Area

were found to be crowned and their center lines created well defined drainage breaks. The runoff quantity for the area was calculated using equations provided in the New York State Stormwater Design Manual based on percent impervious, which was calculated from measurements taken off scaled base maps constructed during the original analysis of the entire study neighborhood.

The amount of water which trees retain during storm events is still under investigation by academics, and for this project was estimated using a calculator tool on the US EPA green infrastructure web site and checked against

RESIDENTIAL BLOCK

area: 167,900 ft²

percent impervious: 51%

1 year design storm: 16,023 ft³

green infrastructure	amount	ft³ water stored	cumulative ft³
trees	82	3,116	3,116
rain barrels	44	323	3,439
infiltration trenches (6",1',1')	1,019 lf	6,970	10,409
vacant land (1.5')	5,185 ft²	7,778	18,187
permeable sidewalks (1')	1,415 lf	7,075	25,262
private rain gardens (6", 1', 1')	2,761 ft²	4,832	30,094

Table 1: Various Green Infrastructure Possibilities and Their Storage Capacities

green infrastructure	cost ($)	ft³ water stored	ft³/$
trees	200/tree	38/30' dia.	.19
rain barrels	50/barrel	7.3	.15
cisterns	7.5/gal	1	.13
permeable paving (1')	6/ft²	.80	.13
rain gardens (6", 1', 1')	11/ft²	1.15	.11
vacant land exavation	2/ft²	1.5	.75
green roofs	14/ft²	.13	.01
clinton rtf	75 mil.	466,666	.006

Source: The Implementation of Sustainable Stormwater Management in a Syracuse, 2009

Additional efforts need to be made in creating incentives and providing education for permeable pavement in Syracuse. Permeable pavement is a technology that can also be replaced by, or used in addition to, other types of green infrastructure such as rain gardens. Identifying site locations and vacant land plots would help to identify whether rain gardens could be used in the same locations as permeably-paved areas. When considering the type of pavement to use, it would probably be best to find pavement that is already in successfully in use in other climates similar to Syracuse. Flexi-pave is one type of pavement identified for site use in Syracuse by Anderson 2009, because it is suitable for cold climates. The above table also demonstrates that permeable pavement and rain gardens are among the cheapest approaches for reducing runoff.

Permeable pavement is just one type of technology that can be further implemented into a larger sustainability plan that utilizes green infrastructure. The City should further study permeable pavement use in all new municipal building construction, large private construction projects, and sidewalk construction by examining the current ordinances and building codes that discourage its use. There still must be further cost-benefit analysis studies conducted by contractors and government officials on permeable pavement's comparison with other technologies. The best type of permeable pavement to use would be Flexi-pave, which has already been incorporated in projects throughout the City including the 1300 square-foot driveway of a site (The Walrath house) that was redeveloped as a rain garden. Flexi-pave is one of the best pavements for Syracuse's climate, and its cost is comparable to other types of permeable pavement that do not hold up as well in the winter months.

5. Conclusion

Creating an environmentally sustainable city is an issue pertinent to the city of Syracuse. This report provides a blueprint to develop a comprehensive sustainability plan that builds upon city accomplishments. Procedural steps are outlined that will help the city identify the true scope of the problem and guide it into areas where significant progress may be achieved.

Nine policy recommendations are outlined in detail, which identify the challenges currently facing the City and implementation strategies to address them. Each of these recommendations is designed to support the broad goal of environmental sustainability, but still distinct enough for implementation on its own merit. Along with consistent support from city officials and citizen participation, this report provides a strategy to develop a comprehensive plan for a more sustainable Syracuse.

Appendix A: Contacts

Section 3: Best Practices

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Section 4: Recommendations for Syracuse

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Appendix B: Sustainable Management Plans

List of Included Plans
Bridgeport, Connecticut
"BGreen 2020" (2008)
BGreen 2020

Hartford, CT
"One City, One Plan" Ch. 12 (2010)
One City One Plan

Worcester, MA
"Climate Action Plan" (2006)
Climate Action Plan

Baltimore, MD
"The Baltimore Sustainability Plan" (2009)
The Baltimore Sustainability Plan

New York City, NY
PLANYC (2007)
PLANYC

Syracuse, NY
Syracuse SDAT (2006)
Syracuse SDAT

Syracuse, NY
"The 12 Traits of Sustainable Communities" (2010)
12 Traits of Sustainable Communities PP

Pittsburgh, PA
Pittsburgh Climate Action Plan (2008)
Pittsburgh Climate Action Plan

Akron, OH
"Greenprint for Akron" (2009)
Greenprint for Akron

Cleveland, OH
"Connecting Cleveland 2020 Citywide Plan" (2007)
Connecting Cleveland 2020 Citywide Plan: Sustainability

Providence, RI
"Greenprint" (2008)
Greenprint

Bridgeport, CT
"BGreen 2020" (2008)

Team Perspective
Extensive list of desired initiatives that does not focus on implementation issues

Guiding Principles
- Spurring economic competitiveness
- Protecting natural resources and public health
- Enhancing social equity
- Improving quality of life

Action Areas

Green energy and buildings
Strategies
- Establish Energy Improvement District - Create a Green Energy Park at closed landfill in Seaside Park - Implement energy efficiency and biomass retrofit at wastewater treatment plant - Benchmark, retrofit, and consolidate municipal facilities - Benchmark and retrofit educational facilities - Create residential weatherization program - Promote energy audits and energy efficiency programs outside non-public sector

Greenfields
Strategies
- Rezone for livable, transit-oriented neighborhoods and redevelopments - Develop GIS into a more comprehensive planning tool - Conduct municipal property planning in search of consolidation opportunities - Create plans for redevelopment of underutilized districts - Develop a life-cycle housing ladder - Encourage Class A office opportunities - Foster neighborhoods of choice

Green wheels
Strategies
- Enact transit first policy to encourage alternative transportation - Assess the transportation demand to prioritize investment - Construct train station - Work with large employers to discourage single driver commutes - Implement a "Complete Streets" Program - Develop Bicycle Infrastructure - Develop Pedestrian Infrastructure - Create anti-idling and fuel standards education and regulation

Green spaces

Strategies
- Establish Conservation Commission to manage and develop green spaces
- Develop a Green Spaces Master Plan
- Increase waterfront access
- Expand street tree and urban forest programs
- Provide access to community gardens and urban farms
- Link green spaces

Water resources

Strategies
- Conduct water resources stewardship program
- Separate sanitary/stormwater overflow
- Institute water conservation programs at municipal schools and facilities
- Institute water conservation programs in private sector
- Incorporate water considerations into green building guideline
- Pursue ban on plastic bags

Municipal solid waste, materials use & recycling

Strategies
- Research best practices of other recycling programs
- Education and promotion of recycling through door to door canvassing
- Promote inside and outside downtown recycling
- Establish recycling programs at all municipal buildings and parks
- Establish comprehensive recycling at schools
- Create composting center

Green businesses jobs & purchasing

Strategies
- Incorporate green jobs training in secondary and higher education schools
- Create green business incubator
- Establish green collar resource center
- Provide weatherization training and certification for 100 college students
- Pilot a green purchasing program

Plan Location
http://www.rpa.org/bgreen/BGreen-2020.pdf

Hartford, CT
"One City, One Plan" Ch. 12 (2010)

Team Perspective
> Relevant plan for Syracuse due to similar demographic features of city

Guiding Framework
- Improve the quality of the environment
- Promote sustainable development

Action Areas

Clean and renewable energy management
Procurement - Attain 100% of renewable energy from clean, renewable energy by 2030
Production - Obtain new clean energy systems via Connecticut Clean Energy Program - Advertise On-Site Distributed Generation Program to raise private interest
Efficiency - Complete energy audit of municipal facilities - Develop citywide management plan for energy use - Retrofit municipal buildings with energy efficient equipment - Replace incandescent traffic lights and street lights with LED lights

Waste reduction
Solid waste reduction - Investigate "Pay as you throw" solid waste programs - Consider adding surcharge to plastic bag consumption - Develop incentives for private solid waste reductions - Develop and promote a backyard composting program for residents
Solid waste reuse - Develop regional waste exchange program - Coordinate with Metropolitan District in collecting chemicals, cleaners, and paint

Urban design
Green buildings - Provide incentives for solar heating, natural ventilation, green roofs, etc. - Require Silver LEED Certification for commercial construction over 100,000 ft^2 - Require Silver LEED Certification for municipal buildings over 5,000 ft^2 - Develop green building guidelines and incentives - Complete City-wide tree canopy assessment

Transportation
Transportation modes - Centralize the public transportation system around the Union Station - Continue support for New Haven-Hartford-Springfield rail service - Improve bicycle and pedestrian infrastructure
City vehicles - Continue transition of City Fleet to alternative fuels - Investigate the replacement of older buses with alternative fuel buses
Public/Private sector initiatives - Encourage additional zip car locations - Provide discounted rates or preferred parking for hybrids

Natural environment
Air quality - Evaluate the synchronization of traffic lights
Public health - Continue to fund and support lead paint abatement and remediation programs - Support the efforts of the Hartford Asthma Call to Action Taskforce - Increase fines for littering and illegal dumping

Water resources
Stormwater management - Conduct City-wide stormwater management study - Resolve shared stormwater responsibilities between City and MDC - Implement the NYPDES Phase II stormwater management plan
Water quality - Regulate the use of herbicides and pesticides in municipal facilities - Use regulatory site plan reviews to ensure stormwater quality measures - Collaborate with DEP to expand the Urban Fishing Program

Plan Location
http://www.hartford.gov/oneplan/Chapters/12- Greening Hartford and Sustainable Development_Draft2.pdf

Worcester, MA
"Climate Action Plan" (2006)

Team Perspective
> *Excellent model that detail specifics on each recommendation including costs*

Guiding Framework
- To improve the economic viability and quality of life, Worcester will pursue the efficient and wise use of natural resources and clean, sustainable sources of energy to serve our needs of mobility, housing, education, community building, economic growth, public safety, and other necessities.

Action Areas

Energy efficiency and renewable sources
- Hire a full time energy manager - Install a 100KW Hydro-Power Turbine in a water filtration plant - Capture methane from landfill to provide 45% of municipal electricity - Promote Clean Energy Choice that provides matching costs of renewable energy - Organize Clean Energy Choice competitions across schools - Establish renewable energy curriculum from Mass. Technology Collaborative - Purchase $25,000 Renewable Energy Certificates - Upgrade 200 exit signs to LED bulbs - Implement "Change-A-Light Campaign" to get residents to switch to CFLs - Develop Energy Management System - Pass municipal energy efficiency purchasing policies - Investigate solar heating, hot water, and electricity at schools - Create energy theme for school projects fair

Transportation and vehicle fleet
- Enable 5-minute idling shut off in all heavy duty municipal trucks - Develop plan for installing 250 kW wind turbine - Strengthen municipal anti-idling by placing signs in targeted locations - Post anti-idling signs at schools - Pilot (B-20) biodiesel pilot project in Hope Cemetery fleet - Pass a fuel efficient vehicle purchasing program for the City - Install modern vehicle fleet software to track mileage and fuel use - Create an online carpool message board for City employees - Promote "Employee Take Public Transportation, Bike, or Walk to Work" week

Waste and recycling

- Implement recycling program in City schools
- Use education efforts to increase recycling rate in the city from 27% to 50%
- Maintain energy and emission information on City website
- Encourage recycling at apartment complexes
- Provide city-wide composting program
- Install recycle bins next to trash cans in City Hall
- Provide recycling at City-sponsored events

Green space

- Use reflective roofing
- Install green roofs
- Strategically select and site trees
- De-pave schoolyards

Process for Plan

1) Greenhouse gas emissions inventory
- Record emissions from the city by sector

2) Set GHG emission reduction target
- Decrease emissions below 11% 2002 levels by 2010

3) Develop a local climate action plan
- Establish Energy Task Force composed of 14 members from municipal departments, utilities, businesses, universities, and environmental organizations

4) Implement local climate action plan
- Previously discussed action areas

5) Monitor emission reductions
- Verify achievement of goals

Plan Location
   http://www.env.state.ma.us/eea/green_communities/library/worcester_climate_plan.pdf

Baltimore, MD
"The Baltimore Sustainability Plan" (2009)

Team Perspective
>   Ideal model in public presentation with comprehensive analysis

Guiding Principles
- *Make Baltimore a clean, healthy, efficient, green, mobile, aware, and invested community*

Action Areas

Cleanliness
Goal 1: Eliminate litter throughout the City - Educate residents and businesses about proper waste disposal - Provide more trash and recycling bins particularly at bus stops - Issue every household a municipal trash can - Increase monitoring and enforcement of trash code through fines
Goal 2: Sustain a clean and maintained appearance of public land - Establish city-wide maintenance standard for public land - Provide technical assistance for community groups
Goal 3: Transform Vacant Lots - Create and sustain a land trust - Use Baltimore Land Bank to redevelop abandoned property - Levy a fee on absentee property owners

Pollution prevention
Goal 1: Reduce GHG emissions by 15% by 2015 - Create and implement a climate action plan
Goal 2: Improve air quality and eliminate Code Red days - Add air quality and climate change impact assessments to city projects - Create color code to defer energy use on high consumption days - Explore more fuel efficient fleet vehicles - Institute city-wide no idling policy to all vehicles
Goal 3: Ensure that Baltimore water bodies are both fishable and swimmable - Implement water quality suggestions from City County Watershed - Study the creation of a stormwater utility - Reduce impervious surfaces and increase on-site water treatment - Protect and restore stream corridors

Resource conservation

Goal 1: Reduce energy use by 15% by 2015
- Require new, stringent energy efficiency standards in Building Code
- Use financial incentives to spur efficiency upgrades in existing buildings
- Increase renewable energy generation
- Mandate efficiency upgrades at home point of sale
- Institute a "Lights Out" policy for specified areas

Goal 2: Reduce water use
- Encourage conservation through tiered use rates
- Develop and implement a water facilities master plan

Goal 3: Minimize production of waste
- Distribute information on purchasing products that produce less waste
- Establish green purchasing guidelines for the city
- Expand composting program

Greening

Goal 1: Double Baltimore's tree canopy
- Conduct a complete inventory on city trees
- Upgrade regulations and policies regarding urban tree protection
- Use grants, coupons, and tree giveaways to incentivize private participation

Goal 2: Become a leader in sustainable, local food systems
- Increase percentage of land used for agriculture
- Purchase locally produced, healthy foods for schools and hospitals
- Compile local and regional data to map available resources

Goal 3: Provide well maintained public recreation space within ¼ mile of all residents
- Conduct inventory and assessment on existing and potential recreation space
- Provide support for NGO management and stewardship of green spaces

Transportation

Goal 1: Improve public transit
- Implement transit-signal priority for public transportation vehicles
- Expand Quick Buses to higher volume transit corridors

Goal 2: Become more bicycle and pedestrian friendly
- Develop a bike to work program
- Evaluate the creation of a bicycle sharing system
- Implement a 'Sunday Streets' Program

Plan Location http://www.dooconsulting.net/pdf/ref_bar/about/051509_BCS-0
01SustainabilityReport.pdf

New York City, NY
PLANYC (2007)

Team Perspective
One of the most comprehensive plans in the country and a great source for ideas

Guiding Principles
- Use land more efficiently to create affordable, sustainable housing & open spaces
- Improve air quality to guarantee safe and breathable air
- Protect water purity and ensure reliable supply throughout city
- Improve energy planning to reduce emissions and save money
- Transform the transportation network

Action Areas

Housing
Goal: Create a million more homes, while increasing affordability and sustainability - Continue publicly initiated rezonings - Increase transit options to spur development - Create new housing on public land - Develop underused areas to knit neighborhoods together - Adapt outdated buildings to new uses - Expand inclusionary zoning to encourage affordable housing

Open spaces
Goal: All residents live within a ten-minute walk from the park - Open schoolyards across city as public playgrounds - Complete underdeveloped destination parks - Provide more multi-purpose fields - Create or enhance a public plaza in every community - Green the cityscape through reforestation and "Greenstreets Program"

Brownfields
Goal: Clean up all contaminated land in the city - Adopt on-site testing to streamline brownfield cleanup - Establish a City office to promote brownfield planning and redevelopment - Provide $15 million for public-private loan fund (Remediation Fund) - Expand participation in State Brownfield Cleanup Program - Provide incentives to participate in Brownfield Opportunity Area planning - Create insurance program and legal protections to limit developer liability - Educate and provide technical assistance to residents about redevelopment

Water quality

Goal: Open 90% of waterways to recreation
- Expand wet weather capacity at treatment plants
- Form an interagency BMP Task Force
- Pilot promising BMPs
- Provide incentives for green roofs
- Protect wetlands

Transportation

Goal: Improve travel times by adding transit capacity
- Increase capacity in congested areas and expand access to underserved areas
- Pilot congestion pricing with a fee for entering city center
- Encourage cycling by conducting 1,800 mile bike master plan
- Expand number of traffic enforcement agents

Energy

Goal: Provide cleaner, more reliable power to every resident
- Establish New York City Energy Planning Board
- Strengthen energy and building codes for the City
- Expand peak load management with a 25% peak load reduction goal
- Expand real-time pricing across City
- Support expansion of natural gas infrastructure
- Pilot emerging technologies in renewable energy
- Property tax abatement for solar panel installations

Air

Goal: Achieve the cleanest air of any big U.S. city
- Replace, retrofit, and refuel diesel trucks
- Introduce biodiesel into City's truck fleet
- Waive City's sales tax on cleanest, most fuel efficient vehicles
- Pilot hydrogen and plug-in hybrids
- Improve compliance of three minute idling policy
- Retrofit small and large school buses
- Work with community groups in planting trees throughout the City

Plan Location
http://www.nyc.gov/html/planyc2030/downloads/pdf/full_report.pdf

Syracuse, NY
Syracuse SDAT (2006)

Team Perspective
>   Focuses on economic renewal particularly for the downtown area

Guiding Framework
>   Design a plan that is:
- Integrative, holistic, and visual
- Achieves a sustainable relationship among people, environment, and place
- Gives three-dimensional form to a culture and a place
- Achieves balance among cultural, environmental, and economic systems

Action Areas

Economy and government

Regional job creation strategy
    -    Build on technology transfer programs by Syracuse University
    -    Link local businesses to the NYC specialists through Chamber of Commerce

Policy framework for public/private partnerships
    -    Use public dollars to renovate historic buildings and develop brownfields
    -    Develop project scoring criteria for economic development funding decisions

Focus on downtown
    -    Emphasize pedestrian-scale planning and placemaking throughout the downtown
    -     Protect and utilize historic and architecturally significant structures
    -    Develop a comprehensive access strategy for downtown

Neighborhood wealth creation strategy
    - Offer job readiness and financial literacy classes in public schools
    - Encourage local entrepreneurship through partnering with the Whitman School
    - Identify small business niches that serve the needs of the community

Environment

Farms to City to farms initiative
    -    Deliver farm fresh foods to schools to promote healthy eating habits
    -    Explore the use of churches to distribute food from local farms
    -    Use abandoned properties for community gardens

Waste to energy
    -    Explore programs to convert biowaste into energy or fertilizer
    -    Attempt cogeneration with biomass fueled power plants
    -    Establish regulations for superior filters on municipal power plants

Energy efficiency
    -    Start an aggressive urban forest campaign planting deciduous trees in the City
    -    Establish low-interest revolving programs for weatherization
    -    Encourage utilities to provide incentives for onsite renewable energy generation

Transport systems and urban form
Multijurisdictional cooperation is encouraged   - Collaborate with Upstate community in planning and lobbying

Create a pedestrian environment
  - Provide adequate sidewalks, crosswalks, signalization, and safety zones
  - Consider diagonal crossing zones at key intersections
  - Provide for minimum sidewalk width standards

Create bikeways, trails, and recreation opportunities
  - Continue implementing the local trails and bikeways plans
  - Assure that zoning provides adequate bicycle facilities
  - Encourage bike-to-work programs
  - Provide adequate bike maps and signs
  - Provide bicycle facilities as part street reconstruction projects

Offer alternative means of transit
  - Strategize on national, superregional, and local commuter rail systems
  - Develop strategic planning for a multimodal transport station
  - Use smaller buses with more frequent headway
  - Create new transit maps to be made available online
  - Consider Zipcar program for downtown and university areas

Plan Location
http://www.focussyracuse.org/non_html/SDATSyracuse_Final_Report.1.pdf

Syracuse, NY
"The 12 Traits of Sustainable Communities" (2010)

Team Perspective
      A self-test to gauge levels of environmental, economic, and social sustainability

Guiding Framework
- A rating system and public recognition program for cities, counties, towns, and villages striving for sustainability

Assessment Areas

1. Government leadership in sustainability
- Environmental
- Economic
- Social

2. Local and economic resilience

3. Land use planning and resource preservation

4. Transportation and mobility systems

5. Water related infrastructure systems

6. Green buildings and housing

7. Energy and non-fossil fuels

8. Waste and material management

9. Local culture, art, and entertainment

10. Quality public education

11. Public health and safety

12. Community engagement

PowerPoint Location
http://greeningusa.org/images/documents/20100512betatest12traits.pdf

Pittsburgh, PA
Pittsburgh Climate Action Plan (2008)

Team Perspective
> Exceptionally detailed plan that separates municipal from community action

Guiding Framework
- GHG emissions reduction target: 20% below 2003 levels by 2023
- Reduce impacts of local and global climate change
- Improve local environment and local economy
- Enhance Pittsburgh's reputation as an environmentally progressive city

Action Areas

Municipal climate action
Existing measures - Participate in "EPA Change a Light Day" to change to CFL lights - Receive Solar Cities America Grant from Department of Energy - Purchase 10% of energy from renewable sources - Continue "Pittsburgh Green Up Program" to turn vacant lots to green spaces - Continue installing LED lights in traffic signals - Expand recycling program to all City buildings
Short-term recommendations - Create a full-time City Sustainability Coordinator - Form a City Sustainability Committee to implement - Require LEED Certification for the construction of municipal facilities - Conduct complete energy audit of municipal buildings and implement retrofits - Replace exit signs with LEDs - Install vending misers on all City-owned vending machines - Install bike racks at all City buildings and create a bike to work program
Medium-term recommendations - Retrofit mercury streetlights with more efficient models - Upgrade lighting at City Parks and Sport Fields - Procure environmentally preferred products - Incorporate alternative vehicles and/or zipcars into fleet
Long-term recommendations - Support planning and zoning incentives - Create city employee commuter incentive program

Community climate action
Short-term recommendations

- Form community climate coalition involving community groups and residents
   - Expand involvement of unions in climate protection activities
   - Plant trees through community groups
   - Further recycling education in public schools
   - Increased enforcement of mandatory recycling
   - Expand recycling drop-hours and locations
   - Use biodiesel for public transportation
   - Encourage retail stations to use B5
   - Provide an alternative fuel map for residents

Medium-term recommendations

- Collaborate with non-profit and university partners in developing smart growth
   - Create neighborhood climate champions to recruit participation
   - Create more energy efficient building codes
   - Create and support incentives for solar energy production
   - Create incentives or requirements for green roofs
   - Grow biofuel feedstock on vacant properties
   - Encourage better loan rates for LEED certified homes
   - Establish incentives for restaurants to recycle grease
   - Create city operated compost facility

Long-term recommendations

- Explore peak pricing pilot project
   - Establish "pay as you throw" policies to reduce waste
   - Establish congestion fees
   - Lobby for a "bottle bill" to encourage recycling and reduce litter
   - Reestablish trolley service

Plan Location
http://www.city.pittsburgh.pa.us/district8/assets/08_pgh_climate_action_plan.pdf

Akron, OH
"Greenprint for Akron" (2009)

Team Perspective
Comprehensive plan with ambitious proposals and capital-intensive investments

Guiding Principles
- Reduce Climate Change Impact
- Efficient Waste Management and Reduction
- Promote Environmental Literacy
- Environmentally, Economically, and Socially Responsible Purchasing
- Seek Outside Funding for Fiscal Prudence
- Promote and Develop Green Jobs
- Encourage Smart Growth

Action Areas

Smart energy & emissions
Accomplishments
- Installation of LED lights in Centre Super Block
- LEED certification for Zoo, Ranger Station, Metro Facility, and other facilities
Initiatives
- Reissue Anti-Idling Policy
- Installation of LED street lights, and retrofits to city owned lights

Smart water & wastewater management
Accomplishments
- Construction of 40 sewage basins to capture sewage overflow
- Replacement of aging septic system
Initiatives
- Convert Compost Facility to Anaerobic Digestion System
- Encourage rain barrels and gardens at homes
- Host pharmaceutical collections events
- Provide tests in homes for leaking toilets and taps

Smart materials & solid waste management
Accomplishments
- Installed automated curbside recycling with smart carts
- Used asphalt recycling machines
- Expanded recyclable plastics to #1-7
Initiatives
- Provide recycling at all public venues
- Reduce use of salt on roadways

Smart transit

Accomplishments
   - Installed 3,200 red LED traffic lights
   - Constructed of bike path and trails along Ohio & Erie Canal Towpath

Initiatives
   - Establish two bike units in Police Department
   - Bike Aboard Program

Smart development

Accomplishments
   - Received $12 million from EPA grants and Ohio Fund for redevelopment
   - Converted vacant downtown buildings into university housing

Initiatives
   - Create brownfield inventory program
   - Establish energy efficiency standards for housing projects
   - Promote land banking to assemble vacant lots for development

Smart community education and promotion of progress
Accomplishments   - Forest to Furnishing Program (recycles urban forest into flooring)

Initiatives
   - Create inventory of urban canopy
   - Map and conserve wetlands and floodplains

Smart community education

Accomplishments
   - $50,000 grant training public school teachers on energy efficiency curriculum
   - Sent energy efficiency kits to 1,700 families

Initiatives
   - Energy efficiency retrofit for town hall to model energy efficiency
   - Sponsor awards for green technology successes for individuals and businesses
   - Conduct ICLEI greenhouse gas inventory every five years.

Smart green jobs
Accomplishments: - Akron Global Business Accelerator serves as green business incubator

Initiatives
   - Provide incubator space for alternative fuel, efficiency, and recycling companies
   - Promote success of companies using Akron Global Business Accelerator

Plan Location
http://www.youblisher.com/p/14359-Greenprint-for-Akron/

Cleveland, OH
"Connecting Cleveland 2020 Citywide Plan" (2007)

Team Perspective
    Offers a different organization strategy by dividing plan into assets and strategies

Guiding Principles
- Economic prosperity
- Environmental quality
- Social equity/equal opportunity

Action Areas

Sustainable development patterns
- Reduce sprawl by investing in urban core of the City - Support Transit Oriented Development initiatives - Change traffic codes to be more pedestrian friendly - Develop and maintain a comprehensive open space - Create a new land conservancy or land trust

High Performance/Green Building
- Create high performance building design and construction guidelines - Develop a high performance building rating system for a variety of building types - Develop green building standards for City-owned and funded construction - Provide residential and commercial incentives such as grants and rebates - Provide website with information on City guidelines and incentive programs

Nonmotorized Travel
- Modify traffic codes and street design standards to be more pedestrian friendly - Create a comprehensive network of bicycle routes, bicycle lanes, and trails - Consider implementing park parking requirements in zoning code - Develop "Safe Routes to School" program - Develop incentives and accommodations for employees to bike to work

Motorized Travel
- Expand use of biofuels in City vehicles - Support City efforts to purchase hybrids and energy efficient vehicles - Reduce fuel consumption of City employees through transit reimbursements

Mass Transit
- Implement a citywide transit plan and recommend construction of new routes - Promote Commuter Advantage Program that offers reductions on pubic transit

Energy conservation

- Conduct an energy audit on all City-owned buildings
- Purchase only the most energy efficient appliances
- Convert all traffic lights to LEDs
- Install a green roof on City Hall and other municipal buildings
- Require landlords and homeowners receiving tax abatements to buy Energy Star
- Expand energy efficiency programs such as Low-Income Weatherization program
- Provide local businesses with tools to estimate GHG emissions

Renewable energy

- Encourage local electricity suppliers to use renewable energy
- Provide incentives for renewable consumption and production

Brownfield remediation

- Increase funding for City's Industrial Landbank Program
- Promote community involvement in redeveloping brownfields

Recycling and waste management

- Decrease community waste by purchasing in bulk
- Measure the volume and toxicity of waste by City and take reduction steps
- Consider charging increased dumping and landfill fees
- Expand recycling program to include yard debris
- Support deconstruction during remodeling and demolition projects
- Work with local builders in developing guidelines for C&D recycling

Air quality

- Calculate and reduce Cleveland's carbon footprint
- Implement a climate protection plan

Plan Location
http://planning.city.cleveland.oh.us/cwp/chapterspdf/sus.pdf

Providence, RI
"Greenprint" (2008)

Team Perspective
      Well-presented and ambitious plan focused on reducing GHG emissions

Guiding Principles
- Implement programs that reduce impact on local and global environment

Action Areas

Energy
Accomplishments   - Purchased 20% of annual energy consumption from renewable sources   - Completed first of five ICLEI steps   - All city funded housing must use LED lights   - Upgraded exit sings to LED lights   - Installed light sensors in Public Safety Complex   - Hired two energy educators for city's public schools   - Replaced 99% of city's incandescent light bulbs with CFLs   - Replaced all incandescent traffic lights with LEDs   - Installed 15 solar powered parking meters   - Commenced trial test of electric motorcycles in police fleet
Initiatives   - Expand renewable energy production   - Create a City of Providence Energy Planning Board   - Utilize software that aggregates utility use from municipal buildings   - Join the State Electronics Challenge   - Establish residential energy efficiency revolving loan fund

The built environment
Accomplishments   - Pledged $750 million to green school buildings through renovations   - Updated water infrastructure to reduce leaking
Initiatives   - Pursue at least silver LEED building qualification when feasible   - Offer LEED incentives citywide   - Host Green Affordable Housing Design Contest

Public space

Accomplishments
- Constructed three community gardens
- Installed solar powered lighting on walking track
- Used recycled materials for public playgrounds
- Completed street tree inventory in 2006

Initiatives
- Open an additional community garden each year for next three years
- Add 20 acres of park space by 2012
- Develop incentives for green roofing
- Separate sidewalks from curb with permeable strip where possible
- Increase urban tree canopy by 7% by 2020
- Plant 1,100 additional trees per year

Transit and transportation

Accomplishments
- Developed a comprehensive transit study
- Used Edulog routing software to create shortest routes with least idling time

Initiatives
- Institute anti-idling campaign on city vehicles
- Explore citywide anti-idling ordinance
- Install more than 1,000 signs to increase visibility of bicycling in the city
- Develop a bike share program
- Encourage companies to give employees incentives to use bus
- Institute free carpooling for municipal employees

Recycling and waste management

Accomplishments
- Distributed "Big Green Can" (model for appropriate waste) to every resident
- Provided recycling education through Public Works at community events
- Received grant from Coca-cola for 60 recycling bins at public events

Initiatives
- Transition to a unit-based-pricing recycling system
- Expand enforcement of city recycling ordinance
- Publicize Home Depot's free in-store recycling of incandescent bulbs
- Pilot a composting program

Plan Location
http://www.providenceri.com/greenprint/greenprint.pdf

Appendix C: Applicable Grants

List of Included Grants

NYSERDA Energy Audit Program
http://www.nyserda.org/programs/energyaudit.asp

NYSERDA FlexTech Program
http://www.nyserda.org/programs/flextech.asp

NYSERDA Existing Facilities Program
http://www.nyserda.org/programs/Existing_Facilities/default.html

NYSERDA Solar Electric Incentive Program
http://www.powernaturally.org/Programs/Solar/incentives.asp

NYS Division of Coastal Resources Brownfield Opportunity Areas (BOA) Program
http://www.nyswaterfronts.com/grantopps_BOA.asp

NYS Department of Transportation's Transportation Enhancement (TEP) Program
https://www.nysdot.gov/programs/tep

NYS Pollution Prevention Institute Community Grant Program
http://www.nysp2i.rit.edu/community_grants.html

NYSERDA Energy Audit Program
Program Overview

This program will provide energy audits to small businesses and other facilities to help them make informed electrical energy decisions and implement energy-efficiency strategies. Audits help identify economically viable improvements that yield substantial annual energy savings.

Funding

Audit costs vary, depending on the customer's annual electrical bills:

Annual Electric Bills	Energy Audit Fee
Less than $25,000	$100
$25,000-$75,000	$400

Contact Information

Region 2 - L&S Energy Services
Contact: Michelle Wooddell
Phone: 518-383-9405 x223
FAX: 518-383-9406
Email: MWooddell@LS-Energy.com

Application Elements

Name of Facility: _____

Address: _____

City: _____   Zip:_____

County: _____

Contact Person: _____

Title: _____

Phone: _____   Fax:_____

Size of Facility (in square feet): _____

Total Annual Energy Costs: _____

Annual Energy Costs By Source:

Electric: $_____;   Natural Gas: $ _____

Fuel Oil: $_____;   Other: $ _____

Electric Account Number: _____

Federal ID Number: _____

I certify that I am acting, or I am authorized to act on behalf of, the facility and that the information provided as part of this application is true to the best of my knowledge.

AUTHORIZED SIGNATURE _____   DATE _____

NYSERDA FlexTech Program

Program Overview

The FlexTech Program seeks customers interested in receiving cost-shared analysis of energy efficiency technical evaluations, process improvement analysis, peak-load reduction studies, energy procurement analysis, and development of peak-load curtailment plans (PLCPs) of their existing facilities as well as combined heat & power (CHP) and renewable generation feasibility studies for implementation within existing facilities. This solicitation is divided into three (3) separate components: 1) Energy Efficiency; 2) CHP and Renewable Generation; and 3) PLCPs.

Funding

All projects must include cost sharing in the form of matching cash support from the applicant. An independent third-party consultant is required for all projects. In-kind contributions of any type are not allowed as matching funds. For most applications, NYSERDA will contribute fifty percent (50%) of the eligible study costs, up to the lesser of either $1,000,000 or ten percent (10%) of the applicant's annual energy costs, based on an approved Scope of Work. The intent for individual studies approaching the $1,000,000 cost-share amount is for long-term energy studies continuing for at least a three (3) year time frame.

Contact Information

Mary Sauvie, PON 1746
NYS Energy Research and Development Authority
17 Columbia Circle
Albany, New York 12203-6399

Application Elements

Applications will be accepted until 5:00 pm December 15, 2011. The hard copy application must contain an original signature. Customers or their selected service providers may submit applications for the Energy Efficiency or CHP and Renewable Generation components of this PON.

Appendix A: Customer Application
Appendix A-1: Energy Efficiency, CHP & Renewable Generation Application
Appendix A-2: Peak-Load Curtailment Plan Application
Appendix B-1: How to Create a Scope of Work
Appendix B-2: Final Report Requirements
Appendix B-3: Project Summary Sheet
Appendix B-4: NYSERDA RCx Deficiency Worksheet (Filled in Example)
Appendix C-1: CHP & Renewable Generation Eligible Projects
Appendix C-2: Required information in a detailed CHP study (costing greater than $20,000)
Appendix C-3: Required information in a preliminary CHP study (costing less than $20,000)
Appendix C-4: Required information in a renewable generation study
Appendix C-5: CHP & Renewable Generation Evaluation Criteria

NYSERDA Existing Facilities Program

Program Overview

The New York State Energy Research and Development Authority's (NYSERDA) Existing Facilities Program offers incentives for a variety of energy projects including Pre-Qualified Measures and Performance-Based Incentives.

Funding

Prequalified Incentives: Applicants can receive incentives ($/unit) for pre-qualified energy-efficiency and conservation measures. Projects can receive up to $30,000 through pre-qualified incentives. For national fuel gas, pre-qualified incentives are limited to a cap of $25,000. To apply for Pre-Qualified incentives, download and complete the Main Program Application and the appropriate Measure Application(s).

- Lighting
- HVAC
- Chillers
- Motors
- Variable Frequency Drives

- Commercial Refrigeration
- Commercial Kitchen Equipment and Washers
- Interval Meters

Gas Efficiency

Performance-Based Incentives: The performance-based incentives component of the Existing Facilities Program offers performance-based incentives to customers or ESCO's who are working on large-scale energy efficiency projects. Performance-based incentives are typically higher than pre-qualified incentives but are based on an engineering analysis and are potentially subject to measurement and verification (M&V) requirements.

- Electric Incentives are provided to customers or energy service companies (ESCOs) that implement energy-efficiency projects that deliver verifiable annual electrical energy savings.
- Gas Incentives are provided to customers or ESCOs working on gas-efficiency projects that deliver verifiable annual gas savings.
- Demand Response Incentives are provided to offset a portion of the technology costs that enable facilities to participate in Demand Response Programs.
- Combined Heat and Power (CHP) Incentives are provided to offset the installation cost of clean, efficient, and commercially available CHP systems.

Contact Information

Todd Baldyga
Program Manager of Existing Facilities Program
518-862-1090, ext. 3354

Application Elements (Prequalified Incentives)

1. Main Application Form
2. Select appropriate measure and complete individual application form
3. All required attachments to the address listed on the main program application.

NYSERDA Solar Electric Incentive Program

Program Overview

Cash incentives are available for the installation of qualified solar electric systems and customers, through applications submitted to the Program by an "Eligible Installer." Eligible Installers are those who have demonstrated technical competence in the PV field and who have signed written agreements with NYSERDA to abide by certain Program terms and conditions. The cash incentives are paid directly to the Eligible Installer, but must be passed on in full to the customers.

Funding

$1.75 per watt up to a maximum of 25 kW per site/meter for not-for-profit schools, not-for-profit organizations, municipalities, and state/federal agencies up to a maximum of 25 kW per site/meter, not to exceed 50% of the total installed system costs. Any organization applying for this incentive level must submit a signed copy of IRS Tax Form 990 or other evidence of not for profit status to be eligible for this enhanced incentive.

In general, incentives for a typical system cover approximately 25-35% of the installed cost of a PV System. Customers may also be eligible for New York State and federal tax credits.

	PV Systems for Homes*	PV Systems for Businesses
Average Size	4.5 kilowatts (kW) or 4,500 watts	9.7 kW or 9,700 watts
Average Cost Before NYSERDA Incentive	$8,450 per kW or $8.45 per watt	$7,990 per kW or $7.99 per watt
Cost Ranges	$6,600 - $12,604 per kW or $6.60 - $12.60 per watt	$6,373 - $9,674 per kW or $6.37 - $9.67 per watt

Contact Information

Marcia Ruth
518-862-1090, ext. 3412

Application Elements

- Installer information
- System manufacturer documentation
- System production efficiency
- Economic analysis of electricity costs before and after installation
- Checklist:
    - Site map
    - Three-line electrical drawing
    - Photo of installation site
    - Shading Analysis Results
    - Installer-Customer Purchase Agreement
    - Copy of utility bill

NYS Division of Coastal Resources Brownfield Opportunity Areas (BOA) Program

Program Overview

The BOA Program provides municipalities with assistance to complete revitalization plans and implementation strategies for areas affected by brownfield sites. The BOA Program enables communities to put strategies in place to return dormant sites and areas back to productive use and simultaneously restore environmental quality. The BOA program will enable local governments to:

- Address a range of problems posed by multiple brownfield sites;
- Build consensus on the future uses of strategic or priority brownfield sites; and
- Establish the multi-agency and private-sector partnerships necessary to leverage assistance and investments to revitalize neighborhoods and communities

Funding

Provides municipalities with assistance, up to 90% of the eligible costs, to complete revitalization plans and implementation strategies for areas or communities affected by the presence of brownfield sites, and site assessments for strategic sites.

Contact Information

(607) 721-8756 - phone, Elaine Miller

(607) 721-8752 - phone, Julie Sweet

Application Elements

Apply to enter the program at the most appropriate of the three program steps described:

Step 1: Pre-Nomination Study

- description and justification of the study area and associated boundaries
- basic description and understanding of current land use and zoning
- delineation and description of existing brownfield sites and other underutilized properties
- description of the area's potential for revitalization

Step 2: Nomination Study

- inventory and analysis of existing conditions and opportunities
- economic and market trends analyses
- reuse potential for properties with an emphasis on the identification and reuse potential of strategic sites which may catalyze area revitalization
- key findings and recommendations

Step 3: Implementation Strategy

- full range of implementation techniques and actions necessary to implement the area-wide plan
- State Environmental Quality Review (SEQRA)
- environmental site assessments for strategic sites

NYS Department of Transportation's Transportation Enhancement (TEP) Program

Program Overview

The TEP is a federal reimbursement program under the Safe, Accountable, Flexible, Efficient Transportation Equity Act administered by the NYSDOT. In recognition that transportation systems are influenced and impacted by more than the condition of the traditional highway and bridge infrastructure, TEP enables funding for transportation projects of cultural, aesthetic, historic and environmental significance. Eligible projects:

1. Provision of Facilities for Bicycles and Pedestrians
2. Provision of Safety and Educational Activities for Pedestrians and Bicyclists
3. Acquisition of Scenic Easements and Scenic or Historic Sites
4. Scenic or Historic Highway Programs
5. Landscaping and Other Scenic Beautification
6. Historic Preservation
7. Rehabilitation and Operation of Historic Transportation Buildings, Structures, or Facilities (Including Historic Railroad Facilities and Canals)
8. Preservation of Abandoned Railway Corridors (Including Conversion and Use for Pedestrian and Bicycle Trails)
9. Inventory, Control and Removal of Outdoor Advertising
10. Archeological Planning and Research
11. Mitigation to Address Water Pollution Due to Highway Runoff or Reduce Vehicle-caused Wildlife Mortality while Maintaining Habitat Connectivity
12. Establishment of Transportation-Related Museums

Funding

The program requires the project sponsor or applicant to front the cost of the project and request reimbursement upon completion. The program also requires the project sponsor/applicant to share in the cost of each project by providing a minimum-matching share of at least 20% of the total project cost. To lessen the financial burden of this requirement, FHWA allows alternative sources of funding. Must have a total cost of at least $200,000 and no more than $2.5 million per project.

Contact Information

John Reichert
(315) 428-4405
jreichert@dot.state.ny.us

Application Elements

- Sponsor and applicant information
- Project description, category, expected returns, and implementation schedule
- Assessment of benefits to public interest and community/political support
- Maintenance and operation of project and relationship to surface transportation

NYS Pollution Prevention Institute Community Grant Program

Program Overview

The proposed goal of this program is to provide financial and technical support for projects that raise awareness and understanding of pollution prevention practices and lead to implementation at the local level. The goal includes the overall improvement of the health, environmental quality and economic vitality of New York State communities.

For the NYSP2I, Pollution Prevention is defined as a strategy for environmental, health and safety improvement and improved efficiency that focuses on reducing the use of hazardous materials and the generation of hazardous wastes as well as reducing energy and resource consumption.

Funding

Grant recipients will be required to establish and maintain complete and accurate records pertinent to the performance of the funded program. Expenses must be auditable to their original source and documentation must be maintained. Grant recipients will be required to provide periodic financial status reports, including back-up documentation for all expenses.

An organization may submit more than one application. However, each application must be for a specific project, although the project may contain several elements. Grant awards will typically not exceed $15,000 per project.

Contact Information

Kate Winnebeck
Environmental Health & Safety Specialist
585.475.5390
kmhasp@rit.edu

Application Elements

- Executive Summary: one page overview to include the following:
- Organization Background
- Project Description (maximum 2 pages)
- Timeline
- Budget
- Letter of Support
- D. Attachments
    - A. Appendix A: Community Grants Program Proposal Cover Page
    - B. Appendix B: Community Grants Program Budget Page

Appendix D: City of Binghamton Resource Conservation Policy

Office of the Mayor

City of Binghamton Resource Conservation Policy

The purpose of this policy is to minimize the consumption of energy and natural resources through the City of Binghamton's governmental operations. By following the below guidelines, staff will help the City to become more environmentally and financially sustainable while establishing Binghamton as a model and leader amongst other municipalities in the movement to reduce global warming.

✓ **Turn off your computers, speakers, adding machines, and printers when you leave the office for the day:** *Turning off your computer and monitor at night can save up to 400 kWh of energy per computer annually. This reduction in energy use translates into nearly $14 in savings per year for each computer*

✓ **Turn off the lights (including desk lamps) in your personal office when you will be gone for more than 15 minutes**

✓ **Turn off power strips when you leave for the day:** *Computers and other devices continue draw power even when turned off. This unnecessary use of electricity can be eliminated by switching power strips off when appliances are not in use.*

✓ **Shared office equipment (such as printers and photocopiers) and lights in common areas should be shut off by the last person to leave the office at night**

✓ **Do not reset computer power management settings. These settings will be programmed by data processing to maximize energy savings and to enhance network capacity:** *Note—Screen savers are not energy savers. In fact screen savers can use more energy than not using one and may interfere with other power management settings*

✓ **Recycle ink cartridges:** *Mail back used cartridges when shipping is provided by the company and recycle all other used cartridges in the mail room. Cartridges brought to the mailroom will be donated to benefit the following charities on a rotating basis: St. Baldrick's Association; Food for the Poor; and the Mental Health Association of the Southern Tier's suicide prevention program.*

✓ **Switch to rechargeable batteries and recycle single use batteries:** *Batteries contain hazardous substances and should be disposed of properly. Regular batteries and even cell phone batteries can be recycled by dropping them off at the mail room.*

Office of the Mayor
City of Binghamton Resource Conservation Policy

✓ **Conserve and recycle paper:** *City operations currently consume nearly 8 tons of copy paper per year, or the equivalent of 133 trees per year. A 15% reduction would save 20 trees each year[1]. Please keep in mind the following tips:*
> Print only when absolutely necessary
> Share electronic copies of documents rather than printed copies when possible
> Use double sided printing and photocopying options when available
> Reuse single sided paper for scrap, notes, and printing

✓ **Recycle all other eligible materials, such as bottles, cans, plastic containers and cardboard**

✓ **When driving City vehicles, turn off the car engine if you are going to be stopped for more than 20 seconds, except in traffic:** *An idling vehicle produces 20 times more pollution than one traveling at 32 miles per hour. Turning off the engine saves fuel and reduces emissions of compounds that lead to global warming and air pollution*

✓ **Close window blinds at the end of the day to cut down on heat loss in the winter and to avoid the heat gain of direct sunlight during the summer**

Appendix E: Data Collection Sources for Worcester

Total Community Data Collection

Sector	Parameter (suggested units)	Source
Residential	Natural Gas (therms)	NSTAR
Residential	Light Fuel Oil (gallons)	Census; EIA (Energy Information Asc.)
Residential	Electricity (kWh)	National Grid
Residential	# of Households	Census
Residential	City Population	Census
Commercial/Industrial	Natural Gas (therms)	NSTAR
Commercial/Industrial	Light Fuel Oil (gallons)	EIA
Commercial/Industrial	Electricity (kWh)	National Grid
Commercial/Industrial	# of Employees	Census
Commercial/Industrial	# of Establishments	
Commercial/Industrial	Area of floor space (sq. ft.)	
Municipal	Natural Gas (therms)	Select Energy; UBWPAD; Water Filtration; Airport
Municipal	Light Fuel Oil (gallons)	Peterson Oil**; UBWPAD; Water Filtration; Airport
Municipal	Electricity (kWh)	Select Energy; National Grid; UBW-PAD; Water Filtration; Airport
Municipal	# of Employees	Census
Transportation	Personal Vehicles (VMT)	CMRPC; Mass Highway
Transportation	Bus - WRTA (VMT)	WRTA
Transportation	Rail - MBTA (VMT)	MBTA
Waste	Trash (tons)	DPW; Wheelabrator; Schools
Waste	Compost (cubic yds. or tons)	DPW
Waste	Recycling (tons)	DPW

Municipal Operations Data Collection

Sector	Department	Parameter (suggested units)	Source
Buildings	Schools	Natural Gas (therms)	Select Energy
Buildings	Schools	Light Fuel Oil (gallons)	School Dept.
Buildings	Schools	Electricity (kWh)	Select Energy
Buildings	City Hall	Natural Gas (therms)	Select Energy
Buildings	City Hall	Light Fuel Oil (gallons)	DPW
Buildings	City Hall	Electricity (kWh)	Select Energy
Buildings	Sewage Treatment	Natural Gas (therms)	UBWPAD
Buildings	Sewage Treatment	Light Fuel Oil (gallons)	UBWPAD
Buildings	Sewage Treatment	Electricity (kWh)	UBWPAD
Buildings	Water Filtration	Natural Gas (therms)	Director WF plant
Buildings	Water Filtration	Light Fuel Oil (gallons)	Director WF plant
Buildings	Water Filtration	Electricity (kWh)	Director WF plant
Buildings	Fire	Natural Gas (therms)	Select Energy
Buildings	Fire	Light Fuel Oil (gallons)	Fire Dept.
Buildings	Fire	Electricity (kWh)	Select Energy
Buildings	Police	Natural Gas (therms)	Select Energy
Buildings	Police	Light Fuel Oil (gallons)	Police Dept.
Buildings	Police	Electricity (kWh)	Select Energy
Buildings	Airport	Natural Gas (therms)	Airport
Buildings	Airport	Light Fuel Oil (gallons)	Airport
Buildings	Airport	Electricity (kWh)	Airport
Buildings	Other Buildings	Natural Gas (therms)	Select Energy
Buildings	Other Buildings	Light Fuel Oil (gallons)	Purchasing Dept.
Buildings	Other Buildings	Electricity (kWh)	Select Energy
Transportation	Parks Dept. (Hope Cm.)	Diesel fuel (gallons)	DPW / Parks / Hope Cm.
Transportation	Parks Dept. (Hope Cm.)	Gasoline (gallons)	DPW / Parks / Hope Cm.
Transportation	DPW	Diesel fuel (gallons)	DPW
Transportation	DPW	Gasoline (gallons)	DPW
Transportation	Police	Diesel fuel (gallons)	Police
Transportation	Police	Gasoline (gallons)	Police
Transportation	Fire	Diesel fuel (gallons)	Fire
Transportation	Fire	Gasoline (gallons)	Fire
Transportation	Airport	Diesel fuel (gallons)	Airport
Transportation	Airport	Gasoline (gallons)	Airport
Transportation	School Buses	Diesel fuel	Durham Bus***
Transportation	Sewage Treatment	Diesel fuel (gallons)	UBWPAD
Transportation	Sewage Treatment	Gasoline (gallons)	UBWPAD
Lighting	Traffic Lights	Electricity (kWh)	Select Energy / DPW
Lighting	Street Lights	Electricity (kWh)	National Grid / DPW
Lighting	Recreational Lights	Electricity (kWh)	Select Energy / DPW

Appendix F: Binghamton Tree Coupon Program Application

APPLICATION

_____
Name

_____
Address of Property

_____
Mailing Address (if different from above)

_____
Email Address

_____   _____
Home Phone   **Work Phone**

Consent: I, the undersigned property owner, do solemnly swear that I am the bona fide owner of the property for which this application is filed, and that I have read and understand the Yard Tree Coupon Program, its terms and conditions, and the agreement presented in the Program Summary & Application. I hereby agree to indemnify and hold harmless the City and its agents and employees from and against any and all claims, damages, and/or liability arising from or related to this application or issuance of any funds there under.

_____
Signature   **Date**

Mail or deliver the completed application to:
Amelia LoDolce
Department of Planning, Housing & Community Development
City Hall
38 Hawley St
Binghamton, NY 13901
For more information, call 772-7028

Ineligible Trees*

- Silver Maple
- Norway Maple *(including Crimson King)*
- Chestnut
- Horse Chestnut
- Cottonwood
- Box Elder
- Ash *(all varieties)*
- Gingko *(females only)*
- Willow
- Catalpa
- Poplar
- Aspen
- Pin Oak

* These trees are ineligible either because they are considered a "nuisance" tree in City code, are prone to disease, or are ill suited for the urban environment.

Participating Retailers

Agway
†*additional $10 discount*
145 Broad Avenue
Binghamton, NY
607-723-7409
www.binghamtonagway.com

Stony Hill Farm Greenhouses
†*additional 10% discount*
3801 Brady Hill Rd
Binghamton, NY
607-669-4187
www.danastonyhill.com

Hillside Garden Center
additional $10 discount
1449 Upper Front St
Binghamton, NY
607-722-4208
www.hillsidegardencenter.com

W & W Nursery and Landscaping
906 Marshland Rd
Apalachin, NY
607-687-0305
www.wwnursery.com

What is the Shade Tree Commission?

The Shade Tree Commission is an advisory board for the City of Binghamton made up of seven members, who are charged with studying the problems and determining the needs of the City of Binghamton in connection with its tree planting programs. The Commission is also charged with helping the Parks and Recreation Department decide what type of trees will be planted in the City as well as for assisting with the dissemination of news and information regarding selection, planting, and maintenance of trees within the City limits.

Contact the Commission at: 772-7001 or shadetree@cityofbinghamton.com

Printed on 100% Recycled Post-Consumer content paper

City of Binghamton
Yard Tree Coupon Program

Program Summary and Application
2009

Sponsored by the Department of Planning, Housing & Community Development, the Department of Parks and Recreation, and the Shade Tree Commission

City of Binghamton
Restoring The Pride

PROGRAM SUMMARY

The City of Binghamton is sponsoring the Yard Tree Coupon Program for 2009 in an effort to encourage property owners to plant trees. Developed by the City of Binghamton Shade Tree Commission, the Yard Tree Coupon Program provides a $35 coupon to eligible property owners for the purchase of a tree that will be planted on their land. This program began in 2008.

TERMS & CONDITIONS:

1. **Participants**. Both residential and non-residential property owners may apply. If the property is leased, the property owner must consent by completing the application (see reverse side). The property must lie within the area of eligibility (see map), and the property owner must not currently have any City code violations.

2. **Availability of Funds**. The budget for this program is $5,000 for 2009. Coupons will be awarded on a first-come first-served basis and will be limited to one coupon per property. Accepted applicants will receive a coupon worth $35 off the purchase of one tree with a retail price of at least $50 that qualifies under the Shade Tree Coupon Program from a local participating nursery and garden center retailer (see reverse side).

3. **Program Schedule**. This offer will be honored for sales between May 1, 2009 and November 30, 2009.

4. **Ineligible Tree Species**. Certain tree species which are considered nuisances, are particularly prone to disease, or not

The planting of new trees on private property will provide numerous benefits to both property owners and our community as a whole. For example, trees can reduce building heating and cooling costs, improve air quality, reduce erosion and stormwater runoff, offset carbon dioxide emissions, and beautify neighborhoods—all of which contribute to a higher quality of life for Binghamton residents.

suited for an urban environment will not be covered by this coupon program. See the list of ineligible trees for restrictions.

5. **Planting Location**. Trees purchased under this program may not be planted in the utility strip (contact the Binghamton Department of Parks and Recreation to request a tree for this location). Trees should be planted in appropriate locations to prevent interference with water, sewer, and power lines. Trees must be planted at the address stated on the application. Failure to do so will result in an obligation to repay $35 to the City of Binghamton.

6. **Notification**. The Department of Planning, Housing, and Community Development will review the applications and make all awards. Coupons will be mailed to accepted applicants within one month of application.

AGREEMENT:

1. The property owner agrees to plant and maintain any tree(s) purchased with assistance of the Shade Tree Coupon Program in a healthy condition for the natural life span of the tree(s). The City of

☐ U.S. Census Block Groups
■ Area of Eligibility

A larger map is available online at:
http://www.cityofbinghamton.com/dept-planning.asp

Binghamton will not be responsible for the planting or any maintenance of the trees purchased with coupons from this program, nor will the City of Binghamton be responsible for any damages incurred to private property (including to electric, sewer or water lines running through private property) by trees purchased through this program at any point throughout their natural life span.

2. Before planting a tree, the property owner agrees to contact Dig Safely, New York (1-800-962-7962) to be sure that underground power lines and other utilities willl not be disturbed by the new tree.

Source:

http://www.cityofbinghamton.com/UserFiles/File/Going%20Green/Yard%20Tree%20Program/2009%20Yard%20Tree%20Coupon%20Application.pdf

Appendix G: Greening New York's Cities Analysis Report

AMERICAN FORESTS
americanforests.org

Current

Analysis Report
for
Syracuse

CITYgreen
calculating the value of nature

Land cover areas are in acres.

■ Impervious Surfaces	7,905.0	48.2%
■ Open Space - Grass/Scattered Trees	3,531.7	21.5%
■ Trees	4,373.5	26.7%
■ Urban: Bare	224.3	1.4%
■ Water Area	371.9	2.3%
Total:	16,406.4	100.0%

Total Tree Canopy: 4,373.5 acres (26.7%)
Total Urbanized Area: 8,129.3 acres (49.5%)

Air Pollution Removal

Nearest Air Quality Reference City: **Albany**

	Lbs. Removed/yr	Dollar Value
Carbon Monoxide:	4,170	$1,780
Ozone:	131,010	$402,490
Nitrogen Dioxide:	40,413	$124,158
Particulate Matter:	92,339	$189,402
Sulfur Dioxide:	21,294	$15,981
Totals:	**289,226**	**$733,810**

Stormwater

Water Quantity (Runoff)

2-yr, 24-hr Rainfall:	2.75 in.
Rainfall Distribution Type:	II
Curve Number reflecting existing conditions:	82
Curve Number using default replacement landcover:	91

	% change
Time of Concentration:	-28.24
Peak Flow:	109.43
Potential for Infiltration:	-36.68
Additional Storage volume needed (to mitigate the change in peak flow):	24,799,656 cu. ft.
Construction cost per cu. ft.:	$2.00
Total Stormwater Value:	**$49,599,312**
Annual costs based on payments over 20 years at 6% interest:	**$4,324,294 per year**

Water Quality (Contaminant Loading)

Percent Change in Contaminant Loadings

Landcover data for this analysis was provided by the USFS as described in the General Technical Report NE-287

AMERICAN FORESTS
americanforests.org

Syracuse Analysis Report
for
Additional Benefits Due to a 5 Percentage Point Increase in Tree Cover

CITYgreen
calculating the value of nature

Land cover areas are in acres.
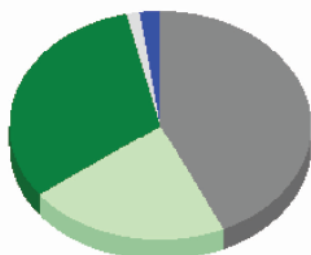
Impervious Surfaces	7,071.2	43.1%
Open Space - Grass/Scattered Trees	3,527.4	21.5%
Trees	5,200.8	31.7%
Urban: Bare	229.7	1.4%
Water Area	377.3	2.3%
Total:	16,406.4	100.0%

Total Tree Canopy: 5,200.8 acres (31.7%)
Total Urbanized Area: 7,300.9 acres (44.5%)

Additional Air Pollution Removal

Nearest Air Quality Reference City: **Albany**

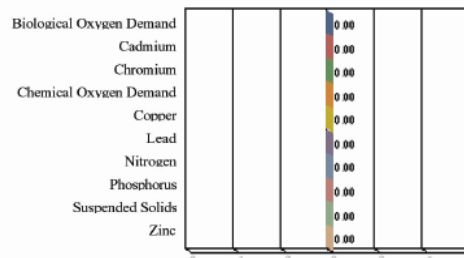|	Additional Lbs. Removed/yr	Dollar Value
Carbon Monoxide:	784	$335
Ozone:	24,623	$75,648
Nitrogen Dioxide:	7,596	$23,336
Particulate Matter:	17,355	$35,598
Sulfur Dioxide:	4,002	$3,004
Totals:	**54,360**	**$137,920**

Stormwater

Water Quantity (Runoff)

2-yr, 24-hr Rainfall: 2.75 in.
Rainfall Distribution Type: II

Curve Number reflecting existing conditions:	82
Curve Number using modeled landcover:	81

	% change
Time of Concentration:	3.28
Peak Flow:	-2.83
Potential for Infiltration:	2.72
Reduction in storage volume required for stormwater management:	2,510,501 cu. ft.
Value per cu. ft.:	$2.00
Total Stormwater Value:	**$5,021,002**
Annual value based on payments over 20 years at 6% interest:	$437,754 per year

Water Quality (Contaminant Loading)
***Not Applicable for Available Data**

Percent Change in Contaminant Loadings

Biological Oxygen Demand 0.00
Cadmium 0.00
Chromium 0.00
Chemical Oxygen Demand 0.00
Copper 0.00
Lead 0.00
Nitrogen 0.00
Phosphorus 0.00
Suspended Solids 0.00
Zinc 0.00

Landcover data for this analysis was provided by the USFS as described in the General Technical Report NE-287

Source: (Greening New York's Cities 2004)

Appendix H: List of Syracuse Tree Stakeholders

Chapter 7: Agencies and Groups Influencing Urban Forest Management in Syracuse

Paul O'Connor

Cornell Cooperative Extension of Onondaga County, Syracuse, NY

The management of Syracuse's urban forest resource is being improved through the efforts and partnering of numerous agencies and groups with city government. The role of these agencies and groups is described in this chapter. A list of key contacts is included in the Appendix.

City Government: The Mayor, Common Council, and city employees are ultimately responsible for the management of public trees within the right-of-ways and parks in Syracuse. Planting, maintaining, and assessing of trees are the responsibility of the Department of Public Works Commissioner. Currently, this department has a Forestry Superintendent and a support staff of five people. On the city's Tree City USA application for 2000, the annual budget for forestry activities is $575,140. The personnel structure and job functions for city forestry activities are:

- *Forestry and Landscape Superintendent*: Responsible for Syracuse's urban forestry program and all work relating to tree care, including emergency tree removal, developing specifications for all tree work done by contract, and supervising the inspector, tree crews, and technical personnel.

- *Tree Trimmer II (Inspector)*: Responsible for on-site inspections of street and park trees and provides recommendations on tree removal and pruning. Supervises tree trimming, removal, and tree care work of crew(s). Performs tree removal, trimming, and maintenance activities; does related work as required.

- *Tree Trimmer I*: Performs trimming and maintenance activities, and related work as required. This reoccurring work entails on-the-ground trimming, pruning and cutting of diseased, damaged, or dead limbs using handsaws and chain saws. Tree Trimmer I works under the direction of the Inspector.

- *Laborer*: Works with Tree Trimmer II as part of ground crew.

- *Landscape Architect*: Works with the Forestry Superintendent regarding tree-related work in city parks. Responsible for the design and planting of park and median trees and tracks contractor work schedules and billing.

- *Data Specialist*: Works with the Forestry Superintendent and the Inspector. Responsible for daily input of data, service requests, and resident

inquiries, as well as daily tracking of field requests and contractor work schedules. Also responsible for contractor's billing.

Bureau of Research: Syracuse's Bureau of Research provides grant support and serves as a link between city departments and groups, such as Re-Leaf Syracuse.

Park Associations: Some Syracuse residents have taken an active role in the welfare of city parks by forming park associations. These park associations have great potential to influence the management of public parks.

Syracuse City School District: Management of public trees on school property is the responsibility of the school district. Funding for the management of trees on school property is separate from funding to manage city trees. Increased collaboration among city departments and the school district can enhance future forestry-related activities.

Re-Leaf Syracuse Committee, Inc. (Re-Leaf Syracuse): Re-Leaf Syracuse is a nonprofit organization created in response to the 1998 Labor Day Storm. It serves as an advisory council for all aspects of urban forest management in Syracuse. Several subcommittees chaired by members of the Re-Leaf Syracuse Board of Directors facilitate grassroot opportunities for residents to become involved in the management of the city's urban forest. Current subcommittees include:

- Design and Master Plan — develops and updates the city master plan for Syracuse.

- Funding and recognition — procures funding to supplement the city budget for forestry activities.

- Education/Communication — provides technical assistance to city staff, initiates outreach programs, and provides information on forestry activities to city residents.

Tomorrow's Neighborhoods Today: TNT is a neighborhood planning effort that brings together neighborhood stakeholder groups to improve the quality of life in Syracuse. The group consists of eight TNT area planning councils that are led by volunteers and supported by the city's Division of Neighborhood Planning. TNT provides a path for communicating information at the neighborhood level as well as resident-based outreach educational activities, and is a source of volunteers.

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USDA Forest Service: Researchers at the USDA Forest Service's Northeastern Research Station unit in Syracuse work with partners to quantify the environmental effects of urban vegetation and develop appropriate management strategies to improve environmental quality in urban areas. Station staff provide research knowledge and links to regional/ national efforts.

Cornell Cooperative Extension of Onondaga County: CCE provides technical expertise and educational outreach serving municipal, residential, and industry audiences. CCE serves as a link to county communities, other professionals, Syracuse residents, and the resources of Cornell University.

New York State Department of Environmental Conservation: DEC serves as a vehicle for cost-share funding of urban forestry activities by the USDA Forest Service. It provides technical expertise and is a partner in educational outreach activities.

Niagara Mohawk Power Corporation: NMPC manages vegetation along its utility corridors throughout Syracuse. It has a strong interest in the management of trees that affect power lines. NMPC has developed cost-share programs and its associated foundation is a potential source of grant funding.

SUNY College of Environmental Science and Forestry: SUNY-ESF is a source of research and environmental knowledge through its undergraduate and graduate study programs, including the development of projects on urban forestry and landscape design.

New York State Arborists Association: NYSA is the state chapter of the International Society of Arboriculture. Members provide tree-care services for residents and municipalities as well as technical expertise in maintenance operations and outreach participation through Arbor Day activities.

Syracuse/Onondaga County Planning Agency: SOCPA provides technical expertise in mapping and planning community resources and provides links to development efforts outside of Syracuse. SOCPA also is staff for the City Planning Commission and Board of Zoning Appeals.

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