






visioncny

Central New York
Regional Sustainability Plan

CLEANER GREENER COMMUNITIES

June 2013

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Executive Summary

The VisionCNY Plan provides a framework that can be used by communities in Central New York to chart a path toward a sustainable future.



The Central New York Regional Sustainability Plan (VisionCNY) was prepared by a regional consortium of communities and a planning team led by the Central New York Regional Planning and Development Board (CNY RPDB) under the auspices of the NYS Cleaner, Greener Communities (CGC) Regional Sustainability Planning Program. This statewide initiative was established by Governor Cuomo in 2011 to develop strategies through a regional planning process. The program is designed to help regions across the State develop plans that will serve as a foundation for investments that will provide the basis for a sustainable future.

Funding for the CGC program comes from the Regional Greenhouse Gas Initiative (RGGI) and is administered by the New York State Energy Research and Development Authority (NYSERDA). NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise and funding to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce their reliance on fossil fuels.

The CGC program is a two-phase competitive grant process. Phase I funding was provided to ten regions across the State as defined through the NYS Regional Economic Development Council Program. Funding was made available to develop regional plans through a process that allowed each region to develop a series of goals, strategies, and project recommendations to support a sustainable future.

Phase II of the CGC Program will provide up to $90 million in statewide funding awarded on a competitive basis for projects that support the implementation of regional sustainability plans. Phase II is scheduled to be launched by NYSERDA in 2013.

The NYS Cleaner Greener Communities program is designed to guide and support actions that encourage certain policy initiatives including:

+ Community-based planning
+ Comprehensive municipal land use policies
+ Coordinated infrastructure investment
+ Promotion of sustainable growth

For purposes of the CGC program, NYSERDA defines sustainability as: "...living, operating, and growing more efficiently while using fewer resources ... lowering costs, creating businesses and jobs, and improving the quality of life for all residents in NYS."

The CGC program provides a vehicle for communities to partner with public and private officials for the purpose of encouraging a discussion that provides the foundation for the development of regional sustainability plans across the State. Participants in the CGC program are asked to examine the conditions of their communities and identify strategies that can be implemented to significantly improve the quality of life for the residents in their respective regions. This effort is expected to guide a range of initiatives at the State and local level in several policy areas including energy management, infrastructure, land use, environment, economic development, materials management, and climate adaptation.

This planning effort brings together representatives from local government, the business community, non-profit organizations, citizens, and other key stakeholders to discuss regional strengths and weaknesses. The effort is designed to (1) engage and encourage local participation; (2) gather information on sustainable community and economic development projects and programs already being undertaken in a region; (3) give stakeholders a central location to document and showcase the efforts already underway in their communities; (4) give public officials, community leaders, and residents the information and support that is needed to advance sustainable programs in their communities; and (5) identify opportunities for new sustainable programs and initiatives.

The purpose of this process is to create a long-term vision for a region using the collaborative input of regional stakeholders and public participants. The planning process is designed to be representative of many voices throughout a region and focused on a long-term perspective. Based upon this approach, this process will provide State and local officials the perspective needed for long-term commitments and investments in economic, social, and environmental resilience.

visioncny: What if...

+ the region's current population of 791,500 increased to 1 million residents?
+ the Erie Canal National Heritage Corridor and the Loop-The-Lake Trail served as the backbone for an expanded trail network in CNY?
+ a network of Combined Heat and Power (CHP) plants is developed across the region?
+ a network of green infrastructure and stormwater management facilities is developed in CNY?
+ the region is served by a true high speed rail passenger line?
+ the amount of greenhouse gases emitted in CNY is reduced by 40%?
+ the MWB constructed a second transmission line and district energy supply from Lake Ontario?
+ the region's current per capita income of $36,833 increased by 10% to equal the national average of $39,980?
+ the region's electric power transmission and distribution facilities were upgraded and integrated in a smart-grid network?
+ an iconic architectural design is chosen as part of the solution to the I-81 challenge?
+ a coordinated plan is developed to integrate the region's network of conservation areas?
+ the total number of jobs in the region increased from 320,000 jobs in 2012 to 405,000 jobs?
+ communities across the region implemented a "Save-The-Watt" energy campaign?
+ the region's cultural resources and historic assets are supported by a coordinated capital campaign?
+ a network of CNG and electric car fueling stations is developed at key locations in the region?
+ 25% of the energy consumed in CNY came from renewable resources?
+ residents in CNY drove 25% fewer miles each year?
+ the total amount of land in agriculture use was increased by 25%?
+ all of the region's public lights were upgraded to LEDs?
+ a comprehensive urban infill development program is implemented in CNY?
+ a modern intermodal rail and "inland-port" is developed in the region?
+ the Save-The-Rain Campaign is expanded across the region?
+ the region had a light rail transit system?

The Plan at a Glance

Community representatives organized the plan around several major public policy issues including energy, infrastructure, land use, environment, economic development, materials management, and climate adaptation identifying for each a broad goal and a series of strategies and project recommendations.



Public meeting, December, 2012

Planning Process

The preparation of the Central New York Regional Sustainability Plan was initiated in July 2012 under the direction of the CNY RPDB representing a consortium of municipalities across the five-county region. This consortium served as the governing body for the entire planning process, which took place over a period of twelve months and concluded in June 2013. This municipally-led planning process involved extensive research and data gathering, public outreach, a consensus-building process, and coordination with the Central New York Regional Economic Development Council (CNY REDC).

To assist with the preparation of the plan, the CNY RPDB assembled a team of technical consultants that was led by O'Brien and Gere Engineers and included AWS Truepower, Barton & Loguidice Engineers, CDH Energy, Earth Sensitive Solutions, HB Solutions, and Terrapin Bright Green. In addition, the CNY RPDB formed a VisionCNY Technical Advisory Committee. This committee consisted of twenty-five individuals representing a broad range of community interests in Central New York. Organizations represented on the committee included Onondaga County, Oswego County, CenterState CEO, National Grid, the Syracuse Center of Excellence in Energy and Environmental Systems, King + King Architects, Bristol-Myers Squibb, Syracuse University, the State University of New York College of Environmental Science and Forestry, Colgate University, Morrisville State College, Bergmann Associates, and the Villages of Hamilton, Skaneateles, and Solvay.

To guide the planning process, the CNY RPDB held a series of bimonthly meetings throughout the program year. These policy level meetings were coordinated with staff and technical consultant meetings that were held with the VisionCNY Technical Advisory Committee. To complement this effort, the CNY RPDB organized a series of focus group meetings across the region with county and municipal officials, key agency staff, and other community representatives. In addition, three presentations were made to the CNY REDC.

To supplement these meetings, the CNY RPDB solicited input directly from the public through the project's website at visioncny.org. This interactive website featured several components including sections which allowed visitors an opportunity to learn more about the region, take a poll, and share their thoughts about VisionCNY. In addition to the use of this social media tool, traditional public

meetings were held in October and December 2012. Overall, approximately 150 people participated directly in the public outreach campaign.

A Vision for Regional Sustainability

Based upon NYSERDA guidelines and public input, the planning team developed a regional sustainability plan for Central New York that advances a long-term vision for the region that:

+ Encourages a reasonable increase in the region's population;
+ Enhances economic development, community vitality, and environmental stewardship;
+ Promotes the wise use of the region's energy resources; and
+ Supports the State's long-term goals of reducing GHG emissions.

To achieve this vision, the planning team developed a set of principles to guide the development of the general goals, strategies, and project recommendations that were incorporated into the plan. These guidelines include:

+ Using community resources efficiently and adopting a long-term view of needed investments that includes social and environmental costs.
+ Consideration of the long-term impact of all community initiatives with the understanding that economic health, environmental quality, and community well-being are interdependent.
+ The need to protect and restore air, water, and land to preserve biological diversity, environmental health, and a natural resource base for future generations.
+ The recognition that partnerships among local, regional, and state government, businesses, residents, and all community stakeholders are necessary to achieve a sustainable community.
+ Building community awareness, responsibility, involvement, and education as key elements of successful policies, programs, and projects.

Technical Approach

Based upon NYSERDA guidelines, the regional plan is divided into seven major program focus areas. These public policy areas include energy management, infrastructure, land use, environment, materials management, economic development, and climate adaptation. Regarding infrastructure, issues addressed in this section include transportation, water and sewer facilities, telecommunication, and energy production and transmission facilities.

Using federal, state and other data sources, the planning team conducted a baseline assessment of existing conditions in CNY. This assessment provided the basis for the development of a broad goal for each public policy area addressed in the plan along with a series of specific targets or metrics which can be used to measure the region's progress toward economic growth and community sustainability. Targets were set with discrete milestones in the year 2030 and 2050. Collectively, each metric and target constitutes an 'indicator' of sustainable development.

Using the baseline assessment as a foundation and the goals and targets as guidelines, the planning team worked closely with its community representatives, focus group participants, and the general public to identify a variety of actions that can be undertaken by a broad spectrum of stakeholders including government, businesses, non-profit organizations and citizens to implement the regional sustainability plan. For each focus area, ten broad strategies are presented and broken up into two categories including short-term opportunities and long-term initiatives. Short-term opportunities are designed to direct attention to work already underway in Central New York or to efforts that can be implemented in the next five years. Long-term initiatives are defined to be more broadly-based and undertaken over an extended time horizon. To supplement these strategies, a representative list of project examples is presented in Appendix I. In reviewing this information, it is important to note that the ideas presented in this plan represent a partial list of suggestions which were considered during the planning process and were chosen in a qualitative manner for inclusion in the plan based on the extent to which they meet several sustainable criteria including:

+ Is the proposal consistent with VisionCNY and other regional and local plans, including the CNY REDC Strategic Economic Development Plan 2012–2016?
+ Will it support reasonable population, job and income growth in the region?
+ Does it result in significant GHG reductions and efficient energy use?
+ Does it have a project sponsor and is it ready for implementation?
+ Can it be replicated in communities across the region?
+ Can it leverage public and private sector investment?
+ Does it provide geographic balance and representation?
+ Does it strengthen the region's resiliency?

The goals, strategies, and project examples incorporated into the VisionCNY plan represent the culmination of a comprehensive planning process that has taken place over the past 12 months. To be effective, communities across the five-county region must remain focused and use this planning effort as the basis to determine what actions must be taken to help ensure a sustainable future for Central New York.

Goals, Targets, and Strategies

A cornerstone of VisionCNY is the goal, targets, and strategies which have been developed for each policy area addressed in the plan.

VisionCNY represents a comprehensive plan which has been developed to provide a roadmap to help communities in Central New York chart a path to a sustainable future. To monitor the effectiveness of the plan, a very broad goal has been developed for each policy area including energy management, infrastructure, land use, environment, economic development, materials management, and climate adaptation. To measure the region's progress toward the achievement of each goal, five measurable targets have been incorporated into each chapter. To ensure the effectiveness of the approach, indicators were chosen, in part, because of availability of public data sources.

Building up this work, a set of strategies has been incorporated into the plan. As noted earlier, ten strategies have been presented for each policy area. These strategies represent initiatives which have been recommended by community representatives for both immediate implementation and long term consideration in the region. In addition, the plan also includes project ideas (Appendix I) that provide ideas of how local stakeholders can collaborate to advance sustainable principles in CNY. In presenting this information, it is important to note that many other worthy suggestions have been made over the past 12 months regarding steps which can be taken to help implement the plan across the five-county region. In each policy area, some of these suggestions are summarized in the plan in the form of specific project recommendations. In other cases, this information has been recorded throughout the planning process and many of these suggestions will receive consideration in the months and years ahead as work on the plan progresses.

Energy Management

Goal: Improve the region's energy management by increasing the efficiency of residential and commercial buildings, curtailing energy demand, increasing the use of local clean energy sources in place of fossil fuels, and accelerating the development of advanced energy technologies.

Targets

1) Reduce regional energy consumption per capita, including electricity and fuels, by 40% (below 2010 levels) by 2030.
2) Increase the amount of electricity generated by renewable sources within the region to meet 25% of the region's consumption by 2030.
3) Increase the annual energy savings achieved through NYSERDA-funded commercial energy efficiency projects by 35% by 2020 and by 50% by 2030.
4) Certify 20% of existing public buildings to ENERGY STAR® or similar energy-efficiency standards by 2030.
5) Increase the portion of new residential buildings built to ENERGY STAR® or similar energy-efficiency standards to 50% by 2030.

Strategies

Short-Term Opportunities

a) Reduce energy consumption and improve energy efficiency in residential and commercial buildings.
b) Promote the development of renewable energy resources.
c) Increase access to private and public financing options for investments in energy efficiency and distributed generation.
d) Prepare a Regional Energy Roadmap.

Long-Term Initiatives

e) Facilitate the use of combined heat and power.
f) Develop district energy systems.
g) Develop neighborhood-scale "net zero" projects.
h) Upgrade or replace power generation, transmission, distribution and storage systems to encourage the development of renewable energy resources and smart grid technologies including vehicle-to-grid.
i) Foster local innovation including the development of clean energy businesses.
j) Encourage the deployment of advanced energy technologies such as hydrogen fuel cells.

Infrastructure

Goal: Provide infrastructure that reduces greenhouse gas emissions, revitalizes existing communities, improves the quality of life, strengthens targeted industry concentrations, and improves the region's competitiveness.

Targets

1) Reduce the total vehicle miles traveled annually in the region by 25% by 2030.

2) Decrease the number of bridges and roads that are rated as "deficient" or "poor" by 25% by 2030.
3) Upgrade 25% of the region's water and wastewater treatment plants by 2030.
4) Maintain the amount (no net decrease) of electric power production within the region that is derived from carbon-free sources.
5) Increase the percentage of CNY residents with high-speed broadband service from 87% to 92% by 2030.

Strategies

Short-Term Opportunities

a) Support a "fix-it-first" regional infrastructure policy
b) Encourage transit-oriented development and bus rapid transit service for priority corridors
c) Expand network of public transit park-and-ride facilities

Long-Term Initiatives

d) Develop a regional transportation demand management program
e) Develop "complete streets" to encourage walking and bicycling
f) Develop a network of CNG fueling stations and EV charging stations
g) Expand use of rail and barge systems in the region
h) Maintain a comprehensive water and wastewater infrastructure investment program
i) Develop safe and reliable energy production facilities and transmission resources that minimize greenhouse gas emissions
j) Expand the region's telecommunication broadband network

Land Use

Goal: Manage the region's economic and physical development through the efficient and equitable use of land to conserve its natural and cultural resources and revitalize its urban cores, main streets and existing neighborhoods.

Targets

1) Reduce the amount of land occupied in Central New York on a per capita basis to 0.225 acres per person.
2) Increase the number of acres of critical conservation areas in Central New York by 25%.
3) Create 50 new miles of dedicated cycle tracks along major commuting corridors by 2030.
4) Reduce the percentage of household income spent on housing and transportation costs in Central New York by 10%.
5) Support activities that maintain or increase the level of farmland in the region, currently at 815,000 acres.

Strategies

Short-Term Opportunities

a) Implement a community-based urban infill program.
b) Implement a regional pedestrian and bicycle trail access program.
c) Implement a regional main street revitalization program.

Long-Term Initiatives

d) Assist communities with the implementation of a smart growth regulatory and incentive program.
e) Support a regional natural area conservation protection program.
f) Develop a regional recreation and cultural heritage protection program.
g) Support a regional agriculture land protection program.
h) Implement a comprehensive brownfield redevelopment program.
i) Support an ECNHC waterfront revitalization program.
j) Promote municipal adoption of a complete streets program.

Environment

Goal: Conserve and protect the quality of the region's water, air, land and wildlife resources without compromising the ability to meet current and future resource dependent needs.

Targets

1) Ensure no net increase in consumptive water withdrawals through 2030.
2) Reduce the number of impaired water bodies in CNY by 50% by 2030.
3) Reduce the number of combined sewer overflows (CSOs) in CNY by 65% by 2030.
4) Reduce the percentage of impervious surfaces in the Syracuse Urbanized Area from 21% to 18% by 2030.
5) Reduce air pollutant emissions by 25% for ozone, sulfur, particulates, and carbon monoxide by 2030.

Strategies

Short-Term Opportunities

a) Provide tools, resources and training for local officials to encourage resource conservation.

b) Promote a comprehensive regional green infrastructure program to improve air and water quality.
c) Develop a regional urban-rural forestry restoration program.

Long-Term Initiatives

d) Implement a coordinated regional invasive aquatic weed-harvesting management program.
e) Utilize and replicate natural systems in support of critical infrastructure services to protect and improve water quality.
f) Develop a regional program to reduce the amount of impervious parking areas.
g) Implement targeted infrastructure improvement for pollution sources known to impact impaired water bodies.
h) Develop a regional public education and water conservation program.
i) Support a regional agriculture cover-crop and no-till program in priority watersheds.
j) Develop a coordinated stream restoration program for high priority water-bodies.

Economic Development

Goal: Support the growth of a diverse economic base that will provide employment opportunities for a broad cross section of citizens across the five-county region.

Targets

1) Increase the region's current population of 791,500 to 1 million residents by 2050.
2) Increase the regions' current number of jobs from 320,000 to 405,000 by 2030.
3) Increase the region's per capita income to equal or exceed the national average by 2030.
4) Improve the region's national economic strength index rating to a "Top 50" score.
5) Increase the number of clean-energy jobs in Central New York as measured by the Brookings Institute by 25% over the next 20 years.

Strategies

Short-Term Opportunities

a) Maintain a strong foundation for the management and efficient delivery of government services at the federal, state, and local level.
b) Support the development and maintenance of a modern infrastructure network in Central New York that is focused on roads, sewer and water facilities, transit services, telecommunication resources, air and rail services, shovel ready development sites, and port facilities.

Long-Term Initiatives

c) Develop a coordinated regional program that will improve the quality of life in Central New York through targeted investments in the region's recreation, cultural, arts, and historic resources.
d) Maintain a strong network of county and regionally-based organizations with the capacity to coordinate the delivery of a range of economic development services, tax abatement, and financial assistance in Central New York.
e) Support the operation of a coordinated and robust business retention and expansion program in Central New York
f) Maximize the region's human capital by improving the alignment of workforce supply and employment demand in the region.
g) Encourage the growth of a strong entrepreneurial culture in Central New York that will strengthen the region's economy through new venture formation and product development activities.
h) Support the region's industry concentrations through investment of resources in targeted research initiatives, capital funding, and workforce training programs.
i) Coordinate implementation of a comprehensive regional marketing and business recruitment program.
j) Implement a comprehensive regional export marketing campaign and technical assistance program.

Materials Management

Goal: Improve the environmental performance and the economic development and job creation potential of the region's material management systems by reducing the production of waste and increasing materials reuse, recycling and energy recovery.

Targets

1) Reduce regional total solid waste generated per capita, including MSW, C&D, hazardous and industrial materials, by 75% (below 2010 levels) by 2030.
2) Reduce the amount of MSW generated and then disposed of in landfills or via energy recovery by 82% (below 2010 levels) by 2030.
3) Reuse 50% of C&D waste by 2030.
4) Increase the amount of food and yard waste composted by 75% by 2030.
5) Increase the number of dairy farm-based anaerobic digesters operating in the region from seven to 20 by 2030.

Strategies

Short-Term Opportunities

a) Increase recycling of post-consumer waste through a regional education campaign and convenient public receptacles.
b) Increase reuse and recycling of construction and demolition materials.
c) Increase diversion of residential and commercial organic material from landfills according to the EPA's food recovery hierarchy.

Long-Term Initiatives

d) Establish municipal single-stream curbside recycling programs.
e) Institute "green fees" or "pay-as-you-throw" programs to incentivize waste reduction and recycling.
f) Convert municipal and private waste transport vehicles to alternative fuels.
g) Install methane collection and control systems, including landfill gas-to-energy (LFGTE) facilities and anaerobic digesters at dairy farms, waste water treatment facilities, and industrial businesses.
h) Support industrial symbiosis through a regional outreach and technical assistance program.
i) Improve the infrastructure for managing specialized materials, including agricultural plastics, electronics and household hazardous waste.
j) Establish local government sustainable procurement policies.

Climate Adaptation

Goal: Adapt successfully to a changing climate and improve the resilience of the region's communities, infrastructure and natural systems.

Targets

1) Reduce per capita regional greenhouse gas emissions to 40% below 2010 levels by 2030.
2) Increase the number of communities participating in the NFIP community rating system from 2 to 10.
3) Complete 25 community vulnerability assessments by 2030.
4) Increase the number of climate smart communities in CNY from 13 to 26 by 2020 and to 40 by 2030.
5) Reduce the percentage of the region's total land value found in floodplains from 14% to 10% by 2030.

Strategies

Short-Term Opportunities

a) Conduct vulnerability and risk-assessments and cost-benefit analyses to identify key areas for climate adaptation.
b) Develop local greenhouse gas inventories and climate action plans and increase the number of Climate Smart Communities.
c) Implement measures to mitigate impacts to critical infrastructure.

Long-Term Initiatives

d) Provide assistance to address climate impacts on agriculture, make the regional food supply system more resilient to climate change, and enhance rural economic security.
e) Develop systems to prepare for and respond to more frequent and extreme storms and flooding events.
f) Develop a regional inventory of flood-hazard occurrence areas.
g) Complete a regional dam inventory and assessment program.
h) Create a central repository of regional climate data and provide channels for the distribution of information.
i) Develop and implement emergency and hazard mitigation plans.
j) Develop a comprehensive forest management program.

Implementation

VisionCNY represents a comprehensive plan that has been carefully calibrated to meet the needs of communities across the five-county region. The document represents both a short-term action-oriented guide and a long-term strategy to ensure that the region can meet the needs of future generations.



Connective Corridor at Marshall Street and University Avenue, Syracuse

In evaluating the purpose of this comprehensive planning effort, it is important to note that the region has a collective strength and sufficient assets to help ensure the successful implementation of the plan. These resources include several important criteria including:

CNY is a cohesive, well-established region. The region's major transportation network, employment base, commuting patterns, media market, and primary cultural and civic institutions, serve to unify its diverse communities, promote a sense of regional identity, and foster collaboration across jurisdictional boundaries.

CNY has significant organizational capacity and a successful track record of working together. The region is well-served by its five-member counties which operate under a county executive or county manager form of government. Each county has a professionally staffed planning, economic and community development, and transportation department. Most have functioning county-based energy or sustainability advisory committees or full-time coordinators.

In addition, there are a number of regional organizations that provide services and coordinate project implementation across jurisdictional boundaries in CNY. These organizations include National Grid, the Onondaga County Water Authority, the Metropolitan Water Board, and the CNY Regional Transportation Authority. Other organizational resources include Onondaga Community College, CenterState CEO, the Manufacturers Association of CNY, Syracuse Metropolitan Transportation Council, CNY Regional Planning and Development Board, CNY Technology Development Organization, Syracuse Center of Excellence, and the regional offices for the NYS Departments of Environmental Conservation, Transportation, Economic Development, and Labor.

CNY communities and stakeholders have prepared or adopted pertinent plans at the regional or local level. A number of plans that address discrete sustainable development issues such as energy, transportation, land use, water, economic development, and materials management have been prepared in recent years. These plans have identified key strategies and projects which complement and reinforce those described in the VisionCNY plan. Examples include the CNY Regional Economic Development Council's *Strategic Economic Development Plan 2012-2016*, the Onondaga County Sustainability and Climate Action Plans, the Oswego County Energy Efficiency Plan, the joint City of Auburn and Cayuga County Energy Comprehensive Sustainable Energy and Development Plan, and

the City of Syracuse Sustainability Plan. In addition, a number of counties and municipalities are preparing, or have already completed, greenhouse gas inventories, including Onondaga County, Oswego County, Madison County, the City of Syracuse, the City of Oswego, the City of Cortland, the City of Auburn, the Town of DeWitt, the Town of Preble, the Village of Fayetteville, the Village of Skaneateles, and the Village of Cazenovia.

CNY has many examples of sustainability projects already completed or underway. Examples cover the range of the plan's focus areas and include solar PV and other renewable energy systems installed by Onondaga County, the City of Syracuse, Town of DeWitt, Oswego County, City of Oswego, the Town of Preble, and the City of Auburn; the ongoing cleanup of Onondaga Lake; the Connective Corridor and Near West Side Initiative in the City of Syracuse; the Madison County Agriculture and Renewable Energy Park; the Cayuga County Regional Biodigester; and the Port of Oswego East Terminal Connector Project. Successful implementation of these projects builds momentum and local capacity to undertake new projects identified in the VisionCNY plan.

In development of the document, the planning team recognizes that the region faces a number of implementation challenges as well. Most of these impediments apply to any region in NYS or beyond, such as changing federal policies and priorities, a lack of federal support for certain policy areas such as urban redevelopment, and limited availability of private financing for needed but sizeable investments in infrastructure such as sustainable 21st century transportation, water, sewer, telecommunications and energy systems.

As is the case in many communities across the nation, CNY's leadership must cope with many pressing issues that must be prioritized and addressed in the short-term with limited local financial and staff resources. Given these immediate challenges, it is difficult for communities to adopt a longer term planning horizon which is needed to properly evaluate the financial and community benefits of various strategies and projects recommended in the plan.

To meet these challenges, the planning team is strongly recommending that the region continue to move aggressively toward the proper use of resources which are and will be made available to implement the sustainability plan. These resources include Phase II funding through the State's Cleaner, Greener Communities program. Consideration should also be given to NYSERDA programs such as FlexTech, Existing Facilities, New Construction and Industrial Process Efficiency which provide incentives for local government, commercial and industrial and non-profit customers. The New York Power Authority administers a number of energy programs that benefit municipalities and other public entities. National Grid, NYS Electric & Gas, and Rochester Gas & Electric provide rebates and other incentives for energy conservation, infrastructure, and economic development projects.

Through the NYS Regional Economic Development Council CFA capital grant initiative, other programs can be accessed to help implement the plan, as well. These resources include the Department of State Local Waterfront Revitalization Program, the Environmental Facilities Corporation Green Innovation Grant Program, and Empire State Development's Capital Grant and Main Street Program. Federal support is available through programs such as the Environmental Protection Agency (EPA) Smart Growth Implementation Assistance Program, the Economic Development Administration (EDA) Global Climate Change Mitigation Incentive Fund Program and the United States Department of Agriculture (USDA) Rural Energy for America Program.

Moving forward, CNY's stakeholders must acknowledge the challenge before them and focus on the implementation of key high priority strategies and projects in the plan. Success breeds success; projects and programs that perform well will attract attention and build the foundation for future endeavors across the region.

In keeping with its mission as a public planning and development agency serving the counties of Cayuga, Cortland, Madison, Onondaga, and Oswego, the Central New York Regional Planning and Development Board looks forward to working with the Central New York Regional Economic Development Council to provide leadership and serve as a steward responsible for helping to ensure the successful implementation of the plan while measuring the region's success in achieving a sustainable future.



Central New York

+ The region's population of 791,500 is an all-time high.
+ The region has approximately 312,000 households.
+ The region covers 4,146 square miles.
+ The region's per-capita income is $36,980.
+ The region's labor force is 394,600 workers.
+ There are approximately 28,000 manufacturing jobs in CNY.
+ The region consumes approximately 6.2 million MWh of electricity but produces over 25 million MWh of electricity, equal to approximately 14.5% of the state's total generation.
+ The region's per capita greenhouse gas emissions are 13 metric tons of carbon dioxide equivalent (CO_2e), far below the national average of 22 metric tons of CO_2e.
+ There are 104 lakes and 6,229 miles of streams in the region, including 1,942 miles of high-quality, oxygen-rich trout-classified streams.
+ The combined urban and rural forest canopy covers approximately 44% of the region.
+ There are nearly 3,600 farms in the region comprising over 813,000 acres of crop land.
+ The region currently recycles or composts 43.5% of all waste, compared to 36% for New York State.



Chapter 1: Profile of Central New York

***Central New York** is geographically centered in Upstate New York and includes the counties of Cayuga, Cortland, Madison, Onondaga, and Oswego. The region covers an area of 4,146 square miles, comprising a balance of an urban center, suburban areas, small cities and towns, and rural farming communities.*

The modern environment of Central New York is built on a bountiful natural resource base. In prehistoric times, this region was covered by an immense sea. These ancient oceans deposited minerals which eventually became a resource base of limestone, gypsum, and salt. The massive glaciers and subsequent rivers of melt water were next to cover this area, slowly carving the land into the rolling hills, valleys, lakes, and passageways of today. This abundant water supply played a pivotal role in the rapid growth of the region and continues to greatly influence the region's development today.

When the first French explorers entered the region from Canada in the 1600s they found it inhabited by an alliance of five nations of Native Americans. These nations came to be known as the Iroquois League or Confederacy, although these people referred to themselves as Haudenosaunee, meaning "the People of the Longhouse." At their pinnacle, the Iroquois were one of the most powerful confederacies on the continent, controlling lands from the Hudson River in the east, to the Illinois River in the west, north to the Ottawa River, and south to the Potomac River.

Led by Samuel de Champlain who visited the area in 1615, the French explorers were the first Europeans to make use of the natural water and land access routes leading through Central New York. They were followed by a rush of Jesuit missionaries and subsequent British settlers in 1751. Following the Revolutionary War, the State subdivided land into Military Tracts or mile-square lots and furnished war veterans with allotments of land for their service. This land encouraged a heavy migration from the east and resulted in the rapid European settlement in Central New York.

While the military land grants began the rapid European immigration into the area, their sustained presence in CNY can be primarily attributed to the salt industry centered in the Syracuse area. The salt industry grew very quickly reaching a peak in 1862 when 15 salt companies produced 9 million bushels of salt. At one time, Syracuse, soon known as the "Salt City," was the only commercial producer of salt in all of North America. Integral to the development of the salt industry was the development of an extensive transportation system in Upstate New York centered on the Erie Canal. With the opening of the canal in Syracuse in 1820, the area began to grow as a transportation and economic center.

By the early-twentieth century, CNY shifted from agriculture to the industrial age and the region became a collection of productive small-to-medium sized centers of commerce surrounded by vast acres of productive farmland with Syracuse at the heart of the region.

Following World War II, the region's population began to move outside of urban areas and the economy shifted from its heavy reliance on manufacturing and began a transformation to a diverse economic base with strong representation in both the goods-producing and service sector.

The region has a population base of approximately 791,500 residents. Statistics show that the region's population has remained relatively stable over the past 20 years since reaching a peak in 1990. Per capita income for the Syracuse Metropolitan Statistical Area totals $36,980, which compares favorably with other metropolitan areas across Upstate New York and with the nation.

Socioeconomic data shows there are approximately 311,956 households in CNY and the average household size is 2.51. The median household age is 38.8. Approximately 12.9% of the region's population consists of various minority communities including those individuals of African-American, Latino, Asian, and Native American heritage. It is estimated that over 27% of the region's population over the age of 25 has a college degree or other more advanced certification. The average household income in CNY is $62,071 and the percentage of families below the national poverty level is 8.74%. The population density in the region is estimated to equal 213 residents per square mile.

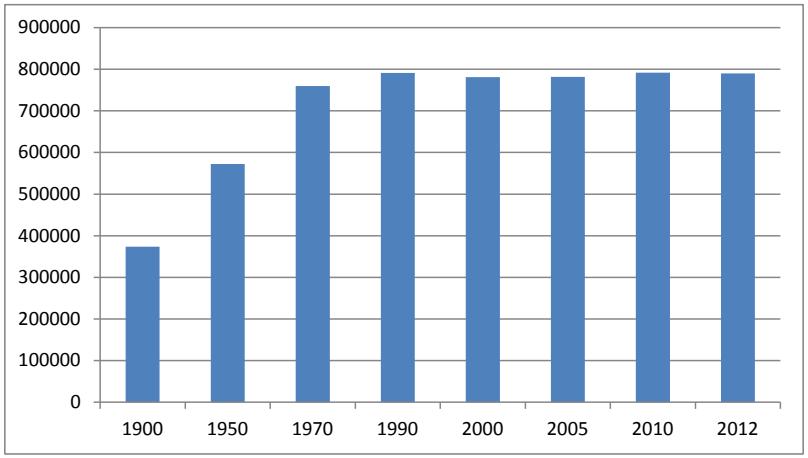
The total number of housing units in CNY is estimated to equal 344,369. Approximately 209,463 of these housing units are owner-occupied and 96,170 are listed as rental units. Typical of communities in the Northeast, the housing stock in the region is fairly old with 30.5% of the units built before 1939 and 61.1% built before 1969. The median housing value in CNY is $116,363 and the median rent is $715.

The region's labor force currently numbers 394,600 workers and has remained stable over the past ten years. The average annual wage cost in the five-county area is estimated to equal $40,286, which is competitive with national levels and significantly below major metropolitan areas in the northeast. Over 38.9% of the region's population has attained a college associate's degree or higher. The skills of the CNY labor force support a wide range of economic sectors including agriculture, manufacturing, health care, education, professional business services, warehouse and distribution, wholesale and retail trade, construction trades, utilities, and public employment.

Current statistics for the region show a total of 330,000 jobs, including 262,000 in the private sector, with an annual payroll in excess of $13.6 billion. The unemployment rate is 8.5%. Major employers in CNY include such prominent names as Syracuse University, SUNY Upstate Medical University, Wegmans, Lockheed Martin, Constellation Energy Group, the Hartford Financial Group, Welch Allyn, Verizon, Syracuse Research Corporation, Bank of America, Excellus BC/BS, Anheuser Bush, Cooper Crouse Hinds, Nucor Steel, Bristol-Myers Squibb, Novelis, Pall Trinity Micro, MONY Group, and Marietta Industries.

The region is served by an extensive transportation network, which includes Syracuse Hancock International Airport, the deep water Port of Oswego, several rail freight carriers, a CSX intermodal rail center, Amtrak passenger rail service, Interstate Routes 81 and 90, and a public transportation bus service maintained by the CNY Regional Transportation Authority. Residents are also served by an extensive network of public sewer and water facilities, which includes a major water supply transmission line from Lake Ontario that is provided by the Metropolitan Water Board and the Onondaga County Water Authority. Ample supplies of electric and gas service are provided

TABLE 1–Central New York Population



Source: U.S. Census

TABLE 2–Central New York Sociodemographic Data

	Syracuse MSA	CNY	NYS	U.S.
Population				
Total	660,283	789,928	19,302,448	306,603,772
Male	320,715	385,859	9,341,547	150,740,216
Female	339,568	404,069	9,960,901	155,863,556
Race				
Caucasian	568,812	690,125	12,768,805	227,167,013
African American	51,569	55,731	3,013,740	38,395,857
Asian	15,897	16,769	1,415,147	14,497,185
Hispanic or Latino	22,050	25,099	3,356,747	49,215,563
Age				
18 years and over	507,476	609,035	14,954,839	232,556,019
65 years and over	89,961	108,636	2,590,899	39,608,820
Median age	38.5	38.5	37.8	37
Households				
Number of households	255,911	305,633	7,215,687	114,761,359
Household size	2.47	2.47	3.24	2.6
Income				
Per capita income	26,567	24,293	31,796	27,915
Median family income	65,526	61,442	69,202	64,293
Percent population below poverty level	13.8	13.7	14.5	14.3
Housing				
Number of housing units	287,381	344,369	8,081,303	131,034,946
Percent built 1969 or earlier	61	61	71	42
Percent built 1939 or earlier	28	31	34	14
Owner-occupied units	174,644	209,463	3,955,232	75,896,759
Renter occupied units	81,267	96,170	3,260,455	38,864,600
Median housing value	119,300	105,967	301,000	186,200
Median monthly rent	725	679	1,025	871
Educational Attainment				
Population 25 years and over	431,446	517,375	12,999,473	202,048,123
Less than 9th grade	13,868	16,845	904,283	12,397,019
9th to 12th grade, no diploma	35,395	43,939	1,091,242	17,121,916
High school graduate	133,174	164,097	3,612,232	57,861,283
Some college, no degree	77,216	92,672	2,097,401	42,350,233
Associate's degree	48,467	59,034	1,070,808	15,344,048
Bachelor's degree	70,463	80,957	2,404,491	35,852,277
Graduate or professional degree	52,863	59,831	1,819,016	21,121,347

Source: ACS 5-year estimates 2007 to 2011

TABLE 3–Central New York Employment by Industry

Industry	1990	2000	2005	Dec-10	Dec-12
Total Non-Farm	317.8	325.4	320.8	320.1	319.1
Total Private	264.2	269	263.5	262.7	259.4
Goods Producing	61.2	57.3	45.5	40	36.8
Service Providing	256.6	268.1	275.4	280.1	282.3
Natural Resources, Mining, Construction	15.6	12.9	12.3	12	12.1
Manufacturing	45.6	44.5	33.2	28	24.7
Wholesale Trade	20.1	15.8	15.6	14.1	15.5
Retail Trade	38.3	38.1	36.9	36.1	36.6
Utilities	6.4	4.8	4	3.4	3.4
Transportation/ Warehousing	9.5	9.2	9.4	9.2	9.4
Information	7.7	7.7	6.6	4.8	4.6
Financial Activities	20.6	17.7	17.6	17	16.7
Professional/ Business Services	27.8	30.2	34.3	34.6	33.4
Educational Services	11.8	15.2	16.7	21.4	21.1
Health Care and Social Assistance	26.9	34.4	38	42.2	42.8
Hospitals	8.9	9.1	8.9	9.4	9.1
Leisure/Hospitality	24.1	25.2	26.6	27.5	26.8
Accommodation and Food Services	21.6	22	22.6	22.7	23.5
Other Services	9.8	13.3	12.5	12.4	12.3
Government	53.7	56.4	57.4	57.4	59.7
Federal	4.6	5.1	4.4	4.4	4.9
State	13	13.8	13.9	13.7	16.3
State Education	6	7.4	8.2	8.3	10
Local	36.1	37.5	39.1	39.3	38.5
Location Education	20.3	23	23.6	25.8	24.5

Source: NYSDOL Employment by Industry, Syracuse MSA, '000s

by the New York Power Authority and several private utility companies including National Grid, New York State Electric and Gas, and Rochester Gas and Electric. The region is also served by an advanced telecommunications system that is provided by such major service providers as Verizon, Time Warner, and AT&T.

When seeking to build an educated workforce, companies across the region are well served by 44 institutions of higher education located in Upstate New York, with a combined enrollment in excess of 215,000 students, and several for-profit education centers. Top area schools include Cazenovia College, Colgate University, Le Moyne College, Syracuse University, Wells College and members of the SUNY system including Cortland, Morrisville, Oswego, Upstate Medical University, the College of Environmental Science and Forestry, Cayuga Community College, and Onondaga Community College. Many of these colleges and universities have made the U.S. News and World Reports annual survey of the nation's best institutions of higher learning.

Environmentally, the region is blessed with extensive fresh water resources, productive farmland, public forest and private woodlands, mineral resources, and a diverse fish and wildlife habitat base. The major water resources serving the region include Lake Ontario, several Finger Lakes including Cayuga, Owasco, Otisco,and Skaneateles Lake, Oneida Lake, Cazenovia Lake, the Seneca-Oneida-Oswego River complex, the Salmon River, the Tioughnioga River, and the Cortland-Homer-Preble Aquifer and the Tug Hill Aquifer. Major wetlands include the Montezuma Wildlife Refuge, Three Rivers Management Area, Cicero Swamp Wildlife Management Area, Bear Swamp State Forest, Three Mile Bay Wildlife Management Area, and the Nelson Swamp Unique Area. Overall, the region's water quality is acceptable with 41% of the lakes and 57% of the stream miles assessed and generally found to be "good to satisfactory" . It is also important to note that air quality in CNY currently meets a range of federal and state air quality standards for ozone, sulfur dioxide, inhalable particulates, and carbon monoxide.

As a major metropolitan area, CNY is served by a robust energy production, transmission, and distribution network. Current statistics show that a majority of the region's electric energy needs are met by three nuclear power plants operating in Oswego County. These resources are supplemented by a major natural gas fired electric generating plant, and several hydroelectric facilities also located in Oswego County. These facilities, which generate over 25,001,693MWh of electricity, are supplemented by major hydro facilities operated by the New York Power Authority along the Niagara River and St. Lawrence River. The region is also well-served by an extensive supply of natural gas that is piped into the area by the region's major private utilities.

Energy use in CNY is divided between stationary fuel combustion (39%), fuel use in transportation (46%), and indirect fuel use resulting from electricity consumption (16%). When combining stationary fuel combustion and electricity consumption, buildings account for 54% of all energy consumption in CNY. Outside of nuclear, natural gas is the most common energy source in the region, comprising 70% of all energy consumption, followed by wood and fuel oil, 11% and 10%, respectively. Energy use is the largest source of greenhouse gas (GHG) emissions in CNY, accounting for 87% of total emissions. This total includes 41% of all emissions from buildings, 43% from transportation, and 4% from energy supply activities including production, transmission, and distribution losses.

Residents in CNY enjoy very affordable housing, a strong K–12 public education system, several vibrant entertainment and shopping districts, cultural amenities that include a professional theatre, professional and college level sports, and numerous outdoor recreation opportunities. The region is also well-served by a strong health-care network led by several regional hospitals, including Upstate Medical University, St. Joseph's Hospital, Crouse Hospital, and the VA Hospital. Quality of life rankings for the region are consistently very high—Forbes.com has ranked Syracuse among the Best Places in America to Raise a Family and the ACCRA cost of living index maintained by the Council for Community and Economic Research shows the region is very competitive with other metropolitan areas across the nation.

Noteworthy institutions operating in CNY include the WCNY Public Broadcasting station, Syracuse Stage, Finger Lakes Music Theatre Festival, Cortland Repertory Theater, and the Landmark Theater. Recreationally the region is well-served by numerous state and local parks, nature centers, commercial ski centers, and spectator sports venues. These assets include Green Lakes State Park, Onondaga Lake Park, Emerson Park, Oneida Shores, NYS State Fair, Greek Peak Resort, Fair Haven State Park, Selkirk Shores, Carrier Dome, Alliance Bank

Stadium, Falcon Park, and the Erie Canal National Heritage Recreation Trail.

In evaluating the region's assets, it is important to note the progress being made by many communities in CNY toward building a sustainable future. Noteworthy examples include developments around the Finger Lakes Musical Theater Festival, completion of the Finger Lakes East Business Park, progress toward the development of alternative agriculture crops, and the successful operation of a commercial land-based wind farm. Other projects include the region's first landfill-based alternative energy business park, construction of several LEED certified academic and commercial buildings, the deployment of PV solar, new housing developments in several of the region's urban centers, a new transit-hub, more than $2 billion of construction activity on University Hill, and redevelopment of the Oswego and Syracuse lakefront.

Completing all of these activities has been the effort to reclaim and protect many of the region's most vital assets. Taken together these activities represent a significant level of accomplishment that should be celebrated in Central New York. In addition, these accomplishments provide a solid foundation that can be used as a platform to launch new sustainability initiatives in the years ahead across the region.



Skaneateles Lake



Solar PV roof installation, Town of DeWitt offices

Chapter 2: Energy Management

***Energy use** has become indispensable to modern life. It makes homes and businesses comfortable, moves people and goods, fires the machinery of industry, and powers progress in society endeavors. It is the backbone of community activity and the lynchpin to societal advancement.*

Energy management has profound impacts on CNY's economy, environment and quality of life. Over-reliance on and wasteful consumption of fossil fuels diminishes the region's energy security and harms economic competitiveness. Extraction, transport, and use of fossil fuels results in air pollution including greenhouse gas emissions which damage the environment and harms public health.

In Central New York and everywhere else, a primary obstacle to energy sustainability is inertia. Vested interests in the status quo are numerous, sunk costs are large, and the energy behaviors of consumers can be slow to change. Externalities in the form of social and environmental costs that are not fully reflected in consumer prices pose a second major barrier. Distributed responsibility represents a third key obstacle. A myriad of officials, agencies, and organizations have energy-related roles, but they do not always work together. Perhaps the most critical barrier has been a lack of a comprehensive strategic plan to improve the region's energy management through concerted action.

And yet, opportunities for positive change abound. National and regional debates about new sources of energy, volatile but generally rising energy costs, new technologies, and a sharpened focus on climate change have created a growing level of awareness of the need for an energy transition. Here in Central New York, substantial conservation and efficiency gains remain to be tapped, and the region has a world-class renewable resource base. Many individuals, organizations, and communities are already going green, and a vibrant cluster of companies is emerging to deliver clean energy services. Regional agencies and local planning frameworks provide powerful institutional capabilities. Perhaps most importantly, energy stakeholders are coming together to bring their combined capabilities and resources to bear on planning, technology, policy and market issues.

Energy choices made today will have significant impacts on the region for generations to come. The VisionCNY Plan sets forth a vision for a robust and innovative clean energy economy that will stimulate investment, create jobs and meet the energy needs of residents and businesses over its planning horizon ending in 2030. To that end, the Plan provides the framework within which the region will reliably meet its future energy needs in a cost-effective and sustainable manner, establishes policy goals and targets to guide regional stakeholders as they address energy-related issues, and sets forth strategies and recommendations to achieve these objectives.

A. EXISTING CONDITIONS

1. Regional GHG Inventory

The regional greenhouse gas (GHG) inventory prepared in conjunction with the development of the VisionCNY Plan identified that Central New York emitted approximately 9.9 million metric tons ($MTCO_2e$) of GHG emissions in 2010. Onondaga County had the largest share of emissions, with 55%, while Cortland County had the lowest share of emissions, with 8%. Onondaga is also the most populated county in the region (59% of 2010 population), while Cortland is the least populated (6%) (Table 4). The primary driver of regional energy emissions is residential and commercial building energy use and transportation rather than industry or agriculture (Figure 1).

Energy use accounts for the vast majority of the total GHG emissions in Central New York. In total, energy consumption for residential and commercial buildings, industry, and transportation is responsible for 87% of the region's emissions, as compared to 84% for the United States as a whole. The region's energy-related emissions are the result of electricity consumption for lighting and other uses in buildings

TABLE 4–Total 2010 Emissions, by County and Gas (MT CO_2e)

County	CO_2	CH_4	N_2O	Other	Gross Emissions
Cayuga	1,023,632	232,686	130,564	32,453	1,419,335
Cortland	580,306	112,824	34,130	19,273	746,534
Madison	729,884	142,504	58,358	28,767	959,514
Onondaga	4,840,079	326,206	120,330	185,467	5,472,081
Oswego	1,168,171	67,381	27,227	47,469	1,310,248
Central New York Total	8,342,073	881,602	370,610	313,428	9,907,712

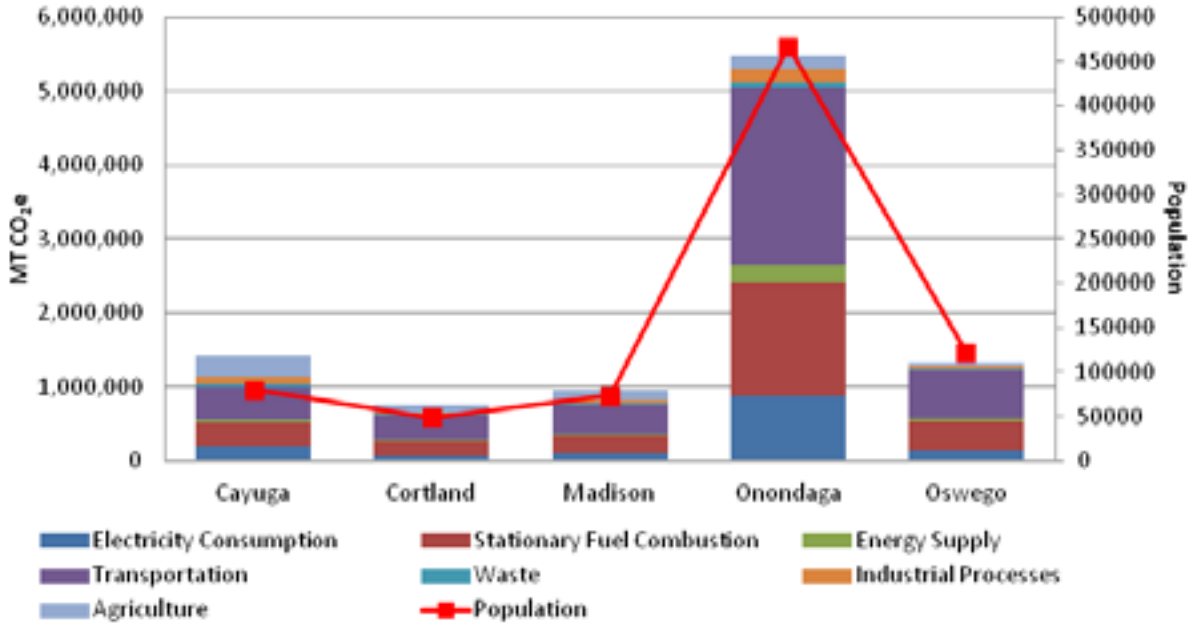


FIGURE 1–Total 2010 Emissions, by County and Sector (MT CO_2e)

and facilities (14%), stationary fuel consumption for heating and other purposes (27%), and the consumption of fuels (primarily gasoline and diesel) for passenger cars, trucks and other on-road vehicles (43%).

On average, Central New York emits fewer greenhouse gas emissions per person (13 metric tons of CO_2 equivalent) than the United States as a whole (22 metric tons of CO_2 equivalent). This is primarily a result of the region's electricity grid mix, which is more dependent on nuclear, hydropower, and natural gas compared to the rest of the nation, which relies more on coal and oil.

2. Regional Energy Profile

This chapter of VisionCNY Plan focuses on regional energy generation and consumption within buildings, including electricity and heating fuels. Transportation energy use is addressed in Chapter 3: Infrastructure. In total, Central New York businesses, residents, and communities spend a substantial percentage of income on building energy use for buildings, reflecting the high cost of fuel, a harsh winter climate, and the older, poorer condition of much of the region's building stock (i.e., insufficient insulation). In 2010, total energy consumption (including transportation fuels) cost the region an estimated $2.45 billion, which amounted to approximately 8% of CNY's Gross Regional Product (GRP).[1] Reducing energy costs for residential and commercial buildings would save taxpayer dollars and leave residents and businesses with more discretionary income to spend or invest in the regional economy.

The regional GHG inventory categorizes electricity in two separate ways: generation and consumption. Generation refers to the electricity created at generating facilities in the region, and the direct GHG emissions are calculated based on the specific type of fuel used. Consumption refers to electricity used in the region, and these emissions are considered indirect and calculated from sales data provided by supply companies and average emissions factors. The difference between generation and consumption, allowing for the transmission and distribution losses from regional consumption, provides an estimate of electricity that is exported and therefore consumed outside the region.

(a) Electricity Generation and Delivery Infrastructure

Central New York is a major contributor to the state's total energy generation. According to the New York Independent System Operator (NYISO), the region produces nearly 25.4 million MWh of electricity, which accounts for 14.5% of the state's generation.[1] By way of reference, CNY is only about 4% of the state's population. Figure 2 shows that fossil fuel based generation (52%) dominates the composition of the region's installed generation base as it does statewide. However, nuclear generation dominates in terms of the local energy generated (82%) - nearly doubling its dominance in capacity (46%). This nuclear generation comes from the three nuclear stations in Oswego, alone generating approximately three times the regions' current electrical need. The remaining energy production is largely from natural gas and renewable fuels. In other words, while oil and coal facilities have a capacity equal to 31% of the region's total available capacity, they generate less than 1% of the actual electricity produced in CNY. Small "behind-the-meter" generation sources, such as solar and small wind, are not included in these totals.

As an industry, the nuclear electric generation sector is an essential component to the economic vitality of the region, supporting a large number of highly skilled workers and providing a vehicle for growth regionally and around the state. As shown in Table 5, Oswego County's role in the region's energy industry is significant.

The capacity-weighted age of the region's current generation facilities is 30.2 years which is significantly skewed since many of the larger capacity additions (nuclear and natural gas) were added in the last 30 to 40 years.[3] Some of the region's oldest generating units, hydroelectric facilities, are reaching a century of service although many have been rehabilitated during relicensing.

Increasing environmental regulations and aging facilities are two of the leading factors in the retirement of existing electric generating facilities. As a result, the need for new generating facilities to meet load requirements must be addressed. For example, NRG Energy Inc. has proposed converting the existing 625 MW coal-fired facility in Dunkirk, NY (Western region) to a modern natural gas-fired combined-cycle plant with the generating capacity of approximately 440 MW — enough to power approximately 350,000 average homes.[4] At

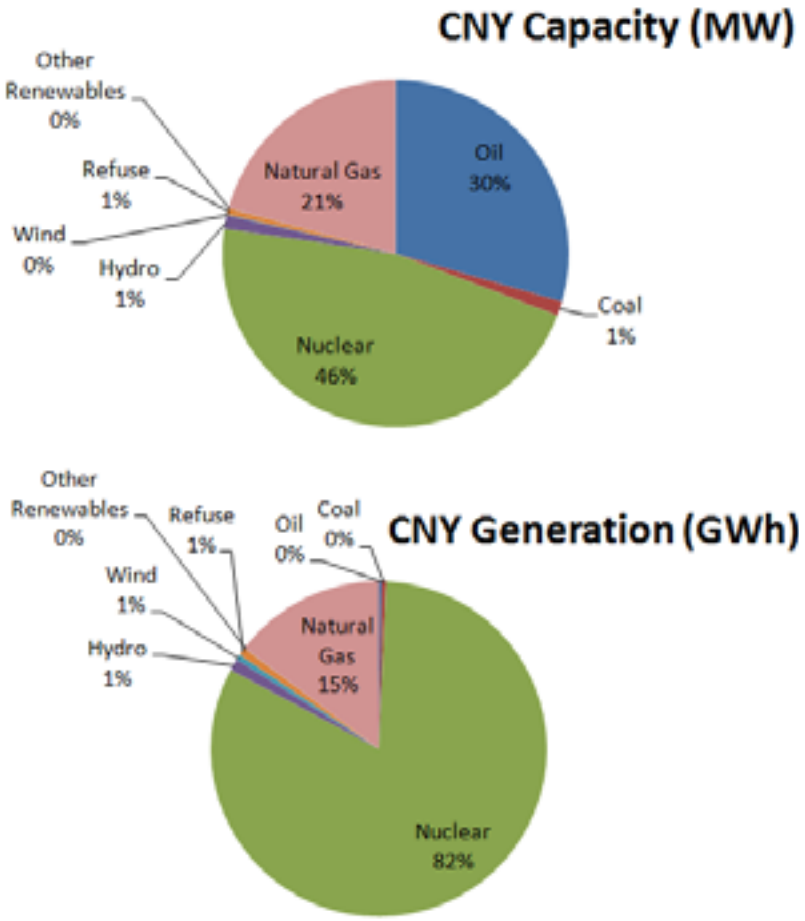


FIGURE 2–Electricity Generation and Capacity in Central New York

Source: 2011 NYISO Gold Book

the same time, growing interest in alternative energy solutions is resulting in a greater desire to site new generating facilities and conveyances. Additionally, state standards such as the Renewable Portfolio Standard (RPS) are providing support for the types of generation resources that the marketplace may not otherwise support.

(b) Electricity Consumption

Electricity is supplied to residents, businesses and organizations in the region by three investor-owned utilities, National Grid, New York State Electric and Gas (NYSEG) and Rochester Gas & Electric (RGE), five municipally-owned utilities (MOUs) and one rural electric cooperative, the Oneida-Madison Electric Cooperative:

+ National Grid: National Grid has a significant presence in four of the five CNY counties (Cortland, Madison, Onondaga and Oswego) and a minimal presence in Cayuga County, where it provides electricity to the Town of Niles, and natural gas to the Town of Sennett.

+ New York State Gas and Electric (NYSEG): NYSEG operates mainly in Cayuga County, as well as southern Cortland County; central and southern Madison County; and a small presence in western Onondaga County.

+ Rochester Gas and Electric (RGE): RGE serves a small service area in northern Cayuga County.

TABLE 5–Installed Electric Capacity and Generation in CNY by County, 2010

	Cayuga	Cortland	Madison	Onondaga	Oswego	Total
Total Capacity (MW)	5.4	--	6.2	280.9	5,294.6	5.587.1
% of Total	0.1%	0.0%	0.1%	5.0%	94.8%	100.0%
Total Generation (GWh)	0.4	--	135.0	483.4	24,468.3	25,087.1
% of Total	0.0%	0.0%	0.5%	1.9%	97.5%	100.0%
* Grid connected load						

Source: NYISO, 2011

Central New York also includes four active MOUs that provide energy services to localized areas: Village of Hamilton (1,528 customers), Village of Skaneateles (1,499 customers), Village of Solvay (5,610 customers), and Village of Marathon (896 customers).[5] The majority of electric energy for these five municipalities is provided by hydroelectric generation that is allocated by the New York Power Authority (NYPA). The MOUs have developed two associations to address various aspects of their operation: the Municipal Electric Utilities Association (MEUA) of NYS and the Independent Energy Efficiency Program (IEEP). The purpose of the MEUA is to secure energy allocation to the MOUs through NYPA. The IEEP was created as a means to share incentive programs to improve energy efficiency among end users, promote best practices, and attract businesses.

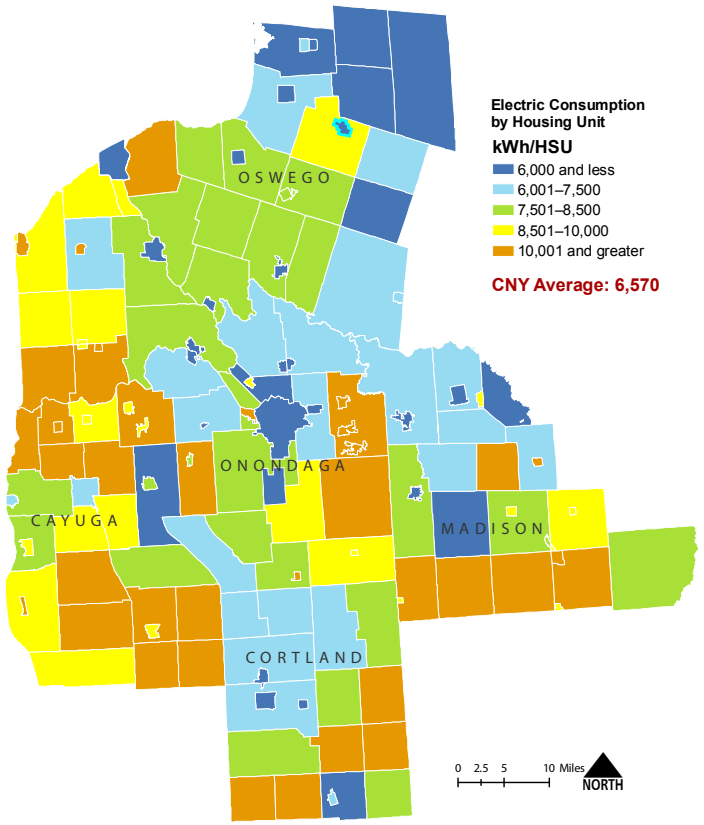
Electricity consumption data for 2010 has been provided by these utilities, and categorized by county and by sector. It is estimated that approximately 6.2 million MWh were consumed within the region in 2010.[6]

CNY's electrical consumption is evenly distributed among residential (36%), commercial (30%) and industrial (34%) users. CNY's residents consume 6,570 kilowatt-hours (kWh) per housing unit or 2,582 kWh per capita, which are below the New York State (NYS) averages for their respective categories (Map 1). Most counties within the region fall below the statewide benchmark, with the exception of Cayuga and Madison Counties (Figure 3). These counties have a significant agricultural component which could explain elevated average residential consumption due to the number of on farm activities supported by their residential service.

(c) Direct Stationary Fuel Usage

Direct Stationary Fuel Usage refers to energy used in buildings and facilities throughout the region, primarily for heating and in the forms of fuel oil (or kerosene), natural gas, coal, wood, or bottled gas (i.e. propane or liquid natural gas). Regional use of these fuels has been estimated for the Regional GHG Inventory using 2010 state-wide fuel use data from the EIA State Energy Data System and allocated to each county in the residential, commercial, and industrial sectors using different allocation methods, chosen to best represent energy usage at the regional level throughout the state. 73.3 million MMBtu are con-

MAP 1—Electric Use Intensity for Residential Sector by Municipality



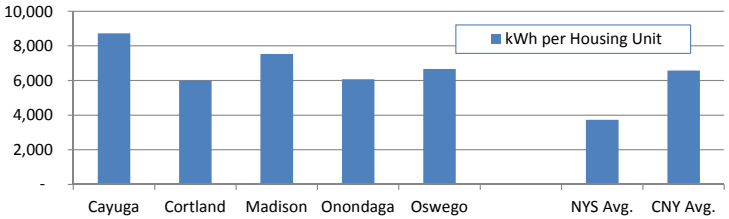


FIGURE 3—County Level Residential Electricity Consumption Benchmarks

Source: CNY RPDB

sumed per year in stationary sources in the region.[7] Table 6 provides the percentage of this total broken down by energy type.

While natural gas is available in all of the five counties of CNY, it does not enjoy the saturation levels of other areas within NYS. The natural gas distribution network serves a large majority of the population and industry (including power generation) in CNY, but is less prolific in rural communities across Oswego, Madison, and Cayuga counties. A substantial portion of natural gas consumption within the industrial sector (57%) occurs in Oswego County and is attributable to several industrial processing and power generation facilities to the north. While a small number of entities receive supply service directly from intrastate or interstate transmission pipelines, the two major local distribution companies; National Grid and NYSEG provide a bulk of gas volumes to the local marketplace through their local distribution networks. In total, residences consume 44% of natural gas, commercial businesses consume 33%, and industrial business consume 22%.

Gas consumption per housing unit and per capita are marginally above the New England and NYS Average (Figure 4). It should be noted that given the density of housing units in New York City area the New England (NE) benchmark was used for comparison purposes. Abundance of alternative heating fuels, such as wood or fuels like propane are potential reasons for Madison and Oswego counties notably lower natural gas use per capita.

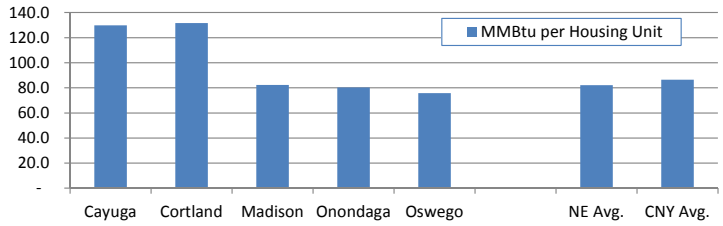


FIGURE 4–County Level Residential Natural Gas Consumption Benchmarks

Source: CNY RPDB

Unlike the virtual complete coverage of electric service to the region, it is more difficult to use natural gas consumption map data to de-

TABLE 6–2010 Stationary Fuel Consumption by Sector and Fuel Type (MMBTU)

Fuel Type	Residential	Commercial	Industrial	Total	Percent of Total
Natural Gas	16,211,707	12,356,854	8,184,319	36,752,879	70%
Coal	171,239	12,447	642,770	826,455	2%
Distillate Fuel Oil	2,735,148	1,864,434	416,679	5,016,261	10%
Residual Fuel Oil	0	0	99,654	99,654	0%
Propane/LPG	2,229,938	564,233	43,090	2,837,262	5%
Other Petroleum	0	0	761,291	761,291	1%
Wood	4,604,197	612,703	410,714	5,627,614	11%
Biogas	0	0	142,476	142,476	0%
Solar	120,905	0	0	120,905	0%
Total	33,760,454	20,756,726	18,811,314	73,328,494	100%

Note: Totals may not sum due to independent rounding.

Source: CNY RPDB

velop reasonable observations or conclusions. There are several reasons for this:

+ Natural gas supply infrastructure primarily services population corridors that can yield higher penetration rates

+ Consumers have options for heating fuels that vary widely from wood and coal to propane, this is particularly true in Oswego and Madison counties

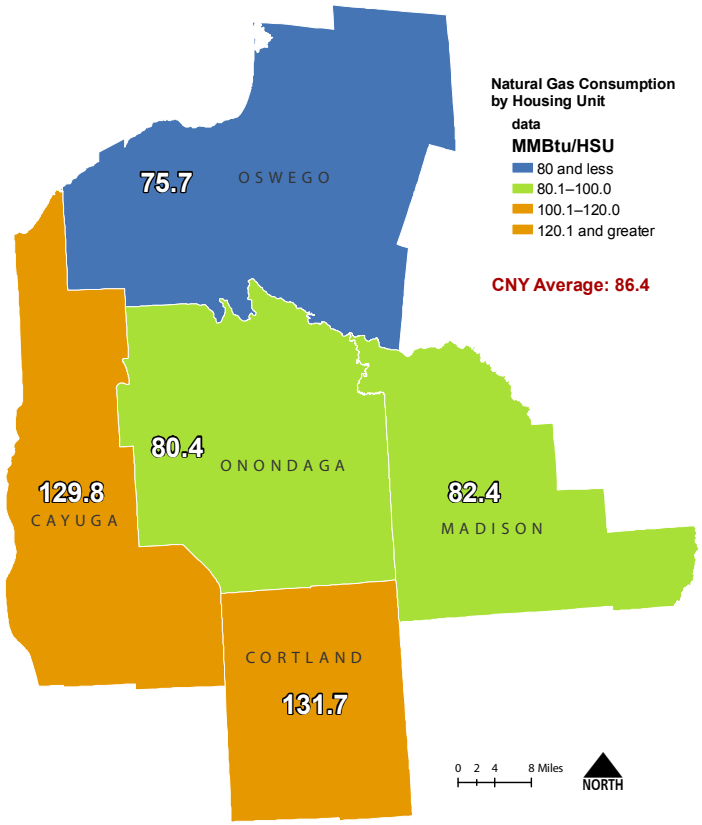
+ Many municipalities are only partially served by natural gas, which can skew representations of data when shown relative to population and housing units

Since these circumstances impair the ability to obtain focused strategies on a municipal level, the energy intensity representations for natural gas were broadened to county level summaries (Map 2). From this perspective, consumption data per housing unit in Cayuga and Cortland Counties is 50% higher than the New England average. Elevated levels of use in these counties could be attributed to some of the same reasons seen in the electric data, however more detailed study of specific drivers would need to be performed.

Homes in the region generally have more significant heating loads than the average New York home due to the higher number of heating degree days. As shown in Table 7, the average home in the state uses about 70 to 90 MMBtu per year.

Analysis of regional data identifies that about 64% of residential customers in the five-county region use natural gas for space heating. Fuel oil is the next most common fuel followed by electricity and then liquid propane gas (LPG). Electric is used for heating in many apartments where the total load is much smaller. Electric use in Onondaga County is higher due to the greater concentration of apartments and due to the fact that Solvay Electric has lower electric rates and therefore more electric heat customers. This analysis also unexpectedly identifies that fuel oil use is significantly lower in the five-county region than in the remainder of New York State (Table 8).

MAP 2–Natural Gas Use Intensity for Residential Sector by Municipality



(d) Energy Efficiency and Demand Response Programs

Fortunately, there are many state programs that support energy efficiency. NYS was one of the first states to implement energy efficiency standards in its building codes. NYS is now moving to implement the national Model Energy Codes, which harmonizes the requirements of the state with code compliance across the U.S. This harmonization was accelerated by stipulations attached to federal funds NYS received under the American Recovery and Reinvestment Act (ARRA). The building code provides a strong foundation for energy efficient buildings in the region.

TABLE 7–Space Heating Consumption and Expenditure

	NYS Households (MM)	Average using fuel as main heating source			
		Consumption		Consumption (MMBtu)	Expenditure
Electricity	0.6	2,766	kWh	9.44	$422
Natural Gas	3.8	69	Mcf	71.07	$855
Fuel Oil	2.1	656	gallons	91.84	$1,362
LPG	0.2	866	gallons	79.67	$1,903

Source: *Patterns and Trends New York State Energy Profiles: 1995-2009*, Appendix B, NYSERDA (2011).

In addition, CNY is served by several state and utility programs intended to promote energy efficiency, reduce GHG emissions, and provide a more reliable electric grid. These programs include incentives offered to residential, commercial, industrial and institutional customers to reduce consumption of electricity, and more recently, natural gas. Programs offered by NYSERDA, National Grid, and NYSEG are funded largely by systems benefit charges (SBC) on customers' electric and natural gas utility bills. In addition, the Dormitory Authority of the State of New York (DASNY) is empowered to provide financing and construction services to specified not-for-profit institutions. DASNY programs encourage energy efficiency as well as green design and construction practices. Finally, the New York Power Authority (NYPA) provides wholesale power to municipal utilities in the region (e.g., Solvay, Hamilton, Skaneateles) as well as several state-owned institutional buildings. NYPA also offers incentive programs to assist large and small businesses, not-for-profit organizations, community-owned electric systems, rural electric cooperatives and government entities in reducing energy use and cost.

NYSERDA programs cover a broad spectrum of energy related projects, all designed to develop competitive markets for energy efficiency. For the commercial, institutional and industrial sectors, NYSERDA reported participation in the Existing Facilities Program, New Construction Program, and Industrial & Process Efficiency Program:

The Existing Facilities Program (EFP) offers a broad portfolio of incentives to help offset the costs of implementing energy efficiency improvements in existing commercial facilities across New York State. The EFP offers incentives through two tracks: the pre-qualified path

TABLE 8–Occupied Households (Number and Percentage) by Type of Space-Heating Fuel

County	Electricity Households		Natural Gas Households		Fuel Oil Households		LPG Households		Other		Total Households
Cayuga	2,686	9%	15,263	50%	7,329	24%	3,504	11%	1,776	6%	30,558
Cortland	1,874	10%	9,224	51%	4,411	24%	1,319	7%	1,382	8%	18,201
Madison	2,941	12%	10,103	40%	8,849	35%	1,891	7%	1,584	6%	25,368
Onondaga	24,670	14%	137,401	76%	10,784	6%	4,332	2%	3,966	2%	181,153
Oswego*	3,991	9%	19,374	43%	10,957	24%	8,160	18%	3,029	7%	45,522
Region	36,162	12%	191,365	64%	42,330	14%	19,206	6%	11,737	4%	300,811
State Total		9%		52%		33%		3%		3%	

*11 occupied units are unaccounted for in Oswego County fuel breakout

Source: *Patterns and Trends New York State Energy Profiles: 1995-2009*, Appendix D-1, NYSERDA, (2011).

and the performance-based path. The pre-qualified path offers fixed incentives are available on a dollar-per-unit basis for smaller-scale lighting, HVAC, commercial refrigeration, commercial kitchen, gas equipment and other categories. The performance-based path provides custom incentives for larger-scale electric, natural gas, energy storage, demand response and other projects.

The New Construction Program (NCP) for commercial/industrial businesses can provide assistance when incorporating energy-efficiency measures into the design, construction, and operation of new and substantially renovated buildings. Incentives are available for the purchase and installation of energy-efficient equipment that reduces electric energy consumption in new and substantially renovated buildings.

The Industrial and Process Efficiency (IPE) Program provides performance-based incentives to manufacturers and data centers implementing energy efficiency and process improvements which will reduce energy costs. IPE's goal is to help manufacturers and data centers increase product output and data processing as efficiently as possible. Therefore, incentives are calculated, when appropriate, based on a reduction in energy usage per unit of production or workload.

Participation data from NYSERDA indicates that for years 2010 and 2011 Central New York saved more than 39.2 million kilowatt hours (kWh) through nearly 436 individual projects that participated in these programs, as shown in Table 9. In 2010 268 commercial, institutional, and industrial customers participated, achieving estimated annual energy savings of 24 GWh. This accounts for about 9% of the statewide customers and 7.5% of the energy savings statewide (statewide numbers were 2,953 customers and 318.6 GWh for 2010). The total annual energy savings of 24 GWh in 2010 and 15.2 GWh in 2011 represent about 0.5% of the approximately 4,000 GWh/year used by commercial and industrial customers in the region.

While the region's utilities currently offer rebates for the installation of energy efficient lighting and equipment by small commercial customers, NYSERDA programs are the most well-established and serve the widest range of customers with programs targeted at various sectors. In addition, NYSERDA is the only organization that published participation rate data. While NYSERDA only published this data for the three programs described above (EFP, NCP and IPE), participation rates for other NYSERDA programs or utility-run programs will be tracked in the future if the data becomes available. NYSERDA's FlexTech Program offers technical assistance to customers to identify energy conservation measures and renewable energy project opportunities on a 50-50 cost-share basis. In addition, investor-owned utilities in the region including National Grid, NYSEG and Rochester Gas & Electric, offer host of rebates and other assistance to small and large commercial customers. While it is important to note that NYSERDA programs are not representative of the full spectrum of what is available to customers in CNY, for the purposes of establishing momentum and tracking progress the VisionCNY Plan establishes increasing participation in NYSERDA programs as a one of the targets of the strategy to decrease commercial building energy consumption.

Energy efficient new construction is not the largest source of savings in the region though it is still noteworthy. In addition to participating in NYSERDA's New Construction Program (NCP), more than 20 projects in the region have been built to the Leadership in Energy and Environmental Design (LEED) standards of the U.S. Green Building Council (USGBC). LEED® is a voluntary, consensus-based program that provides third-party verification of green buildings. LEED®Designs, energy savings, and operational practices promoted by LEED® are valuable and have been transforming market practices. LEED provides credits for energy efficiency improvements above normal practice (i.e., American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 90.1 energy codes). For example, in the LEED-NC (New Construction) category, the energy component can provide up to 10 points for designs that are 50% better than the baseline (under NC version 2). Listings of buildings in the region that have achieved a LEED rating are presented in Table 10. The table includes buildings that were predominately new construction (NC) projects. Other new construction projects that received a rating were Commercial Interiors (CI), Core Shell (CS) or LEED for Homes. Three of the LEED Rated projects were Existing Buildings (EB). There are currently 67 ENERGY STAR® buildings/facilities in Central New York.

A separate but related issue from energy efficiency is the management of energy demand, which refers to the maximum needs of consumers that must be met by the energy supplier at a particular point in time. Utilities typically impose extra costs on consumers if their demand for electricity exceeds some threshold during the day. Demand side changes are largely, if not exclusively, in the hands of the consumer. Various methods can encourage the behavior changes or investment decisions that will lower energy demand and related energy usage. Usually, the goal of demand response or demand side management is to encourage the consumer to use less energy during peak hours, or to move the time of energy use to off-peak times, such as nighttime and weekends. While this does not reduce the total amount of

TABLE 9–Customer Participation and Energy Savings in NYSERDA Commercial Programs for Central New York

2010	Number of Customers				Annual Energy Savings (kWh)				
Sector	EFP-PQ	EFP-PB	IPE	NCP	EFP-PQ	EFP-PB	IPE	NCP	TOTAL
Agriculture & Forestry	8	0	0	0	159,836	-	-	-	159,836
Commercial - Wholesale/Retail	86	49	0	3	2,280,860	3,817,628	-	1,206,959	7,305,447
Education - Colleges & Universities	5	1	0	1	521,536	120,751	-	968,719	1,611,006
Education - Elementary & Secondary Schools	7	0	0	0	253,310	-	-	-	253,310
Federal Government	1	1	0	0	10,073	519,675	-	-	529,748
Health Care	9	0	0	0	887,023	-	-	-	887,023
Hospitality	9	1	0	0	18,442	117,651	-	-	136,093
Industrial/Manufacturing	24	4	17	2	1,070,101	1,751,971	8,442,803	77,310	11,342,185
Local Government	11	1	0	0	592,013	107,433	-	-	699,446
Multifamily (over 4 units)	2	0	0	0	48,128	-	-	-	48,128
Not For Profit	4	0	0	1	75,471	-	-	208,228	283,699
Office	7	1	0	0	58,808	553,488	-	-	612,296
Services - Technical/Energy/Admin	1	0	0	0	29,795	-	-	-	29,795
State Government	1	0	0	0	28,451	-	-	-	28,451
Undefined	11	0	0	0	109,662	-	-	-	109,662
TOTAL (268)	186	58	17	7	6,143,509	6,988,597	8,442,803	2,461,216	24,036,125
2011	Number of Customers				Annual Energy Savings (kWh)				
Sector	EFP-PQ	EFP-PB	IPE	NCP	EFP-PQ	EFP-PB	IPE	NCP	TOTAL
Agriculture & Forestry	2	0	0	0	14,225	-	-	-	14,225
Commercial - Wholesale/Retail	35	25	0	9	523,359	1,052,003	-	2,152,036	3,727,397
Education - Colleges & Universities	5	0	0	2	91,952	-	-	781,463	873,415
Education - Elementary & Secondary Schools	11	2	0	1	79,913	623,187	-	403,848	1,106,948
Federal Government	1	0	0	0	79,874	-	-	-	79,874
Health Care	4	0	0	1	92,539	-	-	306,357	398,896
Hospitality	7	0	0	0	56,965	-	-	-	56,965
Industrial/Manufacturing	13	0	12	1	706,941	-	4,479,956	806,751	5,993,648
Local Government	19	0	0	1	1,050,196	-	-	15,101	1,065,297
Multifamily (over 4 units)	1	0	0	0	-	-	-	-	-
Not For Profit	3	1	0	3	64,980	204,908	-	1,322,062	1,591,951
Office	5	1	0	0	182,200	14,939	-	-	197,139
Services - Technical/Energy/Admin	1	0	0	0	-	-	-	-	-
State Government	0	0	0	0	-	-	-	-	-
Undefined	1	0	0	0	81,400	-	-	-	81,400
TOTAL (167)	108	29	12	18	3,024,544	1,895,037	4,479,956	5,787,618	15,187,154

Source: NYSERDA

energy consumed, it does serve to reduce peak demand at a facility, and thereby reduce the facility's energy bills (since the per-kWh rate is generally based on peak instantaneous load for the preceding billing period).

Weather and behavior are major determinants of peak demand. On an annual basis, the region generally experiences high peak demand periods driven by air conditioning use on the hottest days of the year and during continuous heat waves. During that time, when electricity demand increases significantly, base-load electricity supply has been surpassed and electricity prices are at their highest. Increased demand must be offset by increasing supply or reducing demand. Supplemental power plants called "peaking units" or "peaker plants" can be used to increase supply for these short durations. These resources are generally more expensive to operate, less efficient, and have higher emission rates than base-load power. Reducing peak demand and thus the need for peaking resources can minimize their impacts.

Demand response programs are available at the retail level primarily through utility programs administered through the NYS Public Service Commission. For example, National Grid offers its Emergency Demand program when the NYISO declares a system emergency. Companies enrolled in this program will receive a financial incentive if they can curtail at least 100 kW of electricity one hour after notification. Incentive payments will only be made to program participants if power use is actually curtailed. In addition, National Grid's Day Ahead Demand Program is used when customer bids to reduce load are accepted by the NYISO usually when day-ahead electricity prices are forecast to be high. This provides economic incentives to reduce electricity demand when prices are high. Both programs are open only to customers in certain rate classes, require customers to be able to curtail at least 100kW and require interval metering on net load. In addition, private companies offer demand response services, benefiting both the consumer and utility alike: the former, because of the energy bill savings as described; the latter, because of the reduced need to keep expensive peaking plants on standby during conventional high-demand periods. Finally, NYSERDA offers Performance-Based Demand Response incentives are offered to offset the cost of equipment that enables facilities to participate in Demand Response programs. Common measures include: load shedding controls, automation equipment and new generation equipment. NYSERDA also offers Pre-Qualified incentives for interval meters. Participation in such programs can benefit large commercial and industrial energy users and should be encouraged to the greatest extent possible.

As noted above, CNY's residential sector comprises 36% of total electrical consumption and 44% of stationary-fuel consumption and is an important target for promoting conservation and efficiency. NYSERDA's Residential Energy Services (RES) group administers energy efficiency and "weatherization" programs targeted to new construction and existing homes. Generally, the programs support ENERGY STAR® principles and use energy assessments to identify improvement opportunities. NYSERDA's residential programs include:

+ New York's ENERGY STAR® Certified Homes Program is aimed at builders in the new construction market. The builder receives an incentive for each home that receives an ENERGY STAR® Rating.

+ The Home Performance with ENERGY STAR® Program offers benefits and incentives to help make energy efficiency improvements affordable for eligible New York State homeowners who own a single-family home or a two- to four-unit multifamily building. A reduced-cost energy assessment of existing homes is available through the Green Jobs-Green New York Program. Specialized contractors certified by the Building Performance Institute (BPI) complete an energy survey or audit the home and make recommendations for how to improve it. The contractor also provides a proposal to implement the improvements.

+ The Assisted Home Performance with ENERGY STAR® Program provides additional assistance to low-income homeowners who implement efficiency improvements to their home. Assistance is available in the form of a grant of up to $5,000 to cover up to 50% of the cost of energy efficiency upgrades.

+ The Multifamily Performance Program (MPP) for Existing Buildings and New Construction provides incentives to owners of multifamily buildings with five or more units and four or more floors to install energy conservation measures that are identified in an Energy Reduction Plan prepared by a Multifamily Performance Partner selected by the customer. Both market-rate and affordable-rent buildings are eligible. Incentives come in the form of per unit payments for the installation of measures that achieve at least 15% energy reduction. Existing buildings that project at least 20% energy reduction in the Energy Reduction Plan may also be eligible for an additional Performance payment.

+ NYSERDA offers two low-interest loans options: On-Bill Recovery Loans and Smart Energy Loans. The On-Bill Recovery Financing Program provides low interest loans to homeowners or multi-fam-

TABLE 10–Buildings in Central New York that have Achieved LEED Certification

Project Name	City	County	Rate System	Points	Rating Level	Date
Cayuga-Onondaga BOCES	Auburn	Cayuga	LEED NC 2.2	35	Silver	Sep-09
Glass Tower Hall at SUNY Cortland	Cortland	Cortland	LEED NC 2.1	31	Certified	Jul-08
First LEED for Homes Gold Certified in NYS	Skaneateles	Onondaga	LEED for Homes	NA	Gold	NA
Enable	Syracuse	Onondaga	LEED NC 2.1	27	Certified	Mar-08
C&S Corporate Headquarters Addition	Syracuse	Onondaga	LEED NC 2.2	29	Certified	Mar-09
Robson Woese	Syracuse	Onondaga	LEED CI 2.0	23	Certified	Apr-09
Syracuse Research Corporation	North Syracuse	Onondaga	LEED NC 2.1	31	Certified	Sep-09
Marcellus Free Library	Marcellus	Onondaga	LEED NC 2.2	33	Silver	Oct-09
King & King Architects	Syracuse	Onondaga	LEED NC 2.2	59	Platinum	Apr-11
One Park Place	Syracuse	Onondaga	LEED- EB:OM v2009	51	Silver	Jun-11
Syracuse University - Student Housing	Syracuse	Onondaga	LEED NC 2.2	40	Gold	Jun-11
Kohl's	Fayetteville	Onondaga	LEED- EB:OM v2009	45	Certified	Jul-11
Confidential	-	Onondaga	LEED- EB:OM v2009	50	Silver	Jul-11
Syracuse Center of Excellence	Syracuse	Onondaga	LEED NC 2.2	53	Platinum	Sep-11
SUNY ESF Student Housing	Syracuse	Onondaga	LEED NC 2.2	43	Gold	Oct-11
Welch Allyn - Alterations & Addition	Skaneateles Falls	Onondaga	LEED NC 2.2	43	Gold	Nov-11
Hotel Skyler	Syracuse	Onondaga	LEED NC 2.2	53	Platinum	Nov-11
Washington Station Office Building	Syracuse	Onondaga	LEED CS 2.0	31	Silver	Nov-11
Carmello K. Anthony Basketball Center - Syracuse University	Syracuse	Onondaga	LEED NC 2.2	28	Certified	Jan-12
Syracuse University Green Data Center	Syracuse	Onondaga	LEED NC 2.2	29	Certified	Jun-12
Destiny-Michael Kors	Syracuse	Onondaga	LEED CI v2009	58	Silver	Sep-12
EJ Dillon Middle School	Phoenix	Oswego	LEED NC 2.2	33	Silver	Oct-11
Fulton CSD Bodley High School	Fulton	Oswego	LEED for Schools 2.0	31	Certified	Dec-11
SUNY Oswego Townhouses	Oswego	Oswego	LEED for Homes v2008	45	Gold	Oct-08

Source: Green Building Certification Institute (GBCI) LEED Project Directory

ily building owners for efficiency improvements. Loan repayment can be incorporated into a homeowner's utility bill with payments structured based on the expected savings (both NYSEG and National Grid are participating). The maximum loan amount is $25,000 with a maximum term of 15 years. Repayment responsibility remains with the home's utility bill (i.e., conveys to the new owner) if the property is sold. Smart Energy Loans offer affordable interest rates, flexible terms and simple repayment options similar to any other conventional loan.

In addition, the region's utilities currently offer rebates for the installation of energy efficient equipment, primarily HVAC systems such as furnaces and boilers. Complete data on participation rates for NYSERDA or utility-based residential programs in Central New York does not exist at this time, but it is generally accepted that 90% or more of the region's homeowners have not yet participated. These programs offer significant benefits for homeowners and represent an important opportunity to reduce energy consumption and greenhouse gas emissions in CNY.

(e) Renewable Energy Resources

Renewable energy sources can be derived from natural resources that are practically unlimited, like the sun or wind, or can be grown quickly and managed sustainably, like wood and other biomass. They can have a significant impact on lowering GHG emissions, creating local jobs, lowering the cost of heating and lighting, and reducing dependence on fossil fuels. Technologies that capture Central New York's abundant natural renewable resources include wind turbines, solar electric photovoltaic (PV), solar thermal for hot water and heat, geothermal heat pumps, biogas from agricultural wastes, hydropower, and combined heat and power (CHP) systems.

In 2010, approximately 17% of the State's electricity was produced by renewable sources, primarily conventional hydropower with small amounts of biomass, wind, and biogas.[8] The NYS Renewable Portfolio Standard (RPS) has a goal of at least 30% renewable electricity by 2015, and the NYS Renewable Energy Roadmap recommends significantly increasing solar energy development and other renewables to help achieve GHG reduction goals.[9] A recent study finds that it is technically feasible to convert New York's all-purpose energy infrastructure to one powered by wind, water and sunlight by 2030, although the economic cost may be quite high.[10] The overall switch would reduce New York's end-use power demand by about 37% and stabilize energy prices, since fuel costs would be zero, according to

BPI Certified contractors perform blower door tests to assess air leakage.



the study. It would also create a net gain in manufacturing, installation and technology jobs because nearly all the state's energy would be produced within the state.

Central New York has already installed renewable energy sources. As shown in Table 11, solar PV electric is the most common with systems located in each county and numbering nearly 250. All of the region's installed solar PV capacity is customer-sited or behind-the-meter and there are no utility-scale solar energy facilities in the region to date. Almost half of the solar PV systems are located in Onondaga County. Examples of solar systems installed in CNY are shown in Table 12.

Central New York has three large-scale wind farms, all in Madison County, with a combined capacity of approximately 76 MW -- enough to provide for the electricity needs of approximately 25,000 houses. There are four utility-scale wind farms proposed in Central New York that have been included in the NYISO queue, three in Madison County and one in Cortland County. In addition, there are 29 small-scale wind turbines as of December 2011: two each in Cayuga and Cortland Counties, seven each in Madison and Onondaga Counties, and 11 in Oswego County.[11] Examples of wind energy systems installed or proposed in CNY are shown in Table 13.

There are currently six farm-based operating anerobic digesters operating in the region, as shown in Table 14. Two more are currently in development in Cayuga County, at Oakwood Dairy and Sprucehaven.[12] In addition, Cayuga County has installed a regional digester and Morrisville State College has a small system on campus. These facilities have a total installed capacity of nearly 3 MW.

According to the U.S. Energy Information Administration (EIA), there are three landfill gas plants in Central New York, in Cayuga, Madison, and Onondaga Counties, with an installed capacity of 3.2 MW.

There are twelve operating hydroelectric dams in Central New York, with nine located in Oswego County alone. The number of so-called micro-hydro or "run-of-river" systems that exist in the region is not known.

The EIA shows a very small amount of geothermal being used in the residential sector, likely for geothermal heat pumps.[13] Although its use in the residential sector is currently small, there has been an uptick in installations in the region, as people try to reduce home and business heating costs. Table 15 provides a summary of regional examples of this technology in use, listed by county.[14]

According the U.S. Department of Energy, there are 37 CHP sites in Central New York, with a total installed capacity of about 1,400 MW.

TABLE 11–Solar Installations by County

County	All Funding Sources	RPS Funding	Residential Systems	Commercial/ Industrial Systems	Government/ Non-Profit Systems
Cayuga	33	29	24	6	3
Cortland	27	22	21	5	1
Madison	33	26	26	6	1
Onondaga	106	96	72	21	13
Oswego	39	34	21	10	8
Total	238	207	164	48	26

Source: NYSERDA PowerClerk Database

TABLE 12–Examples of Solar Systems Installed in the CNY Region

Site Name	County	Capacity	Construction Year
Cayuga Community College	Cayuga	25.2 kW	2011
Morrisville State College	Madison	22.8 kW	2009
Our Farm in Cazenovia	Madison	11.3 kW	2011
Onondaga Community College (OCC)	Onondaga	21.2 kW	2011
Le Moyne College	Onondaga	21.0 kW	2011
Syracuse DPW	Onondaga	11.3 kW	2010
Housing Visions Unlimited Inc.	Onondaga	25.2 kW	2009
Scalabrini Apartments	Onondaga	25.2 kW	2009
Syracuse City Hall Commons	Onondaga	21.8 kW	2011
SUNY ESF	Onondaga	26.2 kW	2009
Manlius Pebble Hill School	Onondaga	25.0 kW	2011
DeWitt Town Hall	Onondaga	50.0 kW	2011
APW School District	Oswego	47.8 kW	2010

Source: CNY RPDB

Table 16 provides a summary of several representative examples of this technology in use, listed in order of capacity.[15] There are 13 projects at public schools, seven at farms, five at industrial facilities, five at colleges or universities, two at health care facilities, with the remaining projects at government or commercial buildings.

CNY has a number of district energy systems, including the Onondaga County District Heating and Cooling facility that serves county office buildings, and the Syracuse University (SU) Steam Station that provides chilled water to the campus and steam to several other institutional facilities on University Hill. A number of other college campuses in CNY have district heating and/or district cooling systems, including Colgate University, SUNY Oswego, SUNY Cortland, and SUNY Morrisville, among others. Table 17 provides a summary of regional examples of this technology in use, listed by county.

TABLE 13–Regional Examples of Wind Turbine Energy Generation

Site Name	Developer	County	No. of Turbines	Total MWs	Construction Year
Madison Wind Power Project	EDP Renewables Wind Energy LLC	Madison	7	11.6	2000
Fenner Wind Power Project	Canastota Wind Power LLC	Madison	20	30	2001
Munnsville Wind Project	Airtricity Munnsville Wind Farm LLC	Madison	23	34.5	2007
Cody Road Wind Project	Green Power Energy LLC	Madison	NA	10	Construction on hold
West Hill Windfarm	NA	Madison	NA	37.5	Under review
Rolling Upland Wind Farm	EDP Renewables Wind Energy LLC	Madison	NA	60	Under review
Crown City Windfarm	TCI Renewables Canada	Cortland	NA	90	Under review

Source: NYS DEC

TABLE 14–Farm-Based Operating Anerobic Digesters Operating in the Region

Site Name	County	Total Capacity
Aurora Ridge	Cayuga	600 kW
Twin Birch	Cayuga	180 kW
Patterson Dairy	Cayuga	405 kW
Roach Dairy	Cayuga	450 kW
Sunnyside	Cayuga	500 kW
Cayuga County Regional Digester Facility	Cayuga	633 kW
New Hope View Farm	Cortland	70 kW
Morrisville State College	Madison	50 kW

Source: Cornell University

B. SUSTAINABLE FUTURE IN CENTRAL NEW YORK

1. Goal and Targets

In developing this Plan, stakeholders sought to capitalize on the region's strengths, identify a path to overcome the region's challenges, and seize the near-term opportunities and the longer-term potential that can be foreseen on the horizon by anticipating and tracking the trends and drivers of change affecting the region.

In doing this assessment it is important to note that Central New York has a significant natural resource base and institutional capacity that can be used to help drive many of the sustainable initiatives recommended in the plan. As part of this effort, consideration must be given to the region's electric power generation and distribution base. In addition, community leaders need to inventory and seek opportunities to capitalize on the area's land resources, including brownfields and underutilized agriculture land, to support certain clean energy developments such as solar farms and biomass willow feedstocks, and biodigesters. Also noteworthy are the opportunities associated with the rehabilitation of vacant and underutilized structures with energy

TABLE 15–Examples of Geothermal Heat Pumps in the CNY Region

Site Name	County	Building Size	System	Year Installed
Cayuga Community College in Auburn	Cayuga	33,000 sq ft	94 tons	2002
Memorial City Hall in Auburn	Cayuga	26,768 sq ft	70 tons	2003
Auburn Police and Fire Station	Cayuga	NA	NA	2007
Le Moyne College in Syracuse	Onondaga	35,000 sq ft	60 tons	2002
Barden Homes in Tully	Onondaga	16,632 sq ft	38 tons	2004
SUNY Oswego Science Building	Oswego	230,000 sq ft	800 tons	2013

Source: CNY RPDB

TABLE 17–Examples of District Energy in the CNY Region

Site Name	County	# Buildings, Area
Wells College	Cayuga	22 buildings, 534,460 sq ft
SUNY Cortland	Cortland	41 buildings, 2,500,000 sq ft
Colgate University	Madison	119 buildings, 2,284,000 sq ft
SUNY Morrisville	Madison	49+ buildings, 947,000 sq ft
Syracuse University Steam Station (SUSS)	Onondaga	115 buildings, 7,300,000 sq ft
SUNY College of Environmental Science and Forestry (ESF)	Onondaga	10+ buildings, 715,000 sq ft
Le Moyne College	Onondaga	17 major, 19 minor buildings, 1,000,000 sq ft
Onondaga County District Heating and Cooling (DH&C) Facility	Onondaga	10 buildings, 1,300,000 sq ft
SUNY Oswego	Oswego	47+ buildings, 1,000,000 sq ft

Source: CNY RPDB

TABLE 16–Examples of CHP Systems in the CNY Region

Site Name	County	Equipment	Units Installed	Capacity
Syracuse University Green Data Center	Onondaga	Capstone Microturbines	12	780 kW
Cortland Memorial Hospital	Cortland	Engines	3	1,575 kW
St. Joseph Hospital	Onondaga	Gas Turbine	1	4.5 MW
SUNY ESF in Syracuse	Onondaga	Capstone Microturbine & Backpressure Steam Turbine	2	250 kW
Oneida Healthcare	Madison	Engine	1	540 kW
Note: Systems in red cells are not yet installed.				

Source: CNY RPDB

efficient measures and demonstration projects incorporating renewable technologies. Attention should also be focused on the sustainability initiatives being advanced by the institutions of higher learning and technology centers in the region.

When assessing these challenges, it is important that communities across Central New York recognize that the region's current and projected utility costs present a strong basis for the consideration of certain energy efficiency and renewable energy investments that offer a reasonable payback period and return on investment. However, despite the long-term economic arguments, the region is faced with many challenges as it seeks to implement the VisionCNY Plan. These challenges include those faced by any region as it moves towards a more decentralized energy infrastructure based on local renewable resources including inertia and the difficulty of coordinating investments across sectors and communities in order to achieve deployment of clean energy technologies at scale. In addition, new energy infrastructure, whether behind-the-meter technologies (rooftop solar or "small wind" projects) or direct-to-grid applications (solar farm or "community wind" projects) may encounter environmental challenges or other site-specific NIMBY ("not in my backyard") resistance depending on community priorities and experience. Finally, the region faces challenges that are somewhat unique given the age and condition of its electric generation, transmission and distribution facilities and its building and housing stock. Specifically, the region may need to commit to higher levels of investment than those faced by other parts of the country in order to create a modern efficient energy management system.

Based upon public input and the information presented above, the planning team has established the following energy management goal for Central New York:

GOAL: Improve the region's energy management by increasing the efficiency of residential and commercial buildings, curtailing energy demand, increasing the use of local clean energy sources in place of fossil fuels, and accelerating the development of advanced energy technologies.



The Richard S. Shineman Center for Science, Engineering and Innovation at SUNY Oswego includes an 800 ton geothermal heat pump system.

To achieve this goal, the following targets have been established for Central New York:

1) Reduce regional energy consumption per capita, including electricity and fuels, by 40% (below 2010 levels) by 2030.

This measurement comes from a survey of local utility companies, and includes energy consumed for residential, transportation, industrial and commercial uses. Understanding how much energy is consumed per capita can be very effective in illuminating the need to reduce overall energy consumption regardless of its source. In 2010, the regional energy consumption per capita was 213 MMBtu. The reduction target for CNY is to reduce regional energy consumption per capita, including electricity and fuels, by 40% below 2010 levels by 2030 (128 MMBtu). This target is generally consistent with the state's goal of reducing electricity consumption 15% below projected levels by 2015. Meeting this energy consumption target would put the region on track to meet the region's climate target of reducing greenhouse gas emissions 40% by 2030. The Technical Advisory Committee considers this target to be achievable with currently available technology, and

the rest of this plan outlines sustainability strategies with this overarching goal in mind.

Source: Central New York Regional Greenhouse Gas Inventory November 2012

2) Increase the amount of electricity generated by renewable sources within the region to meet 25% of the region's consumption by 2030.

In 2010, the region's electricity consumption totaled approximately 6.2 million MWh. The largest renewable resources in CNY in order of importance are hydro power, municipal solid waste, wind power, and landfill gas, which collectively make up only 2.5% of current generation or approximately 625,000MWh. Without accounting for increasing demand due to growth in population or load, or the export of electricity produced with renewable resources, meeting this target would require approximately 925,000MWh of additional renewable energy generation to come online by 2030, equal to a 60% increase over current levels. Fortunately, there are both small- (local or distributed generation), mid- (community-based) and large-scale opportunities to increase the use of renewable resources in CNY, and geographic conditions in the region naturally lend themselves to wind and hydro power. The VisionCNY Plan identifies potential solar, wind, geothermal and CHP project opportunities with an estimated electricity generation potential of approximately 320,000MWh, equal to about 35% of the additional need. It is important to note that these project opportunities were identified through a high-level screening process, and that further analysis will be required to assess the economic feasibility and other aspects of project development and implementation.

Source: NYS ISO and Central New York Regional Greenhouse Gas Inventory November 2012

3) Increase the annual energy savings achieved through NYSERDA-funded commercial energy efficiency projects by 35% by 2020 and by 50% by 2030.

NYSERDA commercial energy efficiency programs provide the lion's share of funding in the region and cover a broad spectrum of energy-related projects, all designed to develop competitive markets for energy efficiency. For the commercial, institutional and industrial sectors, NYSERDA reports participation in the Existing Facilities Program, New Construction Program, and Industrial & Process Efficiency Program. Participation data from NYSERDA indicates that in 2010 268 commercial, institutional, and industrial customers participated in NYSERDA commercial programs, achieving estimated annual energy savings of 24 GWh (approximately 82,000 MMBTUs). The target is to increase the annual energy savings achieved to 32.4 GWh (approximately 110,000 MMBTUs) by 2020 and 36 GWh (approximately 123,000 MMBTUs) by 2030. It is important to note that these NYSERDA programs do not represent all of the assistance and incentive programs available to CNY customers, which also include NYSERDA FlexTech as well as utility-based rebates and assistance. It is also important to note that NYSERDA residential programs provide significant resources to CNY homeowners but data on participation in is not currently available. If data on the participation rates of these programs becomes available in the future, it will be incorporated into the tracking progress and the target may be adjusted accordingly.

Source: NYSERDA

4) Certify 20% of existing public buildings to ENERGY STAR® or similar energy-efficiency standards by 2030.

Green buildings, such as those that achieve ENERGY STAR® or LEED certification, perform well above most other buildings, delivering energy efficiency savings of up to 30% or more when compared to typical buildings. Building owners can use the EPA's Portfolio Manager tool to measure and track the energy use of any commercial or industrial building. However, for certain types of buildings, energy performance can be rated on EPA's ENERGY STAR® 1-100 energy performance scale relative to similar buildings nationwide. Buildings that achieve an ENERGY STAR® energy performance score of 75 or higher—meaning they are in the top 25% for energy efficiency in the nation compared with similar buildings—and are professionally verified to meet current indoor environment standards are eligible to apply for the ENERGY STAR®. ENERGY STAR® certified buildings typically use 35% less energy than average buildings and cost 50 cents less per square foot to operate. They also have higher occupancy rates, increased asset value, and lower carbon emissions. LEED for Existing Buildings (LEED-EB) is a whole-

building rating system that encourages owners and operators of existing buildings to implement sustainable practices and reduce the environmental impacts of their buildings, while addressing the major aspects of ongoing building operations including: water and energy use, waste stream management, indoor environmental quality, and more. All buildings (as defined by standard building codes) are eligible for certification under LEED-EB. It is targeted at single buildings, whether owner occupied, multitenant, or multiple-building campus projects; individual tenant spaces aren't eligible. While the exact number of public buildings in Central New York is not known, currently 30 out of 67 CNY buildings that have achieved ENERGY STAR® certification are municipal buildings or public schools, and four out of 25 buildings that have achieved LEED certification could be classified as public including two public schools, one BOCES facility, and one public library. The target is to certify at least 20% of the region's existing public buildings to ENERGY STAR® or similar standards by 2030.

Source: U.S. Environmental Protection Agency ENERGY STAR® Program and U.S. Green Building Council

5) Increase the portion of new residential buildings built to ENERGY STAR® or similar energy-efficiency standards to 50% by 2030.

ENERGY STAR® certified new homes are designed and built to standards well above most other homes on the market today, delivering energy efficiency savings of up to 30% when compared to typical new homes. A new single-family home or multi-family building that has earned the ENERGY STAR® label has undergone a process of inspections, testing, and verification to meet strict requirements set by the U.S. Environmental Protection Agency (EPA), delivering better quality, better comfort, and better durability. While the exact number of ENERGY STAR® homes in Central New York is not known, more than 27,000 have been built in New York State to date with nearly 3,500 built in 2012 alone according to the EPA. This is equal to a market penetration of between 20% and 25%. The target is to increase to 50% the portion of new residential buildings built to ENERGY STAR® or similar standards by 2030.

Source: U.S. Environmental Protection Agency ENERGY STAR® Program

2. Strategies

Through group discussions with stakeholders, the planning team identified areas of key opportunities and challenges to achieving sustainable energy generation, supply, and consumption in the region. After reviewing the goal, indicators and targets, and the key opportunities and challenges, a set of energy management strategies were identified for future implementation. Strategies were selected based on the contribution of each to advance the plan's overall energy management goal and targets. In addition, strategies were evaluated for their overall benefits to the region, as well as the costs and feasibility for implementation.

In establishing an action plan for the region, these strategies were prioritized according to their readiness for implementation in the short-term opportunities or long-term initiatives, with short-term defined as 1-5 years and long-term defined as 5-10 years, as these opportunities may require additional time and effort to develop and implement.

Key strategies that have been identified to achieve the sustainable management of energy resources include:

Short-Term Opportunities

a) Reduce energy consumption and improve energy efficiency in residential and commercial buildings.

b) Promote the development of renewable energy resources.

c) Increase access to private and public financing options for investments in energy efficiency and distributed generation.

d) Prepare a Regional Energy Roadmap.

Long-Term Initiatives

e) Facilitate the use of combined heat and power.

f) Develop district energy systems.

g) Develop neighborhood-scale "net zero" projects.

h) Upgrade or replace power generation, transmission, distribution and storage systems to encourage the development of renewable energy resources and smart grid technologies including vehicle-to-grid.

i) Foster local innovation including the development of clean energy businesses.

j) Encourage the deployment of advanced energy technologies such as hydrogen fuel cells.

a) Reduce energy consumption and improve energy efficiency in residential and commercial buildings.

Retrofitting existing buildings represents the greatest opportunity to reduce energy use and increase efficiency for buildings in Central New York. Over the next several decades, a majority of CNY buildings will require substantial reinvestment in order to remain habitable and cost effective to their owners. Focusing on energy efficiency as part of this process would lead to direct economic and environmental benefits. It would also contribute to local energy independence, economic development, and jobs, creating and retaining employment for local residents.

Significant barriers to the widespread adoption of energy conservation measures include the substantial level of investment required to make the region's older building stock energy efficient, limited availability of incentives and financing mechanisms to spread out substantial upfront costs over the life of measures, lack of awareness of the economic and environmental impacts of energy choices, and status quo behaviors that are difficult or slow to change over time.

Behavior Change Program

To implement the VisionCNY Plan's energy efficiency strategy, support and funding could be provided to expand the Central New York Energy Challenge Program. The Central New York Regional Planning and Development Board (CNY RPDB) has managed the Central New York Energy Challenge Program (www.cny-energychallenge.org) since 2011 as an overarching, coordinated initiative under which a number of targeted efforts have been deployed to help residents, businesses and municipalities to improve energy management. A central component of the CNY Energy Challenge Program is a behavior-change campaign to educate, assist and encourage homeowners to reduce energy consumption through simple, low-cost conservation measures, building enthusiasm, readiness and commitment to participate in NYSERDA's Home Performance with ENERGY STAR® Program. Participants form Energy Teams consisting of relatives, friends, neighbors or coworkers who meet as a group over six weeks. Building upon insights from social science research which demonstrate that providing only information and incentives often has little effect on changing energy behaviors, the campaign encourages peer-to-peer conversations and leads participants through a series of fun and easy exercises designed by the CNY RPDB and NYSERDA which enable them to take control of their household energy use. The campaign's cooperative-based approach focuses on specific behaviors and empowers residents to monitor and verify their own energy consumption rather than encouraging them simply to "use less."

Model behavior-change campaigns in Europe and North America have demonstrated success in altering patterns of consumer energy use over a sustained period of time.[16] The CNY RPDB organized a test pilot of the Energy Team campaign in the City of Syracuse in 2012 with encouraging results. Preliminary data showed that participants achieved a 29% reduction in electricity consumption on average after completing the program. The CNY RPDB plans to expand the campaign throughout the City of Syracuse and several more communities in 2013, with the objective of recruiting at least 200 households. The CNY RPDB established a partnership with the Gifford Foundation, which will provide a $5,000 award to the neighborhood organization that recruits the most residents who complete the Energy Team curriculum. This award may be used for a neighborhood-based sustainability project such a rain garden or bicycle parking.

With additional support, the Energy Team campaign could be adapted to an online platform which would scale up program deployment throughout CNY by facilitating participation, referrals and information-sharing through social media and other tools. Additional resources would: allow expanded marketing, promotion and recruitment activities to occur; enhanced website content that provides consolidated information on local, state and federal incentives to be developed; and partnerships with utilities, energy service providers, architects, engineers and other design/building professionals to be strengthened or developed. In the medium-term, the overall CNY Energy Challenge Program including the Energy Team campaign could be expanded to facilitate commercial energy efficiency and workplace energy behavior change by employees of local government and commercial businesses.

Model Green Homes

Another idea which emerged from the VisionCNY planning process and received support from several building and energy performance contractors is the development of model green homes in urban areas such as Syracuse, Oswego, Auburn, Cortland and Oneida. These model homes would demonstrate strategies and technologies to achieve deep energy savings through on-site monitoring systems, information displays and educational workshops for homeowners, renters, energy performance contractors, realtors, and the general public. Potential partners include local governments, the Syracuse CoE, clean energy contractors, the Home Builders and Remodelers of Central New York, the Central New York Realtors Association, non-profit organizations, investor-owned and municipal utilities. Funds could be sought from federal and state agencies such as the U.S. DOE and NYSERDA.

Public Sector Leading By Example

Regional stakeholders expressed strong support for the idea that local governments and public schools can and should play a key role in promoting building energy efficiency and that assistance should be provided to them to enhance their role. Local governments can promote residential and commercial energy efficiency in several ways. For example, they can:

+ eliminate regulatory obstacles that inhibit installation of renewable energy technologies such as height restrictions for wind turbines;
+ provide expedited permitting and reduce or eliminate permit fees for the installation of clean energy technology as has been done by the City of Ithaca for installation of rooftop solar PV;
+ offer partial or complete local property tax exemption for clean energy investments, such as the City of Syracuse and Onondaga County have done through PILOT (payment-in-lieu-of taxes) agreements for energy-efficient commercial buildings;
+ update and enforce local Energy Codes that meet state standards; and
+ require energy benchmarking and disclosure for large buildings as has been done by New York City through its Greener Greater Buildings laws (Local Law 84 and Local Law 87) or by the City of Austin, Texas through its Energy Conservation Audit and Disclosure (ECAD) ordinance.

Both local government and public schools can lead by example by adopting high energy standards, procuring green energy, and implementing programs and projects that reduce energy consumption within their own buildings and operations, thereby demonstrating the feasibility and benefits of clean energy to the larger market. To cite just a few examples of leadership by public schools, in recent years the Fayetteville-Manlius School District

COMMERCIAL ENERGY CONSERVATION EXAMPLES



Installation of efficient lighting with occupancy sensors in a manufacturing warehouse resulted in reduction of energy demand and usage with a payback of 1.4 years before incentive.



The installation of variable speed compressors for the air system in a manufacturing facility saved more than 455,000 kWh annually, with a payback of less than two years.

has installed solar panels at two schools, the Baldwinsville Central School District and Marcellus Central School District received ENERGY STAR® certificates from the U.S. EPA for superior energy performance, and the Jordan-Elbridge Central School District announced that it will spend $1.3 million to upgrade lighting, boilers and other systems through an energy performance contract.

Local governments in CNY have also demonstrated leadership in the area of energy management. As part of the process of preparing the VisionCNY Plan, the CNY RPDB distributed a survey to all 145 municipalities in the region to compile an inventory of energy and other sustainability projects. Responses were received from 52 municipalities, representing a 36% response rate. While not a comprehensive inventory of all projects in CNY, some notable examples of municipal clean energy projects includes: over 40 municipalities have participated in NYSERDA of utility-based efficiency programs; 11 municipalities (Madison County, Onondaga County, Oswego County, the City of Syracuse, the City of Oswego, the City of Auburn, the City of Cortland, the Town of DeWitt, the Town of Preble, and the Village of Skaneateles) have completed greenhouse gas inventories or action plans; nine municipalities (Madison County, Oswego County, City of Oswego, Onondaga County, City of Syracuse, Town of DeWitt, Town of Preble, Village of Port Byron and Village of Hamilton) have installed solar PV systems; five municipalities (Onondaga County, the City of Syracuse, the City of Auburn, the Village of Baldwinsville, and the Village of Solvay) have upgraded public lighting using energy efficient technologies such as LEDs. Appendix II, Section D summarizes the information that was submitted on the survey replies.

Local government representatives who participated in the development of the VisionCNY Plan expressed a willingness to go further but identified barriers that must be addressed. Beyond funding, staff capacity is the biggest challenge that local governments, public schools and non-profit institutions must address when seeking to implement clean energy initiatives. Technical assistance is often required across a range of activities including:

+ developing a greenhouse gas inventory;
+ preparing an action plan;
+ benchmarking building energy consumption using ENERGY STAR® tools;
+ retro-commissioning buildings;



9kW Solar Photovoltaic system at the Preble Town Hall in the Town of Preble.

+ identifying and evaluating policy and program options including power purchase agreements;
+ designing and implementing programs and projects including collaborative procurement of energy services including energy savings performance contracts, solar PV, energy efficient lighting such as LEDs, etc.;
+ identifying funding sources and financing vehicles;
+ engaging stakeholders; and
+ determining results.

Partnerships with institutions of higher education can support local governments and public schools efforts to increase energy efficiency. Within CNY, several colleges and universities have adopted the American University Presidents' Climate Commitment (AAUPC), by which they commit to eliminate their net greenhouse gas emissions from specified campus operations and to promote research of sustainability programs and empower the "higher education sector to educate students, create solutions, and provide leadership-by-example for the rest of society" (www.presidentsclimatecommitment.org). Specifically, signatories to the AAUPC agree to: complete an emissions inventory; set a target date and interim milestones for becoming climate neutral; take immediate steps to reduce greenhouse gas emissions by choosing from a list

MUNICIPAL ENERGY CONSERVATION



High Bay LED Lighting at War Memorial Arena

Project Type:	Lighting
Location:	Onondaga (Syracuse)
Building:	War Memorial
Project Description:	New LED lighting fixtures were installed to replace existing metal halide lighting fixtures. The new lighting fixtures have lower power consumption and provide for more efficient operation (via wirelessly addressable controls). Project life is estimated to be 15 years.
Demand Reduction:	98 kW
Annual Energy Savings:	194,000 kWh
Annual Savings:	$27,160 (at $0.14 per kWh)
Installation Costs:	$400,000
Simple Payback:	15 years
GHG Reductions:	1.45 million lb CO_2 (using 0.5 lb/kWh)
GHG Metric	3.6 lb CO_2 over project life per dollar invested



New Efficient Lighting at Auburn City Hall

Project Type:	Street and Outdoor Lighting
Location:	City of Auburn
Building:	Not applicable
Project Description:	845 new LED and induction street light fixtures were installed to replace existing high pressure sodium lighting. The new lighting fixtures were both Cobrahead-style as well as Ornamental. Project life is estimated to be 15 years.
Demand Reduction:	180 kW approx.
Annual Energy Savings:	792,700 kWh
Annual Savings:	$66,500 (at $0.084 per kWh)
Installation Costs:	$420,000
Simple Payback:	6 to 7 years
GHG Reductions:	5.9 million lb CO_2 (using 0.5 lb/kWh)
GHG Metric	14.3 lb CO_2 over project life per dollar invested

of short-term actions; integrate sustainability into the curriculum and make it part of the educational experience; and make the action plan, inventory and progress reports publicly available. CNY colleges and universities where the AAUPC has been operational for several years include Colgate University, Onondaga Community College, State University of New York College at Cortland, State University of New York College at Oswego, State University of New York College of Environmental Science and Forestry, State University of New York Upstate Medical University, and Syracuse University. In partnership with SUNY-ESF and other colleges and universities, the CNY RPDB has provided undergraduate and graduate students through courses and internships to assist municipalities to complete community-based greenhouse gas inventories and climate action plans as part of the agency's Climate Change Innovation Program.

Municipalities can receive technical assistance for energy efficiency studies through NYSERDA's FlexTech Program on a 50-50 cost-share basis. During the VisionCNY outreach process, however, stakeholders identified the required cost-share as a potential barrier to their participation in the FlexTech Program.

Fortunately, support and technical assistance is available to CNY municipalities. The CNY RPDB currently administers the CNY Climate Change Innovation Program (C_2IP) with grant funding provided by the U.S. EPA. The program currently assists seven CNY communities to: prepare greenhouse gas inventories and climate action plans; revise local policies, codes and regulations to stimulate increased investment in energy efficiency and renewable energy; educate and encourage residents and businesses to take action to reduce energy use and greenhouse gas emissions; and implement clean energy demonstration projects. The CNY RPDB has also been designated as the regional coordinator of the NYS Climate Smart Communities Program and provides technical assistance to CNY communities that have adopted the voluntary Climate Smart Pledge to reduce energy consumption and greenhouse gas emissions. Over 20% of respondents (n=11) to the CNY RPDB local government survey reported that they had already received technical support and/or funding from the CNY RPDB.

The CNY RPDB has developed an inventory of best practices and model ordinances which is available to CNY municipalities. With additional support, this inventory could be further developed into an online clearinghouse to provide fact sheets, technology transfer materials, model RFPs, and case studies of best practices through the CNY Energy Challenge website. Additional technical assistance is available through the Environmental Finance Center at Syracuse University, local colleges and universities, Cornell Cooperative Extension, the Building Codes Assistance Project (http://www.bcap-energy.org/home.php), GreeningUSA and other local or regional organizations. Opportunities for collaboration and information-sharing between CNY technical assistance providers and local governments should be explored further. These organizations can provide training and tools for municipal staff through workshops, webinars, and other Web-based resources. Funding could be sought from federal and state agencies including the U.S. EPA, the U.S. DOE, NYS DEC, NYSERDA.

A more comprehensive approach would involve the preparation of local government Energy Master Plans. These plans would complement the greenhouse gas inventories and local climate action plans that are prepared through the CNY RPDB's C2IP and would address matters including: electricity, natural gas and steam infrastructure; renewable energy and clean vehicles; energy use in local government buildings and facilities; and other priorities identified in consultation with local government. NYPA issued a Request for Proposals in 2013 for consulting services to prepare a plan for the City of Syracuse, and several local governments have received funding from NYSERDA to prepare comprehensive energy plans over the past several years. Oswego County, for example, is currently completing its Energy Efficiency Plan which will become a component of the county's overall Sustainability Plan. Additional funding could be made available to the region's largest communities to enable them to complete similar plans with the assistance of local colleges and universities, energy or sustainability consultants, or the CNY RPDB.

b) Promote the development of renewable energy resources.

Many opportunities exist to develop renewable resources, which could supply affordable clean energy to homes and businesses throughout the region. Renewable energy sources could also offer substantial regional economic benefits if implemented through distributed-generation (also called behind-the-meter) or community-scale projects. Solar power offers an opportunity for locally-scaled renewable energy generation, and could be implemented

at the residential scale as a replacement for fuel oil heating/water heating systems. While not yet developed in CNY, solar also offers opportunities to produce wholesale (or direct-to-grid) power through large-scale solar farms (several MW or more). Wind power also offers an opportunity to expand renewable energy at the distributed (such as for wastewater treatment plants) or community-scale. Small-scale hydroelectric power projects already exist and so-called "micro-hydro" or run-of-river systems can service residential and commercial buildings, as could geothermal systems (ground source heat pumps).

Several barriers must be addressed to scale up deployment of renewable energy, including the intermittency of solar and wind resources and the site-specific requirements of distributed generation. As illustrated in Table 18, specific renewable resources generally lend themselves to more complimentary location-based conditions. Geographic conditions naturally lend themselves to wind and hydropower. Wind is favored in the hilly areas of Madison and Cortland Counties, as well as along the Lake Ontario shoreline. Large hydropower works best in the region's larger rivers and micro-hydro requires specific geographical and hydrological conditions as well as close proximity to energy load. Other renewable resources are most competitive when compared to competing energy sources. Solar thermal has the most potential in rural areas where hot water heating is normally performed with electricity. Ground source heat pumps are most cost effective where natural gas is not available. And finally some resources, like solar electric, have no particular location-based driver to their adoption.

Other significant barriers to deployment of renewable energy resources include local regulatory barriers such as zoning, technical issues such as interconnection of solar and wind to local distribution networks in some locations such as downtown Syracuse, and high upfront installation costs.

Renewable energy resources, primarily hydroelectric and wind energy, currently generates about 625,000MWh per year in Central New York, amounting to less than 3% of total electricity generated in the region. Since roughly 25% of total electricity generated in CNY remains within the region and 75% is exported, approximately 156,250MWh of electricity produced with renewable resources is available in CNY. If the region meets its target to reduce per capita energy consumption by 40% by 2030, then approximately 930,000MWh of renewable electricity would be required by that date (6.2 million MWh consumed in 2010 multiplied by 60% multiplied by 25%). Therefore, approximately 773,750MWh of new renewable energy generation will be required by 2030.

As part of the development of the VisionCNY Plan, a screening-level analysis was executed to identify potentially viable solar PV and wind projects that could be implemented in the region. This process identified potential large (direct-to-grid) and small (behind-the-meter) solar and wind projects that met standard project implementation criteria including: proximity to load centers or electricity distribution infrastructure; adjacent/current land use; terrain, slopes, and drainage patterns; and potential sources of ob-

TABLE 18—Technologies with the highest potential by County

Distributed Generation Technology	Cayuga	Cortland	Madison	Onondaga	Oswego
Solar Thermal	●	●	●	●	●
Solar Photovoltaic (PV)	●	●	●	●	●
Wind		●	●		●
CHP		●		●	
Anaerobic digesters	●	●	●		●
Hydropower				●	●
Geothermal	●	●	●	●	●
Fuel Cells				●	
District Energy Systems			●	●	●

Source: CNY RPDB

struction (for wind) or shading (for solar) such as tree canopy or nearby structures. In summary, the representative solar and wind energy projects could generate approximately 223,000MWh of additional renewable electricity annually, sufficient to power over 30,000 residential homes and offset approximately 50,000 metric tons of GHG emissions. Development of these potential project opportunities would meet close to 30% of the target of new renewable energy generation by 2030.

A high-level analysis of the technical potential of renewable energy in the region reveals that, in aggregate, there is sufficient buildable area to equate to approximately 3,650 MW of rooftop solar PV and 20,000 MW of wind energy to be installed, equal to more than four times the present installed capacity of all CNY electric generation facilities. It is important to note that the screening level analysis is preliminary and is not exhaustive as there may be many other suitable sites that were not included as part of the evaluation. Further analysis will be required by project sponsors to determine economic feasibility. The viability of any individual energy opportunity is driven by a complex relationship between the available energy resource at a given location and the ability to design, build, and operate a system at that site in a cost effective manner. Significant expansion of renewable energy resources will require investment in equipment and technologies, worker training to overcome a lack of familiarity with community-scale systems, outreach to municipalities to address regulatory or zoning barriers which may limit development, and measures to ensure opportunities exist for residents, local businesses, and communities to gain a stake in energy development.

Based on the input of regional stakeholders, high-profile public facilities and highly visible locations such as the Syracuse Hancock International Airport or the Metropolitan Water Board's new reservoirs in the Town of Clay should be targeted in the short-term. Deployment of renewable energy resources at public facilities can provide cost savings to taxpayers and demonstrate the effectiveness of these clean energy technologies to the broader public.

New York State has established policies that facilitate the development of renewable resources and distributed generation, also called on-site or decentralized generation, which allows collection of primary energy from smaller and more locally-placed and sources and may improve security, and certainly diversity, of supply.



Metropolitan Water Board Reservoirs Under Construction, Town of Clay (Source: Onondaga County Metropolitan Water Board)

The ability to connect distributed generation resources to the grid, called electrical interconnection, has become standardized for all utilities in NYS as per the Standard Interconnection Requirements (SIR) issued by the New York Public Service Commission (NYPSC). Net metering provisions that allow the owner of distributed generation to sell any excess power generated back to the grid at specified rates are also in place. Community-based virtual net metering, which allows for the electricity generated from a solar photovoltaic system located at a specific site to be credited towards kWh consumption at a different location, is an important enabler for distributed power generation within a local community. A key benefit of virtual net metering is that provides entities with sites that are not suitable for solar projects (i.e. shade-challenged roofs, or utility grid interconnection barriers) to install solar projects on locations best suited for solar, and then simply allocate the system's surplus kWh production to the original site.

The NYSERDA Renewable Portfolio Standard (RPS) employs two programs as the principal means of developing renewable resources. The bulk of the electricity needed to reach this goal is obtained from competitive procurements of renewable resources (the Main Tier), meaning large-scale, grid-tied supply from hydro, landfill gas, large wind and biomass facilities. In the complementary program for "behind-the-meter" applications of renewable generation, customers directly participate (the Customer-Sited Tier) with on-site or distributed generation using smaller wind, solar,

and biomass systems that replace grid supply at the point of use. Federal and state income tax credits are available for several of the distributed generation technologies.

Solarize Program

Several ideas identified during the planning process can increase use of renewable energy resources and distributed energy technologies. The Solarize bulk purchasing program that was piloted in Madison County in 2012 could be expanded to cover all of Central New York and to include solar thermal as well as solar PV systems. The Solarize Madison program (www.solarizemadison.com) allows participating homeowners to take advantage of volume pricing discounts up to 5% on PV hardware. The program is operated by the Madison County Planning Department with support from partners including Morrisville State College and the CNY RPDB, which provided a bonus incentive of $2,000 to the first 15 participants who agreed to become a Solar Ambassador to promote the benefits of these systems to the wider community. There is great interest to establish a region-wide Solarize CNY program. Additional funding for Solar Ambassadors throughout the region would help to spread the word and provide customer-to-consumer feedback. A Solarize CNY program might provide even deeper discounts with the larger volume purchasing available throughout the region. Potential partners include local governments, the CNY RPDB, colleges and universities, local non-profit organizations, solar contractors and investor-owned and municipal utilities.

Municipal Collaborative Procurement

The coordination of bulk procurement of solar PV systems by local governments, public agencies and large non-profit organizations could further stimulate the regional market. Bulk procurement by these institutional investors allows greater investment in clean energy systems by aggregating many smaller investments, while affording greater savings for each. The CNY RPDB has communicated with project sponsors of successful model programs in California and the Washington DC metropolitan area, where modest upfront funding has achieved impressive results (considerable new installed solar PV capacity). Additional funding is needed to cover the costs of conducting project sponsor outreach, developing a common RFP, and executing the pre-feasibility technical analysis to screen specific project opportunities. Possible partners include the CNY RPDB, local governments, the U.S. EPA, the U.S. DOE, NYSERDA and NYS DEC.

Online Solar Resource Map

To further increase deployment of solar PV, the VisionCNY Plan calls for the development of an interactive online mapping tool similar to those developed in New York City, Boston, San Francisco, and Los Angeles. This resource would provide technical assistance to customers who would like to install solar PV systems. The CNY RPDB has communicated with project sponsors in NYC and LA and with technical service providers (mapping and website development) about the requirements to establish such a tool. Funding would be required to develop updated LIDAR mapping for the region, and to develop the online tool.

Community Wind Feasibility Studies

Expanding the CNY RPDB's My Wind Program, which provides technical assistance and loans meteorological towers to support community-based wind projects, would help to meet the VisionCNY Plan's renewable energy target. The CNY RPDB received funding from the USDA to develop the program and to conduct a preliminary feasibility study in the Town of Fabius. Similar programs have been created in Massachusetts, Pennsylvania and elsewhere. Additional funding could be sought from foundations and federal and state agencies such as USDA, US DOE, and NYSERDA.

Grid Interconnection

Finally, a regional stakeholder group could be established to identify and address issues that limit the increased use of renewable energy resources. As part of the process of developing the VisionCNY Plan, a focus group meeting was held with National Grid staff to discuss technical and other issues that make it difficult to integrate renewable energy resources and distributed generation technologies into the regional energy grid. A regional stakeholder group comprised of utilities, local government, contractors, renewable energy experts, colleges and universities, and others could be established to address such issues. A regional stakeholder group could also identify locations where the deployment of smart grid technologies could facilitate clean energy investments or energy outreach programs such as the Central New York Energy Challenge. Development of an Energy Infrastructure and Renewable Energy Resources Map could identify potential "hot spots" of planned or potential development where distribution or transmission infrastructure may be in need of improvement.



The Fenner Wind Farm in Madison County was the first commercial-scale project in New York State.

c) Increase access to private and public financing options for investments in energy efficiency and distributed generation.

Initial investment and long payback periods are often disincentives to retrofitting buildings and installing renewable systems. Innovative financing options can overcome this lack of upfront capital. One of the most popular actions coming out of the VisionCNY Plan stakeholder outreach process was the need to provide additional financing options for energy efficiency and renewable energy projects. Stakeholder and expert discussions identified the need to empower local government, agencies, and financial institutions to develop financing options to assist businesses and homeowners. Increasing access to capital will allow more municipalities and home and business owners to invest in energy efficiency measures in buildings and operations and to replace a portion of energy generated by fossil fuels with renewable energy technology. Making these investments offers some of the largest greenhouse gas reductions available in Central New York.

There are a number of existing funding sources to make the cost of energy efficiency and renewable energy upgrades manageable. These include federal tax credits, state tax incentives, incentives and financing from NYSERDA, including low-interest financing available through the Green Jobs-Green NY program and utility-based energy efficiency programs, including on-bill financing. For certain customers, though, as well as for certain larger-scale projects, financing energy efficiency and renewable energy projects is challenging, even when customers have a strong motivation. Non-profit entities, for example, are unable to take advantage of tax credits; and a municipality wishing to invest in a community-wide renewable project may struggle to find a way to do so. Some residential and commercial customers may be unable to meet credit or loan eligibility requirements.

The barriers to implementing this action include lack of capacity and knowledge of energy financing programs among local government officials and a lack of capital to fund such programs.

Revolving Loan Fund

The most straightforward action that can be taken is to expand the Energy Revolving Loan Fund (ERLF) currently administered by the CNY RPDB. This fund, which was capitalized with an American Recovery and Reinvestment Act (ARRA) grant received by Oswego County from NYSERDA, may only be used for energy efficiency investments per federal guidelines. With additional support, the ERLF could be expanded to finance investments in distributed generation technologies, which has been an area of interest expressed by potential project developers. Funds could be sought from local or national foundations, national organizations, or federal or state agencies. New York City secured seed money to establish the New York City Energy Efficiency Corporation (NYCEEC) from the federal government which attracted contributions from organizations including the Rockefeller Foundation, the Kresge Foundation, Deutsche Bank, the Living Cities Foundation, and the Natural Resource Defense Council (NRDC). While the economic recession and prolonged recovery have limited activity in the CNY RPDB's ERLF to date, additional funding would facilitate expanded outreach to prospective borrowers through workshops for financial, tax and other professionals who interact with potential borrower and through advertising in financial and business journals and publications.

Commercial PACE Program

Another idea that received strong support from regional stakeholders is the establishment of a local or regional Property Assessed Clean Energy (PACE) loan program that would allow building owners to make energy efficiency improvements or install renewable energy systems without upfront capital, paying the cost of the upgrade back through a fee that is assessed with the property's tax bill over a period of ten to twenty years. The assessment amount is based on the owner's expected energy savings and is secured by a property lien that takes priority over the mortgage and other loans if there is a foreclosure. This ensures that the loan transfers when the property is sold, keeping the repayment of the loan the responsibility of the building owner benefitting from the improvements. Because a PACE loan is an unsecured loan that does not require an appraisal, preliminary approval can take less than an hour, with closing following in short order. This is crucial for customers in need of immediate equipment replacement. NYS passed PACE-enabling legislation in 2009, and municipalities may pass local laws to allow for PACE loans.[17] The implementation of residential PACE programs has stalled due to a 2010 ruling by the Federal Housing Finance Agency (FHFA) that prevents federal underwriting for mortgages on properties with PACE loans attached (PACE loans are structured as liens on the property, taking precedence over a mortgage, which makes them unappealing to federal mortgage backers). While this does not affect commercial mortgages, because the FHFA does not have oversight of commercial mortgages, commercial property owners typically need their lender's approval before taking on additional liabilities like a PACE lien. The municipalities in CNY could, therefore, pass PACE legislation that commercial building owners could use. There are commercial PACE programs in San Francisco and Connecticut which can serve as models. The U.S. DOE has published guidelines for pilot PACE programs and resources are available through PACENow (www.pacenow.org) a not-for-profit organization. Additional technical assistance can be provided by the CNY RPDB in its role as the CNY Climate Smart Communities Coordinator.

Employer-Assisted Financing

The City of Little Rock has partnered with the William J. Clinton Foundation's Climate Initiative - Arkansas (CCI-AR) to develop an innovative approach that provides barrier-free, low-interest financing opportunities through the Home Energy Affordability Loan (HEAL) program. The HEAL program enlists employers to facilitate and administer the program to qualifying employees and community members. This allows the program to overcome a key outreach barrier and engage people at their place of work. Moreover, CCI-AR facilitates financing of energy efficient retrofits for employees' homes, as well as loan repayments through payroll deductions.

Little Rock is working to share the process and lessons learned from creating the program with other communities interested in replicating it. The CCI-AR is creating a HEAL program template that includes sample forms and documents, sample marketing materials, before and after energy ratings for each home, frequency and cost benefit analysis of expected retrofits, training protocols, and performance and productivity standards. The CNY RPDB is working with the CCI-AR to explore opportunities to deploy the HEAL program in CNY.

d) Prepare a Regional Energy Roadmap.

A Regional Energy Roadmap will establish a detailed plan to achieve Central New York's desired energy portfolio. It will identify potential future energy scenarios and spur action by presenting short- and long-term steps to achieve the desired scenario. The Regional Energy Roadmap will require a proactive strategic planning process which will aim to maximize renewable energy resource development, energy efficient technology and measures deployment, and economic development, and reduced dependence on imported fossil fuels. By identifying clear action steps, CNY would invest in a process that will likely lead to specific dedication of funds and resources, as well as strategic partnerships to leverage existing initiatives. It would also provide foundational knowledge about renewables in the region as well as gaps in developing the potential of these energy sources. The Roadmap would provide a transparent plan for all community members to see the value of the investment in clean energy and the projected results. It would increase elected officials' and the general public's understanding and awareness about the financial and operational aspects of specific renewable energy and energy efficiency. As a regional organization focused on CNY which has an active Energy Management program, the Central New York Regional Planning and Development Board (CNY RPDB) is an appropriate entity to take on such a task. This project could be led by the CNY RPDB in partnership with local governments, colleges and universities, the business community, utilities and other stakeholders.

e) Facilitate use of combined heat and power.

Combined Heat and Power (CHP) – also known as combined cooling heating and power (CCHP) or co-generation – uses an on-site power generation source to meet both electrical and thermal loads in a facility simultaneously. The heat produced by the prime mover (i.e., the engine, turbine, or fuel cell) as a consequence of electrical production, can be used on-site to meet facility heating or cooling loads. In contrast, central station utility power plants expel this heat to the atmosphere. Thus, CHP systems provide better utilization of fuel and as such, are a form of energy efficiency. CHP systems overall efficiency is in the range of 75% as compared with a central utility plant that is approximately 45% efficient. The economic benefits to the customer and the environmental benefits to society are often closely aligned for CHP systems – so a project that is more cost effective or profitable for a customer should also provide greater environmental benefits. In addition to the GHG emissions benefits and cost savings, CHP systems can increase power reliability, enhance power quality, and increase operational efficiency. The fuel used for CHP facilities varies greatly and can include natural gas, biomass, or the heat stored in the earth. Several applications, including large multi-family buildings, hotels, hospitals, nursing homes, assisted living facilities, universities, and certain industrial processes, are especially favorable to CHP. To be cost effective thermal and electrical loads must be consistent (or at least well synchronized) across the day, week and year. Generally systems are sized to meet the thermal loads not the electrical loads.



The Gateway Building at the SUNY College of Environmental Science and Forestry will house a 250 kW CHP system in addition to other clean energy technologies.

Like any capital-intensive project, installing a combined heat and power (CHP) system requires a careful evaluation of the owner's goals, needs, long-term outlook, and of course, the technical and economic feasibility of the project in terms of simple payback and life cycle costs.[18] The detailed feasibility study must understand and consider a wide range of issues including:

+ Thermal and electric loads, current and future, in the facility
+ Gas and electric utility rates, including future projections
+ The physical details such as space and location for equipment, piping and electrical layout details, electrical interconnection details, etc.
+ Electric utility interconnection issues
+ Impact of the system on occupants and neighbors
+ Environmental and regulatory requirements
+ Ability of internal staff to operate and maintain the system.

When considering CHP, the facility's long term planning, decision-making processes, current purchasing strategy for energy, tolerance for fluctuating utility costs, and concerns about overall environmental costs and benefits must be considered. Many of these issues can be precisely quantified, while others require a more qualitative evaluation and extensive consultation with building owners and operators. CHP technology can be difficult for building owners and operators to understand, and there is not widespread understanding or knowledge of the technology. Additionally, the systems can be expensive to purchase and install and require significant upfront expenditures. Balancing peak heating needs which occur in winter with peak electricity demand in summer can make it difficult to maximize efficiency. CHP projects typically require multiple layers of approvals such as electric utility interconnection, natural gas connection and supply or identification of alternative fuel sources, construction and operating approvals, and permit requirements.

Regional Technical Assistance Program

The VisionCNY Plan recommends that screening of candidate facilities should be undertaken to evaluate the economic feasibility

of adding CHP to favorable facilities, including identifying target facilities, guidelines for screening facilities, and guidance for evaluating economic feasibility. A regional program and/or fund could be established to provide technical and financial assistance to owners of candidate facilities. Model procedures and schedules could be developed, and assistance could be provided with the regulatory overview process such as securing air and other environmental permits. Grants or low-interest loans to help cover higher initial costs or feasibility studies could help overcome the cost barrier. Finally, a marketing and outreach campaign targeted to private and public facilities would facilitate information exchange among potential system owners and all of the economic and regulatory stakeholders. The Syracuse CoE has administered outreach and education workshops on CHP through its Research & Technology Forum and these efforts could be expanded. Additional regional partners may include the Industrial Assessment Center at Syracuse University, the Manufacturer's Association of Central New York, Centerstate CEO, the CNY RPDB, local government, and investor-owned and municipal utilities. Funding can be sought from federal and state agencies including the U.S. DOE and NYSERDA.

f) Develop district energy systems.

District energy systems, which involve the local production and distribution of thermal and/or electrical energy for heating, cooling and powering homes, commercial and institutional buildings and industrial process, are typically used in dense urban settings such as central business districts of larger cities, university or college campuses, hospital or research campuses, military bases, and airports. District systems can serve clusters of buildings regardless of whether they have one common owner or separate owners. Typical systems can range from as few as three buildings to as many as 1,800 buildings demonstrating the range of different situations where district energy systems can be applied. District systems take advantage of economies of scale as well as operational benefits of connecting a diverse grouping of customers.

Incorporating district energy encourages land use planners to shape building development in a way that supports the use of district energy networks. This occurs by locating producers of excess heat near to users of heat or developing buildings with high heat densities in clusters that can be connected to a heating and/or cooling piping system.

Launching a successful district energy system is a substantial task that requires significant investment of time and money. Constructing a new district energy system is a major infrastructure project, involving connecting all of the buildings in a district to the central plant through underground pipes. While detailed engineering studies and sound financial and business models are absolutely necessary in the project development process, a developer who does not consider regulatory and policy issues may see a technically sound project stalled or derailed entirely. Project developers may find it challenging to understand complex statutory language and remain informed on these fluid issues, but it is critical to a project's success that a knowledgeable individual understands the policies and regulations that affect a project's development, financial viability, construction, and operation. Even though the long-term energy savings and environmental benefits are significant – and the project would generate many good paying jobs – the high upfront costs can discourage developers. District energy systems often include CHP technology, which can be challenging to connect to the power grid.

Federal incentives are available including the Investment Tax Credit and Production Tax Credit, which may be applicable to some district energy systems. In addition, there are incentives available from NYSERDA for installation of CHP. It is advisable that in the early phase of project definition, steps are taken to determine eligible funding and policy incentives that might impact technology selections. The U.S. Department of Energy Clean Energy Application Centers may offer guidance to assist with identifying available financial and technical resources.

Regional Technical Assistance Program
A regional program could be established to leverage state and federal resources and provide additional assistance to evaluate the technical and economic feasibility of creating district energy systems in favorable locations, including identifying target facilities, establishing guidelines for screening facilities, and providing guidance for evaluating economic feasibility. Technical assistance is needed to facilitate and coordinate the substantial data collection and analysis tasks required to conduct a feasibility study for a district energy project including: establishing project objectives including energy security, emissions reduction and financial goals; cataloging anchor loads and the density and age of buildings of existing development; mapping location, mix of uses, and demands

of new development; mapping existing energy demands and existing energy installations; identifying potential locations for new plant and equipment; identifying potential physical barriers such as railway lines, storm water drains, highways, canals, or rivers; conducting a resource assessment; and prioritizing clusters with maximum density, diversity and anchors, and identify key buildings to be connected.

A regional program could also provide technical and financial assistance to owners of candidate facilities to assist with project implementation. District energy projects typically require multiple layers of approvals such as electric utility interconnection, natural gas connection and supply or identification or alternative fuel sources, construction and operating approvals, and permit requirements. Model procedures and schedules could be developed, and assistance could be provided with the regulatory overview process such as securing air and other environmental permits. Grants or low-interest loans to help cover higher initial costs or feasibility studies including identifying the legal form of a district energy company could help overcome the cost barrier. The program could also include a marketing and information-sharing campaign targeted to private and public facilities and management staff and board members of school districts, institutions, local governments, and other entities responsible for aging physical plants. Possible partners include local governments, the CNY RPDB, the Syracuse CoE, local colleges and universities, non-profit organizations, investor-owned and municipal utilities. Funds could be sought from federal and state agencies including the U.S. DOE, the U.S. EPA, and NYSERDA.

g) Develop neighborhood-scale "net zero" projects.

The development of a neighborhood-scale "net-zero" demonstration projects would provide proof-of-concept to regional stakeholders and funders. This type of project, in which an entire district or neighborhood produces at least as much energy as it consumes, is becoming more common throughout North America and world but none have been implemented as yet in Central New York.

A number of communities across North America including Austin, Boston, Charlotte, Cleveland, Philadelphia, Portland, San Francisco, Seattle, Washington, DC have undertaken projects to establish

XAVIER WOODS: ECO-FRIENDLY INFILL DEVELOPMENT



The Xavier Woods residential development consists of 33 energy efficient houses located on a 6.5 acre parcel on the east side of Syracuse. The city's largest subdivision in decades, the project is accessible to public transit and is a model for location-efficient infill development.

The project features efficient urban design and management of energy and water resources. All homes will be super-insulated, constructed of pre-fabricated Structural Insulated Panels and should perform well in excess of energy code requirements. Ground floor radiant-heated slabs will minimize home heat loss. The radiant pipes can also combine easily with fluid-based alternate energy packages and the houses will accommodate other technologies such as solar hot water and photovoltaic arrays. Lights and appliances are energy efficient and the fixtures are low-water consumption.

The site runoff is designed to exceed NYS DEC standards and the requirements of Onondaga County's "Save the Rain" initiative. The homes will be organized about a new street bordered with sidewalks in a neighborhood that will feature rain gardens and landscaping designed to best manage the ingress and egress of site and storm waters. All site water taken in is conveyed and processed through a series of bioswales and collection structures to a shallow, pervious-basin pond to facilitate infiltration into the ground prior to entering the municipal storm water infrastructure.

"EcoDistricts" to address sustainability issues at the neighborhood scale and to serve as models of innovative technologies and solutions that can be scaled up. According to EcoDistricts, formerly the Portland Sustainability Institute at Portland State University, an EcoDistrict is "a highly integrated neighborhood that is . . . home to smart buildings; strives to capture and reuse energy, water and waste on site; offers a range of transportation options; provides open space for people and natural areas for wildlife; and tracks tangible progress toward neighborhood sustainability over time" (http://www.pdx.edu/sustainability/ecodistricts).

Regional Demonstration Projects

The City of Syracuse and Syracuse University could be engaged to support neighborhood revitalization on the city's distressed Near Westside though a highly-visible demonstration project. The Syracuse CoE, which participated in the Technical Advisory Committee and the development of the VisionCNY Plan, has been actively engaged in ongoing neighborhood revitalization efforts through the Near Westside Initiative and expressed strong interest in this pursuing this concept. The project could re-value a single block or street that is facing vacant or marginalized housing, institutional, and commercial properties in a limited target area. All technologies that will reduce reliance on fossil fuels for heating and cooling and improve energy-efficiency of all existing structures that are occupied, or reasonably can be occupied by businesses or institutions, will be applied. Stormwater diversion could be made part of the project where rainwater will be allowed to percolate back to below-ground water tables or for use by community gardens. The use of geothermal or CHP/CCHP for heating and cooling of adjoining houses/businesses will be applied where appropriate.

Other possible locations identified during the development of this Plan include the Inner Harbor project and surrounding southern shoreline area of Onondaga Lake in the City of Syracuse, the Xavier Woods residential subdivision in the City of Syracuse, and the proposed Midtown Plaza redevelopment project and surrounding area in the City of Oswego. Redevelopment of the ShoppingTown Mall site in DeWitt into a mixed-use town center might provide another opportunity to meet net-zero standards with district energy or other technologies. Possible partners include local governments, the CNY RPDB, the Syracuse CoE, local colleges and universities, non-profit organizations, investor-owned and municipal utilities. Funds could be sought from federal and state agencies including the U.S. DOE, the U.S. EPA, NYS ESD and NYSERDA.

h) Upgrade or replace power generation, transmission, distribution and storage systems to encourage the development of renewable energy resources and smart grid technologies including vehicle-to-grid.

While the nation's electric power delivery infrastructure provided abundant, affordable energy to homes and businesses throughout the 20th century, today's power grids are increasingly operating at their limit, facing shortcomings in capacity, reliability, security and power quality. Meeting Central New York's energy management goals will require smart investments to replace aging infrastructure and expand capacity where necessary to meet increasing electricity demand, and to expedite the interconnection and operational integration of renewable generation to the power grid.

Fortunately, the region already has a fairly robust high-voltage power transmission infrastructure in place, particularly in Oswego County which could be targeted for large-scale renewable energy or energy storage (i.e., fuel cells) projects. Nevertheless it is likely that improvements to the region's aging transmission infrastructure, as called for in the NYS Energy Highway Program, will be necessary to relieve congestion, promote distributed generation, and reduce line loss. Regional line improvements would allow renewable power to be transmitted downstate, and may be required to facilitate large-scale development of regional wind resources. In addition, local transmission and distribution line improvements, and addressing constraints on the "spot network" in downtown Syracuse, would facilitate the interconnection of new distributed generation systems to the grid.

The region's need for additional investment in its energy infrastructure represents a once-in-a-century opportunity to apply new technologies and systems rather than the antiquated designs and technologies of the 1960s and earlier. New advances in power delivery, communications and information technology have laid the groundwork for a modern grid. Proven effective in lab tests and field trials, these cutting-edge solutions offer dramatic improvements in power quality, service and cost savings. Advanced metering infrastructure (AMI), for example, provides two-way communi-

cation between customers and their electric utility, giving utilities detailed information about electrical loads and power outages while giving customers the option to adjust their energy use in response to real-time utility rates. AMI is a necessary underpinning for more sophisticated approaches to demand response. AMI is a step toward "Smart Grid", which is a concept that involves adding internet-like communication technologies and control technologies to the nation's electrical grid.

A study commissioned for the U.S. Energy Information Administration (U.S.EIA) by SAIC identified and characterized the performance of 23 smart grid projects across the U.S.[19] Most every pilot project involved advanced metering infrastructure (AMI), automated meter reading (AMR) as well as smart appliances and dynamic pricing. Of the 23 programs, 13 were viewed as successful or progressing while 10 were either cancelled or postponed; none were in CNY. The primary reasons given for the cancellation or postponement were often attributed to either funding issues or equipment issues (Table 19).

Regional Smart Grid Pilot Program

The VisionCNY Plan calls for the region's utilities to begin smart grid initiatives and to explore the technical and economic feasibility of smart grid/vehicle integration which would allow plug-in

TABLE 19–Performance of Smart Grid Demonstration Projects across the U.S.

		Customer Issues					Technological Issues			
Project Name	Lack of Funding or Cost Issues	Health Concerns	Privacy Concerns	Negative Response to Rate Increases	Inadequate Customer Education for Effective System Use	Customer Service Issues	Equipment or Construction Related Problems	Waiting for Technological Advancement	State / Local Regulatory Orders Causing Delays	Observing Other Pilot Projects before Proceeding
BGE Smart Meter Pilot Program	◉			○	◉			○	○	
CL&P Plan-it Wise Energy Program	◉		○	○					○	
Consumers Energy SmartStreet Pilot. Full Scale Smart Meter Project	◉							○	○	○
DP&L Customer Conservation and Energy Management Plan	○		○	○				◉		○
HECO Smart Meter Pilot Program	○						◉		○	
LIPA BPL and Wireless Communications Demonstration	◉	○					◉			
PG&E SmartMeter Program		◉	○		○	○	◉		○	
PSE PEM Program	○	○		◉	○				○	
Snohomish County PUD Smart Grid Project				○				◉		
Xcel Energy SmartGridCity	◉		○				○		○	

◉ Key Driver for Postponement or Cancellation

○ Other Driver for Postponement or Cancellation

hybrid electric vehicles (PHEVs) or electric vehicles (EVs) to be charged at night using the output of off-peak wind or other energy sources through vehicle-to-grid (VTG) infrastructure.

Although no smart grid pilots have been conducted as yet in CNY, National Grid did propose in January 2010 a comprehensive smart grid demonstration project in the Syracuse area. The plan called for a test site of 39,400 homes and businesses that would use new, state-of-the-art equipment to give customers information about their energy use and tools to reduce their carbon footprint and manage their energy costs. Federal stimulus funds to help fund the project were not awarded and, as a result, the pilot project did not advance. However, National Grid obtained approval in August 2012 from the Massachusetts Department of Public Utilities for a smart grid pilot program for Worcester, MA. The two-year pilot will test new technologies to reduce customer outages, improve operational efficiency, and fully integrate renewable energy including electric vehicles into the grid for over 15,000 customers. Lessons learned from National Grid's pilot smart grid program in Massachusetts could be used to tailor a project suited to the energy infrastructure, customer base and other unique characteristics of the region. With adequate funding, National Grid could develop and implement a version of its previously proposed pilot project in Central New York in partnership with local governments, colleges and universities and other regional stakeholders.

In addition, it is recommended that regional stakeholders explore the long-term feasibility of a smart grid/microgrid network that could support night-time charging vehicle-to-grid charging infrastructure. Implementing a smart grid with smart vehicle chargers would allow communication of price signals to the vehicle charger, and would help to mitigate reliability concerns. In the long-term, it is envisioned that PHEVs/EVs could utilize smart chargers with a smart grid to provide high-value energy storage for the grid. Vehicle batteries could not only be used to supply the grid on a real-time, as-needed basis, but could also provide backup power to homes during emergencies or grid blackouts. Some energy experts envision using PHEVs/EVs as a way to provide energy storage to the grid or to islanded microgrids and to manage surplus electricity to increase total grid efficiency. Shifting transportation fuel demand from liquid fuels to electricity has the potential to utilize already available off-peak electricity generation capability, for example, through the night-time charging of vehicles. A 2007 report from Pacific Northwest National Laboratory (PNNL) found that for the United States overall, over 70% of the existing light-duty vehicle fleet could be fueled with available off-peak electric capacity.[20] Similar results may be expected in Central New York. In addition to the potential for displacement of net oil imports, the massive deployment of PHEVs/EVs would decrease carbon dioxide emissions, decrease electricity rates due to increased sales using the same infrastructure, and create vast electricity storage potential for the grid. Technical assistance should be provided to educate local governments and other regional stakeholders about developing technologies as they become market-ready and incentives should be provided to customers to install VTG infrastructure. Possible partners include local governments, colleges and universities, investor-owned and municipal utilities, the U.S. DOE, NYSERDA, NYPA and the Electric Power Research Institute (EPRI).

i) Foster local innovation including the development of clean energy businesses.

Support for clean energy innovation in Central New York will spur economic development and improve energy management. The Cleantech cluster is poised to become one of the region's strongest business sectors, bringing together a diverse set of companies to create a center of gravity for innovation and economic growth. A 50-state study of the Clean Energy Economy released in 2009 by the Pew Charitable Trusts found that clean energy jobs grew significantly faster (9.1%) than jobs in the overall economy (3.7%) between 1998 and 2007.[21] Bloomberg New Energy Finance reported that, in the past five years, clean energy investment worldwide has grown from $52 billion to $243 billion.[22] According to the Council on Competitiveness, revenue in just three clean energy sectors—wind, solar, and biofuels—is projected to nearly triple from $116 billion in 2008 to $325 billion in 2018.[23] Those regions that lead in this market will generate well-paying jobs. Other nations, especially China and Germany, are investing heavily in this sector and the U.S. risks falling behind. In fact, according to the National Renewable Energy Laboratory, 90% of today's market for clean energy technologies is outside the United States, primarily in Asia and Europe.[24]

Cleantech Cluster Development

Central New York has a number of assets that can be leveraged to support Cleantech innovation, including one of the highest con-

centrations of students in the country along with $2 billion in annually funded R&D at the region's top research institutions. CNY also has a rich history of innovation and leadership, from the invention of the stoplight by Crouse Hinds to the myriad technologies patented by Carrier Corporation to the development of the Fenner Wind Farm in Madison County, the largest of its kind east of the Mississippi River when it was built in 2002. Finally, the region has a robust network of organizations that are already working to support and grow the Cleantech cluster including one of the nation's first clean energy business incubator programs at The Clean Tech Center, which was funded with a $1.5 million grant from NYSERDA in 2009. Created by CenterState CEO in partnership with federal, state and local leaders, The Clean Tech Center has already been named one of the top ten clean tech cluster organizations in the world by Sustainable World Capital in 2010.

The Syracuse CoE is another key organization which supports Cleantech companies, engaging collaborators at more than 200 companies and institutions to address global challenges in clean and renewable energy, indoor environmental quality, and water resources. Its members conduct targeted research, demonstrate new technologies, commercialize innovations, and educate the region's workforce. To cite just one example, NuClimate utilized the resources and expertise of the Syracuse CoE in bringing a new energy-efficient commercial heating, ventilation and air conditioning system for schools and office buildings to market. The CoE assisted NuClimate at several stages of product development and commercialization, including simulation and modeling of their initial concept, testing of a proof-of-concept prototype and providing independent testing to assist NuClimate in accessing its initial markets. In 2010, Syracuse CoE worked with more than 100 organizations, institutions and firms to develop the New York Energy Regional Innovation Cluster (NYE-RIC). The Cluster's Bridge to Markets program connected upstate companies to stakeholders in New York City, including building owners, building and construction trade unions, technology experts, architecture/engineering firms, utilities, bankers and investors. The program opened the doors that allowed NuClimate systems to be used in renovations of New York City public schools and other city buildings, and the company's products are now expected to be installed in more than 100 New York City schools in the next five years.

Municipal Procurement Assistance



Fuel Cell at SUNY College of Environmental Science and Forestry, Syracuse

The Cleantech cluster has a solid foothold in CNY, but additional funding and support could be provided to grow the region's innovation ecosystem and solidify a national leadership position. For example, greater coordination between the clean energy investments made by the region's local governments, businesses and residents and its home-grown businesses and entrepreneurs would accelerate the growth of the region's Cleantech cluster.[25] Local companies need assistance to compete in local government procurement processes and to connect with customers and contrac-

TABLE 20—Examples of Fuel Cells in CNY

Site	Vendor	County	Units	System Capacity	Installation Year
BOCES Regional Information Center in Syracuse	UTC Power	Onondaga	1 PC25C	200 kW	1990s
Liverpool High School	UTC Power	Onondaga	1 PC25C	200 kW	2000
SUNY ESF in Syracuse	Fuel Cell Energy Inc.	Onondaga	1	250 kW	2006

Source: CNY RPDB

tors within Central New York and beyond. This approach has been used successfully in the region; for example, Onondaga County utilized LED technology developed by Ephesus Technologies in a re-lamping project at the War Memorial. Outreach and education could be provided through workshops and online resources organized by the Syracuse CoE, Syracuse Technology Garden, MACNY, the CNY RPDB and others. These workshops could disseminate information on local government procurement processes and best practices, could be provided to connect local governments with companies in the region who provide relevant products and services.

j) Encourage the deployment of advanced energy technologies such as fuel cells.

Advanced energy technologies will spur economic development and help to meet regional energy targets. Some advanced energy technologies that should be promoted in the region include distributed generation technologies, which enable collection of energy from many sources while reducing transmission losses. Energy storage technologies, particularly hydrogen fuel cells, should also be pursued and represent an important opportunity for Central New York. The Breakthrough Technologies Institute ranks New York State among the "Top 5 Fuel Cell States" noting the state's supportive funding policies, its share of U.S. fuel cell patents and its high profile and long-running installations including fuel cell vehicles, hydrogen fueling stations, telecom backup systems and stationary systems.[26] The state's innovative policies include approval by the Public Service Commission for sub-metering of residential fuel cells and incentives up to $1 million available from NYSERDA for the purchase, installation, and operation of customer-sited tier fuel cell systems used for electricity production. The *New York Hydrogen and Fuel Cell Deployment Plan* published in 2012 by the Northeast Electrochemical Energy Storage Cluster (NEESC) states that there is the potential to generate approximately 3.89 million MWh of electricity each year in the state through the development of 494-659 MW of fuel cell generation capacity. In addition, the report notes that New York has more than 180 companies that are part of the hydrogen and fuel cell industry supply chain in the Northeast. Eight of these companies are OEMs of hydrogen and/or fuel cell systems, and were responsible for supplying 808 direct jobs and $119 million in direct revenue and investment in 2010. Examples of fuel cell installations in CNY are shown in Table 20.

Research and Commercialization
The region's network of Cleantech development organizations, including the Syracuse CoE and the Syracuse Technology Garden, local colleges and universities, utilities, and others should coordinate basic research and commercialization efforts to move innovative technologies into the marketplace. Funds could be sought from federal and state agencies such as the U.S. DOE and NYSERDA.

3. Alignment of Strategies and Targets

The following table illustrates the alignment of energy management strategies and targets.

TABLE 21—Alignment of Energy Management Strategies and Targets.

STRATEGIES	TARGETS				
	1	2	3	4	5
	REDUCE REGIONAL ENERGY CONSUMPTION PER CAPITA, INCLUDING ELECTRICITY AND FUELS, BY 40% (BELOW 2010 LEVELS) BY 2030.	INCREASE THE AMOUNT OF ELECTRICITY GENERATED BY RENEWABLE SOURCES WITHIN THE REGION TO MEET 25% OF THE REGION'S CONSUMPTION BY 2030.	INCREASE THE ANNUAL ENERGY SAVINGS ACHIEVED THROUGH NYSERDA-FUNDED COMMERCIAL ENERGY EFFICIENCY PROJECTS BY 35% BY 2020 AND BY 50% BY 2030.	CERTIFY 20% OF EXISTING PUBLIC BUILDINGS TO ENERGY STAR® OR SIMILAR ENERGY-EFFICIENCY STANDARDS BY 2030.	INCREASE THE PORTION OF NEW RESIDENTIAL BUILDINGS BUILT TO ENERGY STAR® OR SIMILAR ENERGY-EFFICIENCY STANDARDS TO 50% BY 2030.
Short-Term Opportunities					
a. Reduce energy consumption and improve energy efficiency in residential and commercial buildings.	●	●	●	●	●
b. Promote the development of renewable energy resources.		●			
c. Increase access to private and public financing options for investments in energy efficiency and distributed generation.	●	●	●	●	●
d. Prepare a Regional Energy Roadmap.	●	●	●	●	●
Long-Term Initiatives					
e. Facilitate the use of combined heat and power.	●	●		●	
f. Develop district energy systems.	●	●		●	
g. Develop neighborhood-scale "net zero" projects.	●	●	●		●
h. Upgrade or replace power generation, transmission, distribution and storage systems to encourage the development of renewable energy resources and smart grid technologies including vehicle-to-grid.		●			
i. Foster local innovation including the development of clean energy businesses.	●	●	●		
j. Encourage the deployment of advanced energy technologies such as hydrogen fuel cells.	●	●	●		

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Papermill Island, Baldwinsville, New York

Chapter 3: Infrastructure

***Infrastructure** plays an important role in enhancing community sustainability. Infrastructure can be defined as "the underlying foundation or basic framework; the system of public works of country, state, or region; the resources (such as personnel, buildings, or equipment) required for an activity."*[1]

The infrastructure of a region includes the built-environment (schools, post offices, emergency stations, etc.), as well as transportation facilities (highways, bridges, roadways, airports, canals, etc.), public works (sewer, water, and waste systems), telecommunication networks (cell towers, telephone lines, cable networks, etc), and the energy grid (both generation and distribution). Infrastructure is inextricably tied to many of the areas of concern for sustainability – human health, environmental systems, air and water quality, and economic vitality. A region's infrastructure plays a critical role in influencing land use, environmental resources, and economic development opportunities.

Infrastructure is constantly being invented, reinvented, improved, and repaired and, in effect, we are building the infrastructure of 2030 today. Given the expected useful life of civil infrastructure, the roads, bridges and water treatment plants we build today are expected to provide service for 30-50 years. In order to affect the sustainability landscape of 2030, regions need to be able to influence the way that civil infrastructure is designed, constructed and operated today.

According to the American Society of Civil Engineers' (ASCE's) 2009 Infrastructure Report Card, the nation's existing infrastructure is in a poor state of repair, earning an overall grade of "D". Not only does the Report Card point out serious deficiencies, it emphasizes the need for investment.[2]

The report card identified three key infrastructure concerns for New York State as a whole: Bridges, Roads, and Mass Transit. Notably the report identified $21.82 billion in wastewater infrastructure needs, $14.81 billion in drinking water infrastructure needs over the next 20 years, and that 42% of New York's bridges are structurally deficient or functionally obsolete. The report also identifies 391 high hazard dams (defined as a dam whose failure would cause a loss of life and significant property damage) in the State, including 29 located in CNY. All but one of these dams

in CNY have submitted an Emergency Action Plan (EAP) to the NYS DEC.[3]

A. EXISTING CONDITIONS

A well-developed network of state and interstate highways traverses Central New York, as does a system of freight and passenger rail service, making the region a transportation hub within New York State. The region's transportation network also includes Hancock International Airport, the deep water Port of Oswego, a CSX intermodal rail center, and a public transportation bus service maintained by the CNY Regional Transportation Authority.

The region's road network is mature, no major expansions of the system are currently envisioned, and requires substantial investment to maintain a state of good repair for today and future generations. Some major components of the regional network of highways, most notably the I-81 viaduct in downtown Syracuse, are reaching the practical reaches of their design life.

Continued funding for the maintenance of roads and bridges throughout the region is a significant challenge. In light of the current fiscal challenges at the local, state, and national levels, the region may need to divert any funding for improvements or expansions of the transportation network to simply rebuild the existing system.

The region is served by an extensive network of public sewer and water facilities, which includes a major water supply transmission line from Lake Ontario that is provided by the Metropolitan Water Board and the Onondaga-County Water Authority. Energy services are provided by the New York Power Authority, several private utility companies including National Grid, New York State Electric and Gas, and Rochester Gas and Electric, and a handful of municipal utilities.

The region is also served by an advanced telecommunications system that is provided by such major service providers as Verizon, Time Warner, and AT&T. Onondaga County is the telecommunications hub for CNY and is served by an extensive network of fiber optic transmission and distribution routes. There are 9 major fiber carriers, served by a centrally located "carrier hotel" and other carrier points of presence in downtown Syracuse, as well as an extensive network of central offices (67). In addition, there are over 600 cell tower locations in the region.

1. Transportation Resources

Over the past 60 years in Central New York, as in the balance of the U.S., primacy has been given to the movement of private vehicular traffic on the region's road network. In many instances this overriding strategy has undermined the traditional character of the region's historic communities. Rural hamlets, small villages, and cities large and small have all succumbed to the pressure to widen roads, prioritize vehicular traffic, and to build box chain stores with ample parking. The result has been to devalue the historic infrastructure of dense downtown districts that supported community and economic life throughout at least the first half of the 20th century.

As a result, the region's transportation system is heavily reliant on the single occupancy vehicle. As show in Table 22, vehicle miles traveled (VMT) in 2009 was 21.8 million or over 10,000 miles per capita. Over the last 20 years, VMT in Central New York has increased 43%;

TABLE 22–Vehicle miles traveled 2009

Location	Daily Vehicle Miles Traveled DVMT (1,000)	Yearly Vehicle Miles Traveled YVMT (DVMT*365)	Total Population (2010 Census)	YVMT/ Capita (1,000)
Cayuga	2,006	732,190	80,026	9.15
Cortland	1,687	615,755	49,336	12.48
Madison	2,160	788,400	73,442	10.74
Onondaga	12,828	4,682,220	467,026	10.03
Oswego	3,138	1,145,370	122,109	9.38
CNY Region	21,819	7,963,935	791,939	10.06

DVMT was estimated using data from a sampling of traffic counts in each area. Please note that traffic count adequacy or currency maybe an issue on lower functional class facilities

Source: NYSDOT HPMS Data, 2009

between 2000 and 2007, it increased by 12%. This increase resulted in Onondaga County residents driving almost 7.5 miles a day more than their statewide counterparts.[4] Residents of the Syracuse metro area drive more miles per capita than any other metro area in New York State with the exception of the Capital District; 17% more than Rochester; and 8% more than Buffalo-Niagara Falls. Only 2% of the region's residents use public transportation to get to work.[5] As shown in Table 23, the U.S. Census indicates that more than 79.4% of the labor force drove alone to work in 2010. Another 9.4% rode together in carpools, 1.9% used public transportation, and 4.9% bicycled or walked to work. Non-automobile trips are largely made up of residents within the City of Syracuse, as well as other small cities within the region, where conditions are more suited to walking, bicycling and transit.

TABLE 23–Transportation, Overall: Total percentage of people commuting via walking, biking, transit, and carpooling

Location	Total Workers	Total Car, Truck, Van drove alone	Total -Car, Truck, Van-Carpooled	Total Public Transport	Total Walking	Total Bicycle
Cayuga County	36,799	29,130	3,703	476	1693	74
	%	79.2%	10.1%	1.3%	4.6%	0.2%
Cortland County	22,318	17,432	2,089	187	1250	89
	%	78.1%	9.4%	0.8%	5.6%	0.4%
Madison County	33,203	25,956	3,021	167	1693	133
	%	78.2%	9.1%	0.5%	5.1%	0.4%
Onondaga County	216,202	172,184	19,702	5,781	9080	1081
	%	79.6%	9.1%	2.7%	4.2%	0.5%
Oswego County	52,719	42,184	5,442	357	2531	105
	%	80.0%	10.3%	0.7%	4.8%	0.2%
CNY Region	361241	286886	33957	6968	16247	1482
	%	79.4%	9.4%	1.9%	4.5%	0.4%

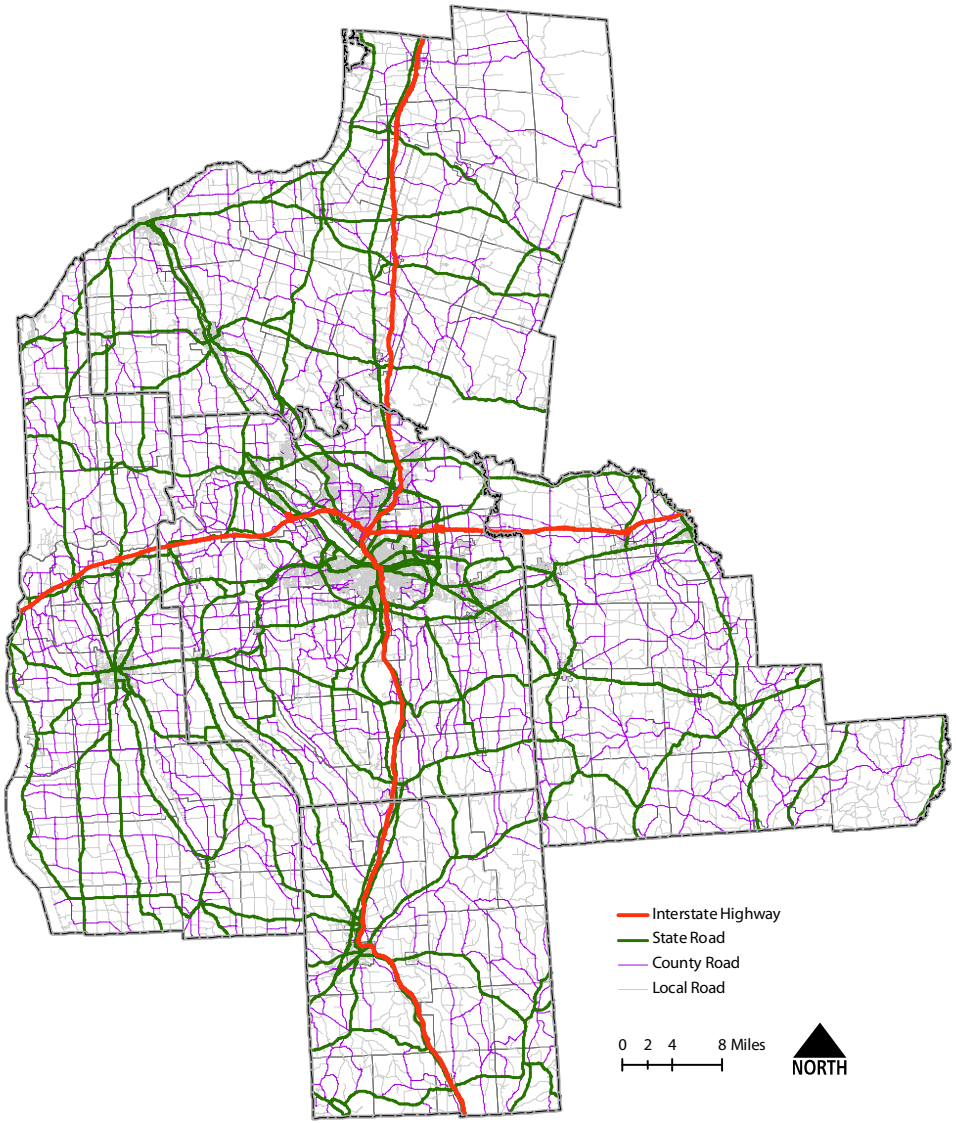
These trends may become increasingly less attractive as transportation fuel costs and infrastructure maintenance costs continue to rise and as the negative effects of increased traffic congestion, air pollution and reduced quality of life become felt by residents. Additionally, automobiles and trucks contribute significantly to the region's GHG emissions, air pollution, and problems with the contamination of stormwater run-off. The Vision CNY plan must, then, consider the significant impacts of the transportation system on the natural environment.

The transportation sector is the largest contributor to Central New York's greenhouse gas emissions, as it is in the United States as a whole. According to the EPA, transportation accounted for 32% of U.S. CO2 emissions in 2008. In contrast, the regional greenhouse gas inventory prepared as part of the process of developing the VisionCNY plan reported that transportation represented 43% of Central New York's emissions in 2010. The region ranked 9th out of the top 100 metropolitan areas in automobile-based emissions at 1.333 metric tons per person.[6]

Fortunately, the historic development patterns of villages and cities within Central New York are conducive to improving pedestrian and bicycle mobility. Traditional street grids intermingled with an organic web of roads help to create a pattern of relatively short blocks that make it easy to navigate on foot between multiple destinations. Known as connectivity, these road systems have many short links, numerous intersections, and minimal dead-ends which allows for more direct routes between destinations.

These traditional patterns of street networks have found a resurgent interest as development trends have turned back towards the centers of existing communities. The Cities of Syracuse, Oswego, and Auburn, as well as villages like Baldwinsville, Hamilton and Marcellus have witnessed new construction projects as well as the rehabilitation of historical warehouses and commercial buildings into offices, lofts, and retail spaces. In support of these new found development pressures, communities have begun to develop strategies for maximizing mobility options through improving pedestrian, cycling, and transit options. Moving forward, the region's major rail and shipping facilities

MAP 3–CNY Road network



will provide important opportunities for reducing greenhouse gas emissions associated with the movement of freight in and out of the region by truck.

(a) Road Network

Central New York encompasses approximately 10,548 centerline miles of roads, with 34% of the system is within the Syracuse Metropolitan Transportation Council (SMTC) Metropolitan Planning Area (MPA)[7] (approximately 3,534 centerline miles of roads), and an additional 7,013 centerline miles of roads located outside of the MPA but within the five county region (Map 3). The roads are owned and maintained by various jurisdictions including the NYS Department of Transportation (NYSDOT), the NYS Thruway Authority (NYSTA), the Onondaga County Department of Transportation (OCDOT), and the City of Syracuse. Each of these entities work together to manage the regions road network.

The NYSDOT and the NYSTA own approximately 15.1% of the system (which equals about 1,592 centerline miles). The NYSDOT system contains the majority of the main commuter routes. Other key jurisdictional ownerships in the MPA are the OCDOT and City of Syracuse. OCDOT is responsible for 7.6% of the system (803.20 centerline miles) and the City of Syracuse is responsible for 4.1% of the system (420.71 centerline miles).

The region's road network is substantially mature; there have been minimal new capacity projects and system additions in recent years. The majority of money spent on the New York State Transportation Improvement Program (STIP) from the Federal Highway Administration (FHWA) is used for maintaining the existing road network. As Table 24 demonstrates, a significant portion of the overall spending on the regional road network takes place within Onondaga County. The dollars shown are for specific projects within the region, and do not include those for general maintenance (i.e. paving and milling or striping).

Examples of system expansion are primarily for new residential streets constructed within Onondaga County over the past decade, which amount to roughly 61 miles of new roads.[8] Though this expansion represents less than 1% of the entire regional road network, it occurred

TABLE 24–NYS Transportation Improvement Program Spending in Central New York

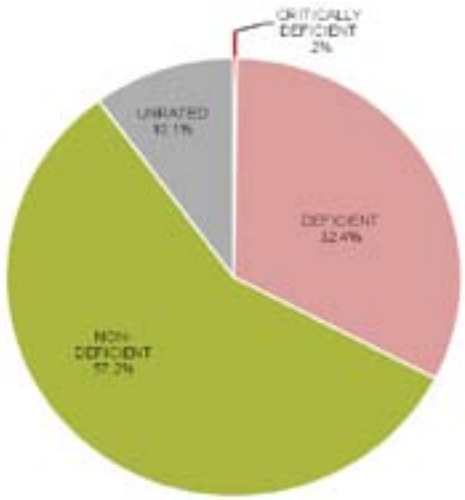
	Dollars Spent (in millions)		
County	Federal	State/Local	Total
Cayuga	18.027	4.366	22.393
Cortland	13.578	2.491	16.069
Madison	2.28	0.619	2.897
Onondaga	173.182	50.9379	224.1199
Oswego	34.314	7.82	42.134
CNY Region	241.379	66.2339	307.6129

during a period of negative population growth. As the cost of maintaining existing infrastructure rises, expansion of the road network in the face of a declining population is not advisable.

The condition of bridges in the region has been a critical funding issue for a number of years, this is apparent from a review of the State Transportation Improvement Program. As shown in Figure 5, 2012 data from NYS DOT indicates that roughly one-third of the over 19,800 bridges in Central New York are classified as deficient (meaning that a bridge is a candidate for rehabilitation, replacement, or even closure) and that forty-four of those bridges are critically deficient (meaning that a bridge is given priority for funding for rehabilitation, replacement, or even closure). The percentage of bridges that are deficient along with the limited amount of money available for funding improvements has made bridge repair a key improvement area noted by the NYSDOT.

There are a large number of interstate bridges that also need repair within the same timeframe because many are of the same age. Specifically, there are 124 bridge spans on the I-81 viaduct alone that will need to be addressed within the next decade. While a significant effort has been made in the last decade to remedy this problem, many bridges still are in need of repair and compete for a limited amount of federal money.

FIGURE 5– Bridge conditions in Central New York, 2011

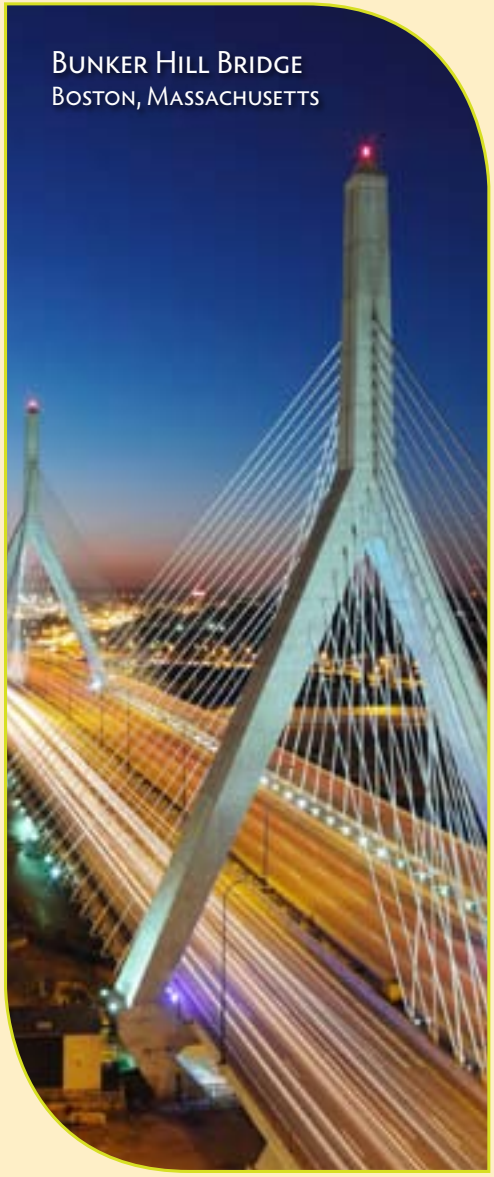


(b) Transit Service

The Central New York Regional Transit Authority (CNYRTA) operates **Centro**, the public transportation system that serves Onondaga, Oswego, Oneida and Cayuga Counties. Centro operates fixed-route public transit systems and demand-responsive paratransit service with a total fleet of 254 buses. In 2005, Centro expanded their transit services into the Cities of Utica and Rome. Centro operates connecting routes between the cities of Syracuse, Oswego, Fulton and Auburn, as well as city transit services within each of these cities. During peak hours within Onondaga County, service frequencies result in continuous and heavy use. In the midday and evening periods and on weekends, up to 18 Centro routes converge simultaneously every 35 minutes at the newly opened Transit Hub in Downtown Syracuse. Suburban routes operate with a seventy-minute level of service (headway) during these time periods.

Centro's routing system in Onondaga County has undergone a series of changes since the economic decline that began in 2007 in response to dwindling State and local operating assistance. Centro's annual budget declined by 7% between the 2008-09 and the 2010-11 fiscal years (from $28.5 million to $26.5 million). Nearly 50% of Centro's operating costs are covered by the New York State Mass Transit

THE I-81 CHALLENGE



Bunker Hill Bridge
Boston, Massachusetts

I-81 was built through Onondaga County in the early 1960s. Now that the road is 50 years old, portions are nearing the end of their useful life.

This is particularly true of the 1.4 mile elevated section of I-81 in downtown Syracuse, known as the viaduct. Over the next decade, these portions of the road will need to be replaced, reconstructed, removed, or otherwise changed. The official decision-making process designed to find a solution for the future of I-81 was initiated in 2010 and is called The I-81 Challenge.

The I-81 Challenge is being led by the NYSDOT and the SMTC. This initiative is composed of three separate but integrated efforts including a corridor study, a public participation program, and a travel demand modeling effort.

At this stage, community leaders are planning to advance the discussion that has already started about the future of I-81. Information about the existing conditions of the highway and the regional transportation system has been collected and shared with the public. Based on this research and public input, the NYSDOT has generated a several options for the future of the viaduct through Syracuse. These options include rehabilitation, reconstruction of the elevated section in downtown Syracuse, utilizing a tunnel or depressed highway, or bypassing the City and replacing the viaduct with a boulevard.

In the coming months, the options will be narrowed to a small number of alternatives through a combination of technical analysis and continued public involvement. The alternatives will be refined and analyzed in greater detail and a formal environmental review process, including official hearings, will begin. This process will lead to a recommendation by the NYSDOT regarding the future of the I-81 viaduct in Syracuse.

It is important to note that many communities are confronted with the same issues regarding the future of an interstate highway that travels through their urban centers. In some cases communities have looked beyond the technical engineering challenge and viewed the situation as an opportunity to redefine their downtown and create an iconic image for their community. The Bunker Hill Bridge in Boston, the Hovenring in the Netherlands, the Lujiazui Circular Pedestrian Bridge, in the Pudong District, Shanghai, China, and a boulevard bus-rapid-transit or light rail system are examples of innovative solutions that have been implemented by communities.



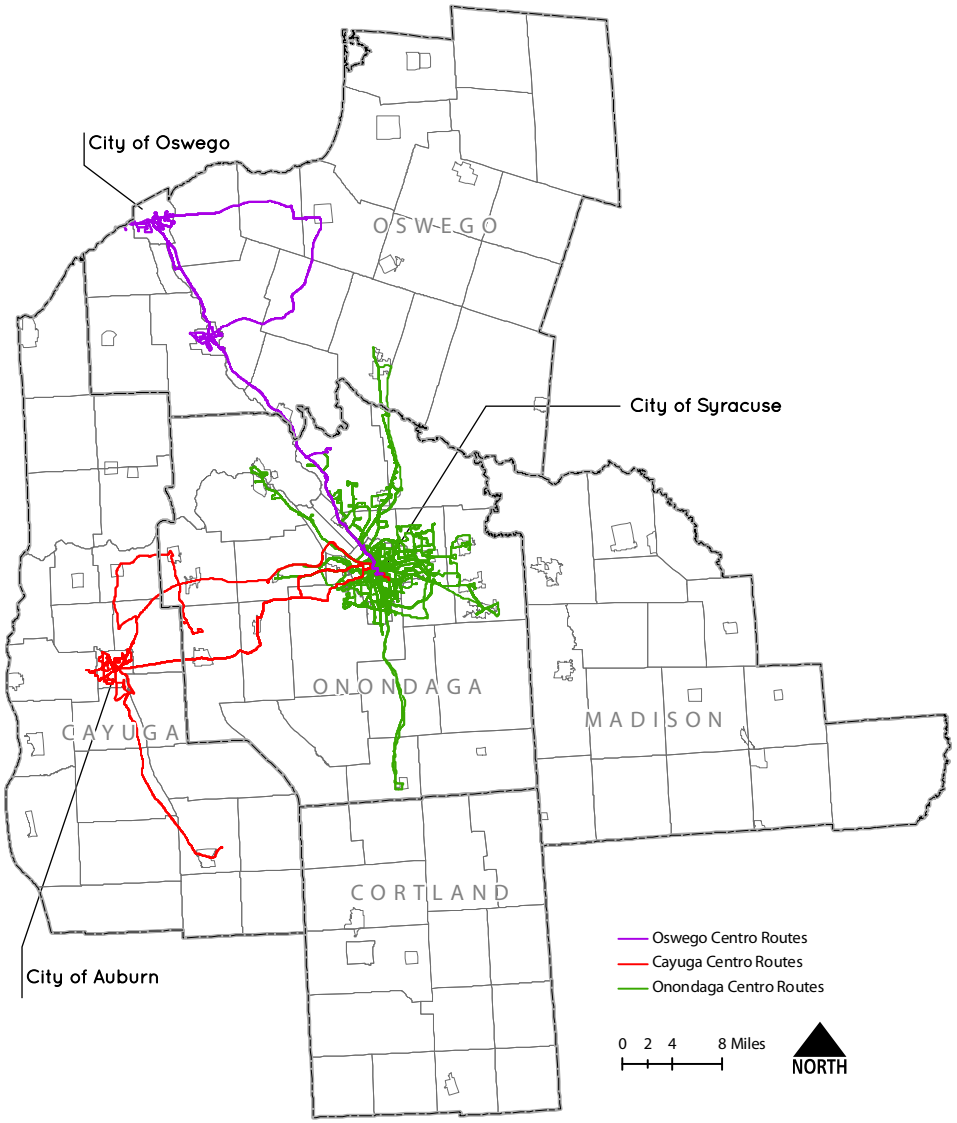
Operating Assistance program (STOA). Over a two-year period from 2009 to 2011, the Authority's allocation from STOA was reduced by $2 million. Additionally, a portion of Centro's service funding comes from a mortgage recording tax (MRT) levied on real estate transactions that has also seen declining revenues, a 30% decrease since the 2006-07 fiscal year (from $7.83 million to $5.45 million).[9] Despite significant service reductions since 2007, Centro has been able to retain its core market of urban and suburban riders. Moreover, Centro has proven adept at reacting to large spikes in ridership experienced during periods of high fuel prices. Despite a series of service reductions and fare increases, the Centro routing system continues to provide good service to suburban markets, as many "one-seat" rides as possible for significant origin and destination pairings.

As shown in Map 4, the majority of Centro's routes meet at a central point of the regional hub-and-spoke system at the recently completed Transit Hub in Downtown Syracuse. The $18.8 million Hub, located at the intersection of South Salina Street and Adams Street, features 22 passenger loading bays and an enclosed passenger waiting area that includes a customer service desk, public restrooms, and electronic bus departure information board, and automated buss pass vending machines. The Hub will accommodate between 5,000 and 8,000 riders transferring downtown each day. The move, by many accounts was long overdue. The former Centro Common Center facility formerly situated at the corner of Fayette and Salina Street had long suffered from the congestion associated with people waiting for bus transfers sometimes 6 busses deep. Nearly two thirds (65%) of the Syracuse metropolitan region's bus riders will transfer to other routes at the new Transit Hub.

Like many public transit properties throughout the nation, Centro originally inherited a fleet past due for replacement from its private sector predecessor. Federal funds, which comprise 80% of capital acquisitions, can be used to replace buses every 12 years. As a result, Centro's need to replace large numbers of buses simultaneously has ratcheted thru the decades since the original replacement cycle was initiated. As buses require maintenance and eventual replacement, there is a need for continuous funds to be available to upgrade and keep Centro's fleet in a state of good repair. Currently Centro is faced with the need to replace 70 buses in the near future at a cost of nearly

MAP 4—Centro Bus Routes

The Central New York Regional Transit Authority (CNYRTA) operates Centro, the public transportation system that serves Onondaga, Oswego, Oneida and Cayuga Counties. Centro operates fixed-route public transit systems and demand-responsive paratransit service with a total fleet of 254 buses.



Centro Transit Hub, downtown Syracuse



$32 million. Funding resources are currently short of the required amount.

Centro is pursuing efforts to improve service on its existing routes. One example is its collaboration with Syracuse University on the Connective Corridor project to implement an improved computer aided dispatch system and automated vehicle locator system for Centro. Real-time "next bus" information is available for customers as well as automated stop announcements on buses, electronic destination signs and other features intended to improve customer service. The new GPS tracking system was unveiled in February of 2012.

More than a dozen Bus Time LED signs have been installed at bus stops along the corridor; each sign provides visual and audible information on the arrival time of the next scheduled bus. Customers can also access the information via text message / e-mail or by accessing Centro's website on their smart phone or personal computer. The ITS (intelligent transportation system) technology in Syracuse is unique because it is converging network technologies and VoIP (voice over Internet protocol) on each bus while connecting these technologies via a cellular signal to a centralized command center. Customers are now able to wait at an equipped bus stop and receive information on exactly when their bus will arrive at that stop. Each sign will visually count down the arrival of the next scheduled bus and can provide audio announcements of the same information for sight-impaired users. The cost of the new system is approximately $2.8 million and is funded through $2.25 million in SAFETEA-LU grant monies secured by Sen. Charles E. Schumer (D-NY), along with 10% matches provided by both Syracuse University and the New York State Department of Transportation. The Bus Time system has provided similar technology for transit systems in Chicago, New York City, Chattanooga and Richmond. This technology should be extended strategically throughout Centro's service routes to help to improve system ridership along with enhancements to service frequency and improved station offerings (see call out in left hand margin).

In 2012, CNYRTA completed a renovation and improvement project that more than doubled the amount of paved parking spaces and improved traffic and pedestrian flow at the William F. Walsh Regional Transportation Center (RTC). While parking has been in short supply since the RTC facility opened, Amtrak ridership is up 44% since 2000 (approximately 420 boardings per day), and has placed added pressures on parking availability for system users.

(c) Bicycle and Pedestrian Resources

Central New York has an extensive recreation trail network, with the Erie Canalway National Heritage Corridor (ECNHC) at its center. The ECNHC stretches for 350 miles linking the western and eastern boundaries of New York State, with extensions planned within Onondaga County to link to the "Loop the Lake" Trail around Onondaga Lake and on to the Syracuse Creekwalk (Map 6). Separately, these trails provide excellent quality pedestrian and cycling resources for residents throughout the region; linking them together will allow even greater numbers of residents to enjoy these activities.

The City of Syracuse has been working to expand bicycle infrastructure within the city limits since 2006. Bike lanes were implemented primarily within proximity to Syracuse University within the University Hill Neighborhood as a response to neighborhood requests to both accommodate existing cyclists and to slow down vehicular traffic. Just over 9 miles of cycling lanes were developed through the end of 2010, with an additional 4.6 miles added through the end of 2012 (Map 5).

The City released its first plan for expanding bicycle infrastructure in 2012 in order to set forth a vision for a cohesive and connected bicycle network. The *Syracuse Bicycle Plan 2040* analyzes opportunities for expanding bicycle infrastructure throughout the city as well as outlining key tools, and conceptual design strategies for implementing bicycle travel networks throughout the city.

The Connective Corridor project is an important component of this expanding network. The project will establish a bicycle and pedestrian corridor that will link University Hill to Downtown Syracuse through over $40 million in public investment. The corridor exhibits dedicated bike lanes as well as bicycle parking. Investments are also being made to improve public transportation along the corridor, and ultimately will establish a model for mobility for CNY. As the Connective Corridor takes shape the Syracuse University Office of Community Engagement is exploring options for creating a bike share program to complement the aforementioned investments.

Outside of the City of Syracuse, NYSDOT has three on-road bicycle routes listed in the CNY region the Seaway Trail (63 Miles), State Bike Route 11 (101 Miles), and State Bike Route 5 (58 Miles, which follows along Route 31 and Oneida Lake in CNY). Other municipalities within the region have expressed interest in their municipal plans, but have not yet established any significant networks of bicycle infrastructure.

(d) Air Service

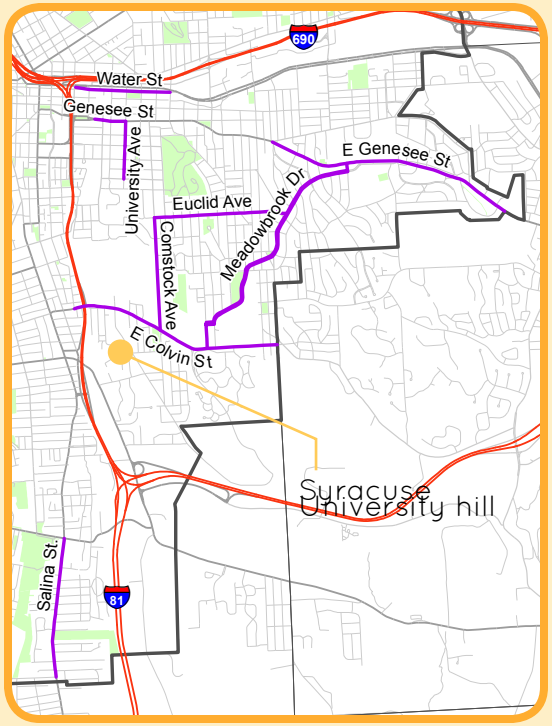
Hancock International Airport is centrally located within the region approximately seven miles northeast of downtown Syracuse. The airport is owned and operated by a Regional Airport Authority, created by the NYS legislature in 2011 and approved by the Federal Aviation Administration in 2010. The City of Syracuse had owned and operated the airport since it opened at its current location in 1949. Hancock International Airport is the only airport providing commercial air passenger service in CNY.

The airport facilities are modern with space available to expand to meet new opportunities. In addition to commercial passenger service, Hancock provides an extensive air cargo operation, including U.S. Customs inspection service, as well as general aviation services for private pilots and military operations. There are currently two run-

MAP 5–Bicycle routes in the City of Syracuse

The City of Syracuse has been working to expand bicycle infrastructure since 2006. Bike lanes were implemented primarily within proximity to Syracuse University within the University Hill Neighborhood as a response to neighborhood requests to both accommodate existing cyclists and to slow down vehicular traffic. Just over 9 miles of cycling lanes were implemented through the end of 2010, with an additional 4.6 miles added through the end of 2012.

Existing Bike Lane





The Syracuse Connective Corridor completed a cycle track in 2012 along University Avenue. The Connective Corridor will ultimately create a continuous bicycle system between the University Hill Neighborhood and the Near Westside Neighborhood, connecting through downtown Syracuse.

BICYCLE & PEDESTRIAN NETWORKS

In addition to on-road or urban bike lanes, there are several priority projects underway within the region focused on the region's historic waterbodies and waterways. These initiatives have the potential to increase trips made by alternative transportation.

New York State Erie Canalway Trail



Portions of this planned 350+ mile trail have been completed within Onondaga County that link to the end-to-end statewide Erie Canalway Trail along the Erie Canal Corridor from Buffalo to Albany. The most important gap in the current Canalway Trail is located within the City of Syracuse and would connect completed sections west of Syracuse in Camillus with those in the Town of DeWitt to the East. Once complete, the Canalway trail will become the longest continuous bicycle and pedestrian trail in the United States.

The Syracuse segment of this trail is considered to be one of the most difficult gaps to complete, primarily due to the fact that the 15-mile segment that will connect Camillus in the west and DeWitt in the east, traverses land that is the most urbanized along the entire state route.

The current iteration of the canal corridor in Syracuse—Erie Boulevard—does little to interpret the historical nature of the corridor. While the Erie Canal Museum and the water feature and interpretive elements in Clinton Square provide some benefit, the entire corridor would benefit from new streetscape elements that help to identify the corridor, the completion of the bicycle route for tourism promotion, and additional interpretive signage would be beneficial to celebrate the canal's legacy.

Additionally a completed trail segment through Syracuse would provide a valuable alternative commuting corridor from both the Eastern and Western suburbs to the major employers in Downtown Syracuse. Several of the region's top employers are located within the Central Business District of Syracuse including UPSTATE Medical University and Syracuse University.

A study is currently underway to determine short and long-term routes for the trail. Participants in the planning process have indicated a keen desire for the trail to follow the historic route of the canal (now Erie Boulevard), at the same time providing for an "off-road" experience. Indeed the historical route followed a relatively flat expanse that made it ideal for moving freight along the canal, but also that provides the perfect conditions for an accessible bike route.

The Canalway Trail, once complete, would cross the Syracuse Creekwalk and provide access to the Loop the Lake trail system. The Canalway master plan also calls for the development of a trail extension to Oswego following the historic Oswego Canal and current NYS Barge Canal system along the Oswego River.

Onondaga "Loop the Lake" Trail

Onondaga County continues to work on completing a long planned bicycle/pedestrian trail around Onondaga Lake, which will provide a non-motorized transportation link between Liverpool, Solvay, and the City of Syracuse.

The most recent section of the trail system was completed in 2002 along the West shore of the lake. In 2012, the Onondaga County Legislature unanimously approved more than $1.2 million in funding for improvements to the Loop the Lake Trail that will add two additional miles of paved, Class 1 trail on the West Shore of Onondaga Lake from the present trail end at Nine Mile Creek to the State Fair parking lots near I-690 Exit 7.

These improvements are under construction and are anticipated to be open to the public in the beginning of 2014. Additionally the County will explore the design of an ADA compliant bridge that will enable the connection of the Loop the Lake trail with the Syracuse Creekwalk.



MAP 6–Existing and Proposed Trails

The Erie Canalway Trail, Onondaga Loop the Lake Trail, and the Syracuse Creekwalk have the potential to form an interconnected web of cycling and walking trail systems connecting a significant portion of the regions population to major employment centers.

- Erie Canal to Oswego Connection - Proposed
- Erie Canal Trail - Western; Erie Canal Trail - Eastern
- Canal Extension Trail - Proposed
- Unsigned On-Road Erie Canal Trail
- Onondaga Lake Trail
- Onondaga Creekwalk

0 0.5 1 Miles

NORTH

Lysander
Clay
Cicero
North Syracuse
Seneca River
Liverpool
Van Buren
Salina
Onondaga Lake
Geddes
Camillus
East Syracuse
Solvay
SYRACUSE
De Witt
Onondaga Creek

City of Oswego
City of Syracuse
OSWEGO
CAYUGA
ONONDAGA
MADISON
CORTLAND



Syracuse Creekwalk

A short section of this bicycle and pedestrian trail has been in existence since the early 1990s, with the first completed portions opened in the Franklin Square and Inner Harbor in Syracuse's Lakefront Area.

In 2010 and 2011, the City of Syracuse extended the trail north from the Inner Harbor to the mouth of Onondaga Lake and south from Franklin Square to Armory Square in Downtown. This has allowed the Creekwalk to become a continuous 2.2 mile trail with a nominal width of 13 feet, stretching from Onondaga Lake to Armory Square. Construction was completed in the Spring of 2012. Green infrastructure improvements were incorporated into the trail. A feasibility study for the next section (Phase II) of the Creekwalk, from Armory Square south to Kirk Park, was completed in February 2008. Phase II has not yet received funding for design. Phase III, which is a concept only at this time, would extend the Creekwalk from Kirk Park to the southern border of the City at Dorwin Avenue.

ways one at 9,003 feet in length and one at 7,500 feet in length. In 2009 there were over 2 million total passengers through the airport, with roughly half of the passengers boarding (enplaned) at the airport and the other half deplaned. The airport is also served by commercial freight service, including Federal Express and UPS which accounted for 92% of the total freight traffic (33,403,461 of 36,284,867 lbs.) in 2009.

Syracuse Hancock International Airport has 26 passenger boarding gates and is served by the following carriers: Air Canada, American Eagle, Delta, JetBlue, United Airlines, and USAirways. Other airlines that operate at the Airport include Comair (a Delta affiliate), CommutAir (a Continental affiliate), Allegheny, Mesa, Trans States, Colgan Air, Piedmont, Chautauqua, and shuttle America (affiliates of USAirways).

The City of Syracuse is proceeding with a major passenger terminal renovation project that will include a 147,000-square-foot addition connecting the two separate wings of the terminal on the second level, both pre- and post- passenger security screening points. Green design and construction techniques that will significantly reduce operating costs for the building and reduce the building's carbon footprint are being incorporated into the project.

Proposed techniques include solar panels to produce electricity and hot water; construction techniques that minimize waste and encourage recycling; extensive use of natural daylighting; enhanced indoor environmental quality; and the use of sustainable construction materials. The use of green technology combined with the installation of more energy-efficient HVAC equipment is estimated to reduce terminal operating and maintenance costs by as much as $1.00 per square foot per year.

Hancock Airport, its designate relievers and several other general aviation airports constitute the Central New York portion of the Federal Aviation Administration's National Plan of Integrated Airport Systems. The general aviation airports provide alternative sites for privately owned aircraft whose pilots prefer a smaller airport setting. The Oswego County Airport is designated by the Federal Aviation Administration (FAA) as the general aviation reliever to Hancock International Airport, and is located at a distance of 25 miles. The Oswego County airport has approximately 25,000 take offs and landings per year, and has 41 hangar stalls and tie-down aircraft parking.



Rendering of Hancock Airport passenger terminal renovation project depicting the 147,000-square-foot addition connecting the two separate wings of the terminal on the second level, green design and construction techniques will significantly reduce operating costs for the building and reduce the building's carbon footprint.

The Village of Hamilton Municipal Airport is also designated as a reliever and the adjacent "airpark" is a development site. Cortland County also operates a reliever airport, the airport saw an average of 47 flights per day in 2009. There are several additional small airports within the region that do not possess the "reliever" airport designation including the Skaneateles Aerodrome (Map 7).

As shown in Table 25, Hancock has extensive air cargo operations including U.S. Customs inspection service. The airport in recent years has undergone a substantial expansion in the capacity to handle air cargo. A highly successful effort has been made by the private sector and the City of Syracuse to expand and modernize air cargo facilities and services.

Air Cargo companies that operate at Syracuse Hancock International Airport include Airborne Express, Air Now, Federal Express, United Parcel Service, the United States Postal Service, and Wiggins Airways.

According to the Syracuse Hancock International Airport's web site, the Air Cargo Operations are located on 22.5 acres of land. Carriers have ample office, parking, and loading dock space, as well as aircraft apron areas. Air cargo activity includes the handling of air cargo

TABLE 25–Hancock International Airport, Amount of enplaned freight and mail by year from 2000 to 2010

Year	Enplaned Freight	Enplaned Mail	Total tons
2000	18,142	0	18,143
2001	21,300	1,325	22,625
2002	19,505	1,262	20,767
2003	19,186	697	19,883
2004	20,380	355	20,735
2005	20,958	176	21,134
2006	20,974	197	21,171
2007	24,928	44	24,972
2008	22,774	0	22,774
2009	18,142	0	18,142
2010	19,290	0	19,290

Source: Hancock International Airport, 2011

and express and regular mail. The existing air cargo facility is located southwest of the terminal complex. A 100,000 square foot cargo building with a parking apron allows direct aircraft access for quick and efficient cargo handling.

Hancock Airport has the land area capability for substantially expanding ground facilities that will accommodate the growth of air cargo operations to meet future needs. Other New York State airports are reportedly constrained in this respect. In addition, the capability for expanding runway and taxiway facilities serves not only air passenger growth but air cargo carriers as well, offering greater capacity and flexibility to meet changing circumstances.

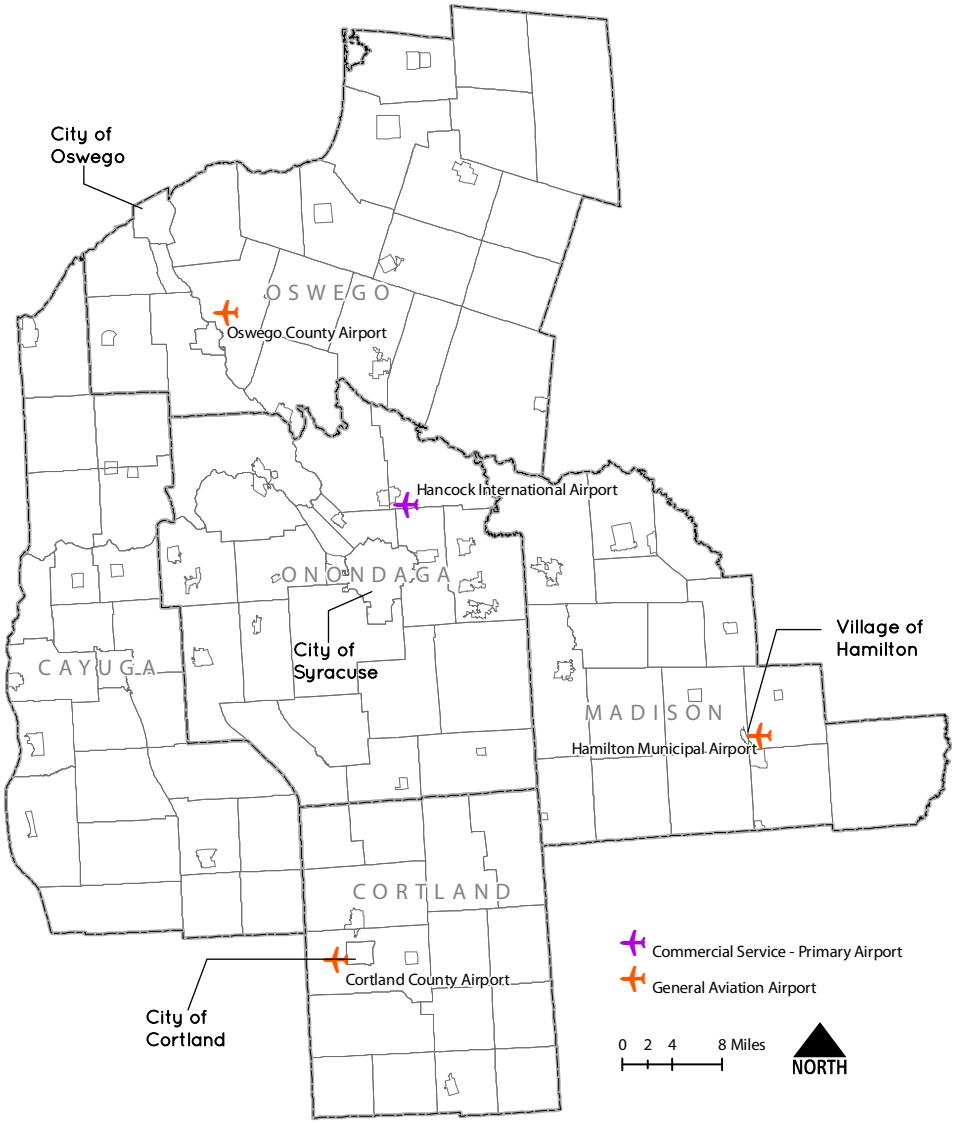
(e) Water Transport

Port of Oswego

The Port of Oswego is the first U.S. port of call on the Great Lakes (Map 8). The Port offers a deep draft terminal with access to the

MAP 7–Airport Facilities

Hancock Airport, its designate relievers and several other general aviation airports constitute the Central New York portion of the Federal Aviation Administration's National Plan of Integrated Airport Systems.



New York State Barge Canal, and multi-modal connectivity that includes marine highway, on dock rail, and efficient connections to the Interstate highway system. Approximately 120 vessels call on the port on an annual basis, and the port moves in excess of one million tons per year in cargo including windmill components, cement, corn, soybeans, nuclear power components, aluminum, and petroleum products such as liquid asphalt and heating fuel.

Over recent years, the Port of Oswego has undergone a revival in commerce harking back to the time when the Oswego Harbor was filled with sailing schooners. In 2002, the Port received fewer than a dozen rail cars. Finishing 2011 the Port handled over 750 rail cars, with both grain, aluminum and wind turbine components equaling a close to a 1000% increase. In 2003 the Port received no aluminum shipments by water, but by the conclusion of 2011, the Port logged eleven port calls by ship for aluminum discharge.

In 2004-2005, the Port aggressively sought agrimarket development and became home to Oswego Grain, Inc., a division of Perdue AgriBusiness. This, along with an increase in grain exports, led to a 318% increase in grain handling between 2008 and 2009. Oswego Grain also has corn contracts to support the Sunoco's ethanol plant which is the largest ethanol plant in the eastern United States, located just 10 miles from the Port.

Since 2004, the Port of Oswego has been a logistic partner with Novelis Oswego Aluminum Plant, located just three miles from the Port. Over the last several years, Novelis has used marine transport, utilizing the Port of Oswego to meet the escalating demand for aluminum sheet metal for the U.S. auto industry, an outgrowth of rising fuel economy standards. Novelis is currently expanding its manufacturing operations. Scheduled for completion in 2013, the expansion will allow the plant to produce an additional 440 million pounds of aluminum sheet a year for the automotive industry. The increase will represent five times the company's current North American capacity for producing aluminum sheet for that industry. The 200 million dollar expansion will add an additional 100 jobs to the 651 currently em-



The Port of Oswego has become major transportation player in the national renewable energy market. Since 2002 the Port has handled 188 full wind turbine units and 243 components, including tower sections, blades and nacelles.

MAP 8–Port of Oswego

The Port of Oswego is strategically located on the southeastern shore of Lake Ontario providing a connection between the NYS Barge Canal System which links to New York City, the St. Lawrence Seaway, and the Great Lakes system. Additionally, the port is well served by both rail (Map 10) and the Interstate Highway System (Map 3).



ployed at the plant. At present about half of the aluminum produced at the plant is sold to the automotive markets.

The Port of Oswego has become major transportation player in the national renewable energy market. Since 2002 the Port has handled 188 full windmill units and 243 components, including tower sections, blades and nacelles. The Port's position on the eastern United States as a top tier green energy transportation center is well known in the industry. These projects have both utilized ship, rail and truck movement to installation points. The Port of Oswego is unique in Lake Ontario as it offers an intermodal deep water port with a location that is central to the best windmill placement sites.

The Port of Oswego has been working to complete its East Terminal Connector project which will construct a combined connector roadway and rehabilitate and embed the existing railroad track between the former Fitzgibbons Boiler Works property and the Port of Oswego's existing Eastern Harbor Facility on the mouth of the Oswego River along the shore of Lake Ontario. The project will add an additional six acres to the existing port operations. This will effectively increase the open flat storage area on the Port's eastern shore from 6 to 12 acres. Rail freight shipments have increased 683% in the last several years at the Port and site storage is badly needed for the Port's future growth. The improved lot will be traversable by tractor-trailer and rubber tired cranes for loading and unloading materials. The design load for the lot's structural section will accommodate crane "picks" of up to 50 tons and provide adequate layout for circulation of equipment, which is need for the steady renewable energy projects.

New York State Barge Canal System

The New York State Canal Corporation is responsible for the overall operation, maintenance and rehabilitation of the 524-mile New York State Canal System (Map 9). The statewide Canal System is made up of four canals: the Erie Canal, the Champlain Canal, the Oswego Canal and the Cayuga-Seneca Canal. Within CNY the Canal System includes Oneida Lake, the Oneida River, Onondaga Lake, the Oswego River, the Seneca River and Cross Lake (MAP). In 2005 there were 2,468 cargo vessels reported on the Canal, 119,113 recreational boats, and 8,163 tour boats.

MAP 9–NYS Barge Canal System in Central New York

The Barge Canal system is well integrated with the transportation system in Central New York. Freight can easily be transferred from the Canal system to rail, highway, or onto the Great Lakes system and St. Lawrence Seaway.



The New York State Canal System is a commercially viable waterway connecting the Hudson River with the Great Lakes, Finger Lakes, and Lake Champlain. A 2010 study completed for NYSERDA and NYSDOT identified the Barge Canal as a critical piece of economic infrastructure. Adding container barges to the New York State Canal System could relieve road congestion all along the Canal because each barge would have the capacity of 60 to 120 trucks. The report favorably compares the Port of NY/NJ and its connection with the NYS Barge Canal and Upstate NY to that of Rotterdam and its connection to the Rhine Valley in Germany where there is an active container-on-barge economy.

Combined with inland port upgrades currently being planned for regional freight rail facilities, the NYS Barge Canal system could play a significant role in increasing the sustainability of the regional economy.

(f) Rail Facilities: Passenger

Rail passenger service in the region is provided through the National Railroad Passenger Corporation (Amtrak), which provides intercity rail passenger service on three different routes (Lake Shore Limited, Empire Service, and Maple Leaf) through CNY (Map 10). The routes correspond with destinations – Lake Shore Limited connects to Chicago, while Empire Service connects to NYC – although the routes follow the same course through the region.

Amtrak passenger train ridership has increased in Syracuse (the sole passenger station in the region), where an average of 426 passengers per day began or ended their trips in 2011 up 12% from 2010. Statewide, Amtrak carried about 11 million passengers last year, but about 9 million were in New York City. Syracuse experienced the fifth highest total boardings/de-boardings of all stations in NYS in 2012 (Table 26).

Primarily a freight railroad, the Finger Lakes Railway has offered passenger services along the Finger Lakes Railway since 2000 in the form of special excursions sponsored by local organizations.[10] In 2008, over 12,000 passengers boarded the train for a total of 62 days of excursions.[11] The railway can be boarded in a handful of locations within the SMTC MPA.

A local development group is working with the Finger Lakes Railway to create a stop for passengers in Auburn. The station would be near the current rail crossing on North Street. It is hoped the project would create another Auburn gateway for exploring the Finger Lakes by rail. Currently the railroad goes through many historic and interesting communities including Canandaigua, Geneva, Watkins Glen and Seneca Falls. In Auburn, the line traverses the city from the Finger Lakes Mall to Grant Avenue.

The proposed Auburn Station would be adjacent to a microbrewery or other restaurant amenity. The facility will start small, with a simple covered boarding area, but have room for expansion as demand increases. Though focused mainly on tourism at first, this will leave options of for a wider variety of passenger traffic including commuters. Depending upon regional transportation needs (as well as external

TABLE 26– New York State FY 2012 Amtrak Station ons/offs Top 5 Stations Source: Amtrak

Location	Ons/Offs
New York, NY	9,493,414
Albany-Rensselaer, NY	769,413
Rhinecliff, NY	177,375
Hudson, NY	167,286
Syracuse, NY	152,957
Total New York Ons/Offs	11,555,411

factors such as fuel prices) rail may be an important option linking Auburn with other cities in the region.

(g) Rail Facilities: Freight

CNY is well served by freight rail (Map 10). There are approximately 285 miles of active rail lines within the region with 230 miles categorized as Class 1 lines,[12] 31 miles classified as Class 2, 22 miles as Class 3 lines, and about a mile of terminal lines. These lengths include all sidings and railyard tracks and were calculated using GIS software. While this data is 10 years old, it represents the best data available.

According to the NYSDOT bridge inventory, there are approximately 35 railroad bridges in the region (these bridges are not included in the 492 bridges inventoried in the SMTC bridge and pavement report). Additionally, there are approximately 110 at-grade crossings within the region.

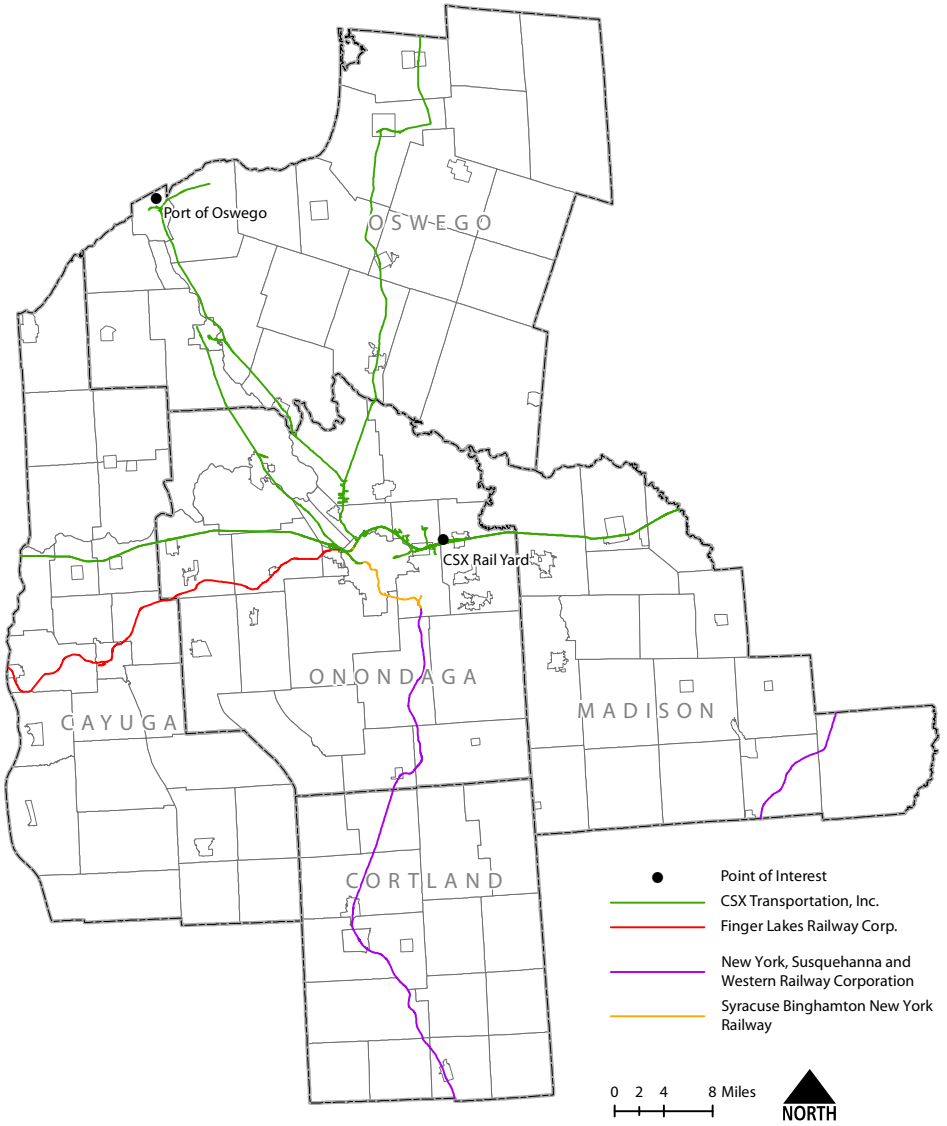
Additionally, there is one major (Class 1) carrier, CSX Transportation; one regional carrier, New York, Susquehanna & Western Railway; and one shortline railroad, Finger Lakes Railway.

The region is currently pursuing two projects, one in the Town of Manlius associated with the current rail yard, and another located in Cortland County. These facilities would not only allow for the processing of imports from downstate, but could also allow for regional businesses to more actively participate in the global economy.

Nationally, CSX operates on more than 21,000 miles of track in 23 states, and has access to 70 ports and nationwide transloading and distribution services.[13] In New York State, CSX operates nearly 1,300 miles of railroad, maintaining more than 1,750 public and private grade crossings in the state.[14]

CSX operates the Chicago Main line that links Central New York with New York City, New England and the Midwest. The company also operates the Baldwinsville, Fulton, and St. Lawrence Subdivision lines to the north of Syracuse, with the St. Lawrence Subdivision being the gateway to Montreal and Canada. Another significant segment of CSX business is the rail/truck intermodal freight terminal located in the DeWitt rail yard. The DeWitt yard is a major intermodal facility serv-

MAP 10—Central New York Rail Network



ing the Northeast and is the only terminal of its type between New York City and Buffalo.

The New York, Susquehanna & Western Railway (NYS&W) is a regional railroad company operating on over 400 miles of track in New York, New Jersey, and Pennsylvania and is 286,000 pound gross weight capable on all lines.[15] In CNY, the railroad operates two lines: the Syracuse to Binghamton, and the Utica to Binghamton. In Syracuse, the NYS&W interchanges with CSX and in Binghamton with the Norfolk Southern Railway and the Canadian Pacific Railway. The Utica traffic is interchanged at Syracuse via Binghamton. The NYS&W has expanded its traffic base in Cortland County and in the Southern Tier. Much of the traffic base is in New Jersey on the railroad's southern branches. The NYS&W serves the Ainsley Superior Warehouse, a 175,000 square foot warehouse/distribution facility located on East Brighton Avenue in Syracuse.[16] Because of its location, the warehouse facility offers easy access to I-81, I-481 and the NYS Thruway.

The Finger Lakes Railway, a privately owned Class III railroad, operates the shortline between Solvay and Geneva, and has produced significant results since taking ownership of the former Conrail Geneva Cluster (including the Auburn Branch).[17] The Finger Lakes Railway has been able to stop the decline of rail traffic in its service area. The Finger Lakes Railway customers see benefits due to the interchange rights with two Class 1 railroads (CSX and Norfolk Southern [NS]) instead of one. Interchange with CSX occurs in Solvay and Lyons, while interchange with the NS occurs in Geneva.

2. Water & Wastewater Facilities

The region's water infrastructure can be separated into three main categories: drinking water supply, wastewater treatment, and stormwater management. There are several main issues facing the region's water systems. While the region is blessed as a whole with excellent drinking water sources, water quality in some of the key watersheds in the region are in need of protection.

Central New York's surface and groundwater resources adequately meet the collective water needs of municipalities, households, businesses and industries across the region. Most lakes and rivers in Central New York are multipurpose waterbodies with uses ranging from public water supply and wastewater assimilation, to recreation and hydroelectric power generation. Approximately 60 million gallons of surface water is withdrawn per day to meet the domestic, industrial, agricultural and mining needs of CNY. In 2005, the last year for which data is available, regional patterns of water use indicate that the largest demand for water withdrawals (fresh and saline) is for thermoelectric generation (86%), followed by Public Supply (10%), Industrial (2%), Domestic (1%), Irrigation (0.3%), Livestock (0.3%), Aquaculture (0.3%), and Mining (.13%) (USGS, 2005). High-yielding groundwater aquifers, such as those located in Cortland County and in the Tug Hill Plateau, serve as primary drinking water sources for many communities within the region. The majority of the Region's water supply is drawn from Lake Ontario and three Finger Lakes (Owasco, Skaneateles, and Otisco Lakes). Drinking water sources also include rivers, streams and ponds.

There are 72 non-transient community water systems in Central New York, each supplying a minimum of 100 people. The Cities of Fulton and Cortland, in addition to a number of small village systems and many individual residences rely on groundwater as a primary drinking water source. Large yields are available from relatively shallow wells tapping the permeable glacial deposits and extensive water-saturated sand and gravel deposits which line many valleys throughout the Region. Based on current reported withdrawals from public water suppliers meeting the 100,000 gpd reporting threshold, there is a greater than 100% surplus in available public water.

The region is faced with aging wastewater and stormwater infrastructure. Aging infrastructure causes extensive problems such as lost water, inflow and infiltration and, in some cases, sanitary sewer overflows. The average design life of sewer pipe is 50 to 70 years, and some systems within the region are approaching 100 years. According to the American Society of Civil Engineers, aging water infrastructure results in 7 billion gallons of water lost each day in the United States. The U.S. also discharges approximately 10 billion gallons of raw sewage into lakes and rivers every year from combined sewer overflows.

One of the most prevalent issues with aging infrastructure is inflow and infiltration. Stormwater overflow occurs when groundwater or stormwater enters sanitary sewage systems due to improper connections, cracks or leaks. This adds to the flow in the sanitary sewer, result-

ing in the conveyance and treatment of groundwater and stormwater at a substantial cost to the water treatment systems, municipalities and taxpayers due to the large amount of energy necessary to convey (when pumped) and treat sewage. Stormwater also uses valuable capacity in the sanitary sewer system, which may require the addition or expansion of treatment facilities to treat larger volumes of sanitary sewage. In addition, stormwater may create sanitary sewer overflows during wet weather events, polluting the environment and compromising public health.[18]

(a) Drinking Water Supply

The Skaneateles Lake Watershed which provides drinking water primarily for the City of Syracuse, Otisco Lake which supplies the Onondaga County Water Authority, Owasco Lake which provides water to the City of Auburn, as well as the entire Lake Ontario Watershed which provides drinking water to a majority of the residents of the region through the Metropolitan Water Board are critical water resources that must be protected. Additionally, sole source aquifers within the region that provide drinking water and that can be affected by agricultural and mining/drilling processes and should be giving careful consideration (Table 27).

Three primary entities are responsible for providing water service in Onondaga County:

+ The Metropolitan Water Board and the Onondaga County Water District;
+ The Onondaga County Water Authority; and
+ The City of Syracuse Water Department.

In the four surrounding counties, the small cities of Auburn, Oswego, Fulton, Cortland, and Oneida supply water to the majority of residents. The infrastructure related to these entities is directly related to the region's current development patterns as the provision of water infrastructure has taken place in response to development pressures. Water infrastructure can and often does induce further growth in areas where such growth might not be preferred.

Although the supply of freshwater is not an immediate issue in Central New York, it is a finite resource that must be used wisely and protected against unnecessary loss. On hot summer days, demand can increase by as much as 67% over an average day's production.[19] Additionally, many drinking water systems have reached or exceeded 100 years of age and are still utilizing some of their original infrastructure. Various system components have life cycles which can range from 20 years (pumps, filter media, etc.) to 50 years (storage tanks, treatment plants), to over 100 years (transmission and distribution mains). Normal upstate NY climate related factors, including snow load, ice formation and freeze/thaw cycles can significantly shorten the useful life of certain water system components resulting in significant unaccounted for water loss due to leaks and failures in our aging clean water infrastructure system. While regular rehabilitation and maintenance can extend the useful life of certain water system component, eventually, they will all require replacement.

TABLE 27–Major Water Supply Systems in Central New York

		Million gallons/day		
System	Source	2011 Average	Maximum Capacity	%Percent of Capacity
Metropolitan Water Board	Lake Ontario	18.5	50	37%
Onondaga County Water Authority	Otisco Lake	17.28	20	86%
City of Syracuse	Skaneateles Lake	35.52	58	61%
City of Oswego	Lake Ontario	9	20	45%
City of Auburn	Owasco Lake	4.8	15	32%
City of Oneida	Florence Creek	2.2	3.4	65%
City of Cortland	groundwater	2	10	20%
City of Fulton	groundwater	1.2	5	24%

Metropolitan Water Board (MWB)

The Metropolitan Water Board (MWB) is the administrative body of the Onondaga County Water District (OCWD) and provides wholesale drinking water from Lake Ontario throughout major portions of CNY (Map 11).

The MWB was created in the mid 1960s to provide wholesale drinking water from Lake Ontario to municipal corporations and public authorities and to supplement the limited capacity of the area's primary retail water utilities – Onondaga County Water Authority (OCWA - Otisco Lake supply) and The City of Syracuse (Skaneateles Lake supply). The system was designed to meet the needs of a County population that was projected to grow to 788,700 residents in 2020, resulting in the current excess capacity, based on Onondaga County's population of 467,026 as reported by the 2010 U.S. Census.[20] The MWB system has the capacity to sustain production of up to 60 million gallons/day and store in excess of 110 million gallons of water for emergencies, including fire protection and periods of drought. During 2011 the MWB provided roughly 18.5 million gallons/day to OCWA (roughly 50% of the OCWA total annual delivered water of 13.59 Billion Gallons for 2011). There is significant capacity within the system.

The Metropolitan Water Board (MWB) pumps water from Lake Ontario through an eight foot diameter intake it shares with the City of Oswego. From an offshore intake in Oswego, "raw" water is pumped to a nearby Water Treatment Plant where it is filtered, purified and tested prior to the transmission of "finished" water to a Terminal Reservoir in the Town of Clay. By 2014, the Terminal Reservoir will be replaced by covered tanks as a means of compliance with the EPA Long Term 2 Enhanced Surface Water Treatment Rule (see Current Capital Projects link).

Water exiting the treatment plant is then pumped to distribution reservoirs and tanks in Onondaga County and distributed on a wholesale basis to the Onondaga County Water Authority (OCWA), the City of Syracuse, and the Town of Hannibal located in Oswego County. The drinking water is supplied by OCWA to consumers in Onondaga, Oneida, Oswego and Madison Counties; the City of Syracuse in Onondaga County; and the Town of Hannibal in Oswego County.

MAP 11– Metropolitan Water Board Distribution System

Water exiting the Metropolitan Water Board treatment plant is pumped to distribution reservoirs and tanks in Onondaga County and distributed on a wholesale basis to the Onondaga County Water Authority (OCWA), the City of Syracuse, and the Town of Hannibal located in Oswego County.



To fund major capital projects, MWB collects ad valorem taxes from three zones of assessment in the OCWD, as well as customers outside the OCWD, while operating and maintenance costs are funded by sales revenue from wholesale water rates.

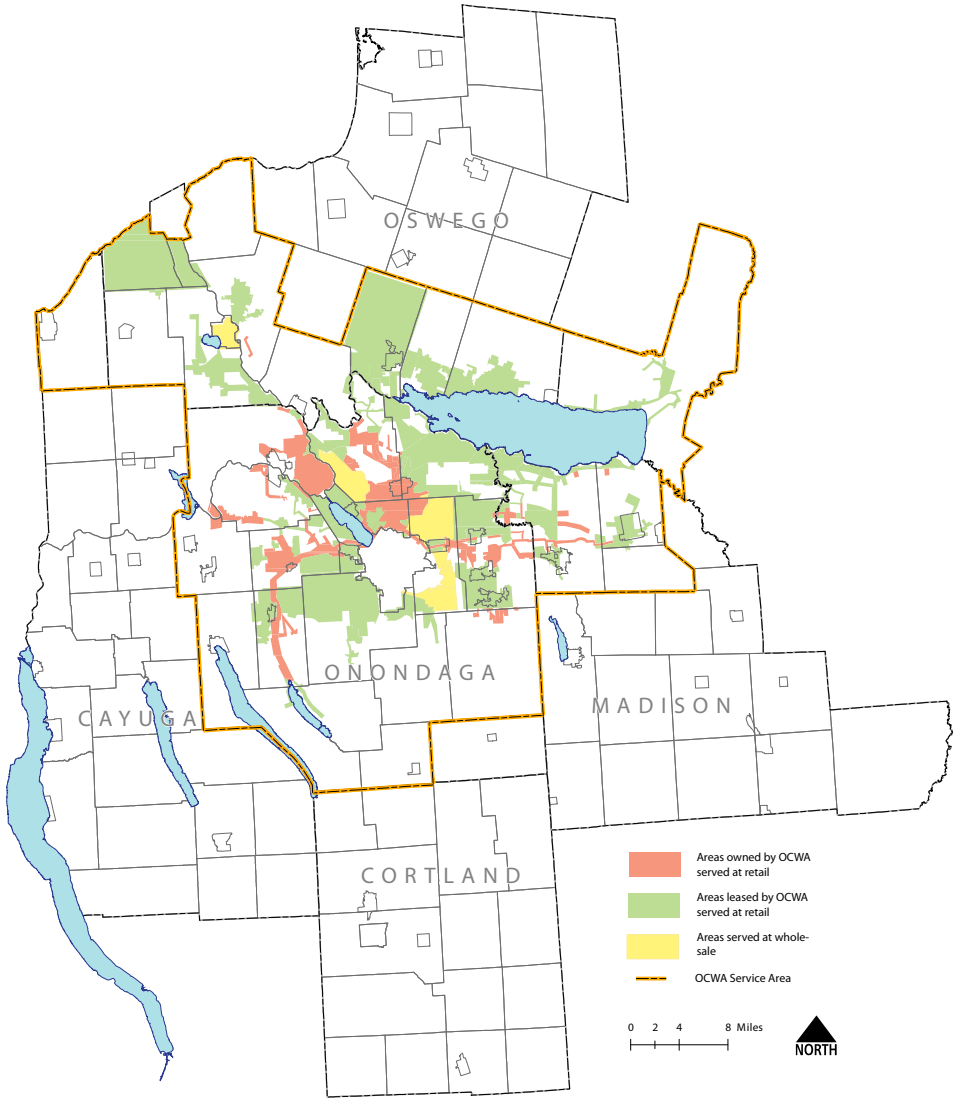
In 2010 and 2011, in partnership with OCWA, MWB completed and began operation of a 20 million gallon tank to replace the Western Reservoir and two tanks with a combined capacity of 50 million gallons to replace Eastern Reservoir, shifting storage capacity to the east. The final element of the Storage Master Plan implementation will continued in 2012 as construction began on two 15 million tanks to replace Terminal Reservoir. Construction is anticipated to continue into 2014. Through these projects, MWB is demonstrating a leadership role in implementing use of best practices for green infrastructure design and construction. As an example, Onondaga County is considering the installation of solar photovoltaic systems on top of the covered storage tanks.

Onondaga County Water Authority (OCWA)

The Onondaga County Water Authority (OCWA) is by far the largest drinking water provider in CNY (Map 12) serving 340,000 residential customers, thirty large industrial customers, three municipal wholesale water customers (DeWitt, Clay, and Camillus), and supplying water on an intermittent or emergency basis to seven additional municipal water systems (Table 28). OCWA is among the 125 largest publicly owned water suppliers in the United States. Created in 1951, OCWA water originates from Otisco Lake (approximately 17.28 million gallons/day in 2011, or 46.4% of OCWA's total water supply). OCWA also purchases water wholesale from the MWB (Lake Ontario approximately 20 million gallons/day, or 49.8%). OCWA purchased an additional 1.41 million gallons/day from the City of Syracuse (Skaneateles Lake 3.7% of total water supply).

Since 1993 OCWA has absorbed seventeen local water utilities, growing by more than 50% in the last twenty years from about 60,000 service connections to over 100,000 connections (Map 12). Only one-third of that growth came from new construction.[21] OCWA is now responsible for the maintenance of over 2,000 miles of main pipeline; with several million dollars worth of pipeline replaced each

MAP 12–OCWA Service Territory



source: OCWA

TABLE 28–Municipalities that receive service from OCWA

ONONDAGA COUNTY			
Towns, cities	Water source	Villages	Water source
Camillus	Otisco/ Skaneateles	Baldwinsville	Ontario*
Cicero	Otisco/Ontario	Camillus	Otisco
Clay	Otisco/Ontario	E. Syracuse	Otisco/Ontario
DeWitt	Otisco/Ontario/ Skaneateles	Fayetteville	Ontario
Elbridge	Otisco	Liverpool	Otisco/Ontario
Geddes	Otisco/Ontario/ Skaneateles	Manlius	Ontario
Lafayette	Ontario	Marcellus	Otisco
Lysander	Otisco/Ontario	Minoa	Otisco/Ontario
Manlius	Ontario/ Skyridge Wells	N. Syracuse	Otisco/Ontario
Marcellus	Otisco	Solvay	Otisco
Onondaga	Otisco/ Skaneateles		
Otisco	Otisco		
Pompey	Ontario		
Salina	Otisco/Ontario		
Skaneateles	Otisco		
Spafford	Otisco		
Syracuse	Otisco/Ontario*		
Tully	Tully Valley Springs		
Van Buren	Otisco/Ontario		
*Emergency connection only			

MADISON COUNTY			
Towns, cities	Water source	Villages	Water source
Lenox	Ontario	Canastota	Ontario
Sullivan	Ontario	Chittenango	Ontario
Oneida (City)	Ontario*		
*Emergency connection only			

ONEIDA COUNTY			
Towns, cities	Water source	Villages	Water source
Verona	Ontario	Sylvan Beach	Ontario
Vienna	Ontario		
Annsville	Ontario		

OSWEGO COUNTY			
Towns, cities	Water source	Villages	Water source
Fulton	Ontario*	Central Square	Ontario
Granby	Ontario	Phoenix	Ontario*
Hastings	Ontario		
Oswego (Town)	Ontario		
Oswego (City)	Ontario*		
Schroeppel	Ontario		
West Monroe	Ontario		
Volney	Ontario		
Minetto	Ontario		
Scriba	Ontario*		
*Emergency Connection Only			

year. Additionally OCWA operates 56 storage facilities and 41 pumping facilities.

OCWA's growth has primarily been related to acquisition of existing water systems, such as those in the Town of Van Buren, the Villages of Minoa, East Syracuse and Marcellus, and Metropolitan Water Board facilities, or through the construction of town water districts designed to service existing homes in the Towns of Marcellus, Otisco, Spafford and Skaneateles. However, as new development continues to be proposed by developers and approved by municipalities in areas that require infrastructure extensions, at the request of municipalities OCWA installs new water mains and other associated infrastructure that is paid for by developers. This is occurring predominantly in the Towns of Clay, Cicero and Onondaga.[22]

OCWA's water rates have more than doubled in the last ten years for several reasons, including increased pension and health care costs, increased purchased water costs, enhanced security, upgrades to comply with changes to the Safe Drinking Water Act, and ongoing replacement of older tanks, pump stations, meters and water mains. At the same time rates remain competitive nationally. Residential rates are in the median range for the country, while industrial rates remain in the bottom quartile.

While the number of service connections has risen, overall water consumption has declined in recent years. In 2011, OCWA experienced a 14.24% decrease in water consumption, followed by an additional 11.62% decrease in consumption in 2012. Through investments in efficiency, and upgrades to reduce loss throughout its systems OCWA has seen a 10% decrease in energy consumption over the past decade.

City of Syracuse

The City of Syracuse Water Department (SWD) provides retail water service to the entire City of Syracuse. Through wholesale and other service agreements, the SWD also supplies water to portions of the towns of DeWitt, Onondaga, Geddes, Camillus, Skaneateles, Salina, and the villages of Jordan and Elbridge. Since 1894, the primary water supply for the City of Syracuse has been Skaneateles Lake, one of the Finger Lakes located approximately 20 miles southwest of the City.

The Syracuse water system is made up of over 500 miles of pipelines to deliver water from Skaneateles Lake to the City and to distribute the water throughout the City. The water supply system consists of water storage in Woodland and Westcott Reservoirs on the west side of the City. Water is also stored in two standpipes and in the three tanks that comprise Morningside Reservoir.

The City is able to supplement its Skaneateles Lake water supply with Lake Ontario water when necessary through an interconnection with MWB facilities. The City normally relies upon Lake Ontario water during times when drought conditions limit the available supply from Skaneateles, during emergencies, or during periods of high consumption. Since the MWB system is connected to the City's system on the north side of the City, this area may receive water from Lake Ontario from time to time.

The Woodland Reservoir Ultraviolet Light Treatment Facility Project is a two-year project mandated by the federal government that will begin in July. The project involves the demolition of three buildings and the construction of two new buildings that will house ultraviolet light treatment equipment. The City must complete this project to maintain its filtration avoidance waiver for the Skaneateles Lake Water supply. This waiver exempts the City from building water filtration facilities as long as the City follows specific watershed rules and regulations and institutes successful water quality protection programs. Construction is expected to be completed by autumn of 2014.[23]

During 2011, the total amount of water entering the City of Syracuse water system was 10,984 million gallons (30.096 MGD). 12,964 million gallons (35.52 MGD) was withdrawn from Skaneateles Lake and 188.49 million gallons (0.516 MGD) came from Lake Ontario (Metropolitan Water Board).

City of Oswego

The Oswego Water Department is responsible for providing potable water to the City, as well as the Town of Scriba. The City water source is Lake Ontario, in conjunction with the facilities of the Metropolitan Water Board. The distribution system includes a 10 million gallon finished water-covered reservoir. Treatment includes disinfections, filtration, and fluoridation. The Oswego water system serves approxi-

mately 29,400 people, including residential, commercial, and industrial uses. This is made possible through over 8,000 service connections. Total water produced in 2002 was 2.9 trillion gallons.

The City of Oswego is under a consent decree from the U.S. Federal Government for violations of Section 301(a) of the Clean Water Act in relation to the City's West Side sewage treatment facility and combined sewer system (CSO). The requirements of the decree include completing and implementing a Long Term Control Plan (LTCP) to address combined sewer overflow (CSO) correction and abatement, stormwater management, and pretreatment program elements. The city is currently implementing a comprehensive overhaul of its combined sewer system (CSS). The consent decree requires that over 75% of the city's CSS be separated by 2021. The total cost to the city is estimated to total over $87 million. The city is also pursuing green infrastructure alternatives to meet the requirements of the consent order.

City of Fulton

Drinking water for the City of Fulton originates from 10 groundwater wells, as well as treated surface water from Lake Ontario through a connection to the MWB. The OCWA source is received already filtered and treated, and it is used to supplement groundwater sources, as needed, to meet system demand. Of the 10 groundwater wells owned and operated by the City, two are located on the Water Works property, two are located on County Route 57 south of the Water Works property and six wells are located at the Great Bear well field. The Fulton Water Department, a division of the Department of Public Works, maintains approximately 66 miles of water main lines and 555 fire hydrants.

City of Cortland

The City of Cortland provides public water throughout the entire City, and has done so since at least the early 1900s. The public water supply serves the residents and businesses within its limits, but also has emergency connections to several other municipalities. The City also provides water to portions of the Town of Cortlandville via an intermunicipal agreement (Table 29). The source of the City's water is a group of three ground wells with production capacities of 2,300 gallons per minute (GPM), 3,600 GPM, and 3,000 GPM. Each of the wells draws from the highly productive Cortland-Homer Preble Sole Source Aquifer which is part of the entire Homer-Cortland valley and its typical sand and gravel deposits.

There is more than sufficient water capacity to meet the present needs of the City. The average daily usage for the City is typically 2.0 million gallons per day (GPD), with a range of static pressure between 35psi (SUNY college hill and Ridgeview Avenue) and 85 psi in all other areas within the City. There are three storage tanks serving the system. One is a three million gallon concrete tank located on Saunders Road in the Town of Cortlandville. The other two are 1.25 million gallon (each) steel bolted tanks located on the SUNY campus. The storage tanks are served directly by 24" transmission mains from the wells. The City's wells are in one location, which makes the City's water supply vulnerable. An alternate, back-up location may need to be identified.

An issue of prime importance that has received recent attention is the protection of the aquifer recharge area. A recent source water assessment of the system by the NYS Health Department concluded that the City's supply is "highly susceptible" due to the highly permeable nature of the aquifer, and the close proximity of land uses and activities to the wells (see Table 30 for information on private well systems in the area). Unfortunately, much of the recharge area is located outside the City in the Town of Cortlandville.

City of Auburn

The drinking water source for the City of Auburn and surrounding communities is Owasco Lake. Water is provided through a single 30-inch intake line that extends over 1,800 feet into the lake. The City's allowable withdrawal from Owasco Lake is 15 million gallons per day (mgd).

The city of Auburn water system serves approximately 27,179 Auburn residents through 8,800 service connections (2010 Census). Water from the City of Auburn is also distributed to areas within the Towns of Sennett, Fleming, Throop, Brutus, Montezuma, Springport, and Aurelius as well the Villages of Port Byron and Weedsport, and the Cayuga County Water Authority and the Thruway Authority. In total, Auburn supplies close to 45,000 people in Cayuga County with drinking water. The daily average of water treated and pumped into the distribution system is 4.8 million gallons per day. It is estimated that approximately 27.16% of the total water produced is lost due

TABLE 29–Community Water Suppliers Within Cortland-Homer-Preble Aquifer System

Supply	Population Served	Water Usage (gallons per day)
City of Cortland	20,100	3,792,000
Cortlandville	2,700	413,600
Homer	4,250	717,800
McGraw	1,300	87,900
Scott	154	9,341
Preble	51	3,200
Green Acres MHP	32	2,000
McBride MHP	54	3,400
Mountainview MHP	86	5,400
Parker Manor MHP	64	4,000
Pine Hill MHP	253	16,000
Ripley Hill MHP	64	4,000
Tully MHP	333	13,672
TOTAL	29,441	5,072,313

(MPH = Mobile Home Park)

Source: Cortland County Health Department.

TABLE 30–Private Well Information within Cortland-Homer-Preble Aquifer System

Town	Estimated Population	Estimated Water Usage (gal/day)
Cortlandville	2,700	270,000
Homer	1,575	157,500
Preble	860	86,000
Scott	140	14,000
TOTAL	5,275	527,500

to leakage, used to flush mains and wash streets, fight fires and for internal use at the Water Filtration Plant, as compared to 45% in 2006

Owasco Lake is classified as a Class-AA Special water body designated by the New York State Department of Environmental Conservation (NYSDEC) as listed in 6 NYCRR Part 702. It is considered an excellent source of potable water, and must be protected.

City of Oneida

The City of Oneida drinking water supply is from Glenmore Reservoir on Florence Creek, which is located twenty miles north of the City in the Town of Annsville, Oneida County. The dam impounds water from a 13.8 square mile watershed on the edge of the Tug Hill Plateau. The 378-foot long and 45-foot high dam, constructed in 1926, provides water storage to buffer seasonal water demands as well as dry weather supply. The reservoir holds 299 million gallons of water. The City owns the 500-acre site on which the reservoir and dam are located.

Oneida's Florence Creek Water System was constructed in 1926. In early 1980, the City's current water treatment plant was completed to provide filtration to the City's upland supply, for the first time correcting problems of taste, odor and color. Today the City of Oneida Water Department serves almost 21,000 people and provides an average daily water supply of 2.2 million gallons (2.2 MGD).

A 20" cast iron main transports the water from the clearwell tank into the City. A pump station at Lake Street increases the capacity of the 20-mile pipeline from 2.8 MGD to 3.5 MGD with one pump operating. The water is distributed through a network of 80.8 miles of cast iron, asbestos cement and ductile iron water main throughout the City. Two domed concrete storage tanks have a combined capacity of 15 million gallons and are used to balance pressure in the distribution system and to ensure an adequate water supply for fire protection. A chlorination facility is located at the site to further treat all water leaving the tanks.

(b) Wastewater Systems

There are 43 wastewater treatment plants currently operating in Central New York (Table 31). The age of these plants ranges from 8 to 88 years. Approximately 79% of the waste water treatment plants in Central New York are over 30 years old and have reached

or exceeded their expected useful life and therefore pose a threat to quality of the waters they discharge into. Twenty-eight plants employ secondary treatment technology and 43 plants employ tertiary treatment technology. The NYS DEC database "Descriptive Data of Wastewater Treatment Plants in New York" indicates that only 23% of municipal wastewater treatment plant equipment is more than 30 years old statewide. Aging wastewater infrastructure is tied directly to the quality of the region's waters. A 2004 DEC study documented the correlation between wastewater infrastructure and water quality.[24]

Aging infrastructure is most prevalent in the City of Syracuse, the small cities within the region including Auburn, Cortland, Oswego, Fulton, and Oneida, as well as some older towns and villages. As this infrastructure continues to age and requires more maintenance and replacement, the costs associated with this infrastructure will continue to rise. These high costs may be particularly burdensome for the municipalities with lower-income residents and higher percentages of tax exempt properties, such as the City of Syracuse.

TABLE 31–Wastewater treatment facilities in Central New York

Plant	Year	Design Flow (MGD)	Collection System*
Cayuga County (7)			
Auburn	1937	12	sc
Moravia	1971	0.6	c
Union Springs	1960	0.33	s
Aurora	1971	0.3	s
Weedsport	1966	0.3	s
Port Byron	1966	0.285	s
Cayuga V	1964	0.1	s
Cortland County (3)			
Cortland LeRoy/ Summerson	1940	9	s
Marathon	1976	0.063	s
Cuyler	1977	0.01	s
Madison County (6)			
Oneida	1924	2.5	s
Canastota	1959	1.73	c
Madison City SD/Cazenovia	1977	0.95	s
Hamilton Village	1968	0.85	s
Chittenango	1985	0.8	s
Morrisville	2003	0.18	s

Plant	Year	Design Flow (MGD)	Collection System*
Onondaga County (14)			
Onondaga Metro	1960	80	c
Onondaga Oak Orchard	1968	10	s
Onondaga Baldwinsville	1983	9	sc
Onondaga Meadowbrook	1969	6.5	s
Onondaga Wetzel Road	1959	3.5	s
Onondaga Lake Shore (Brewerton)	1971	3	s
Minoa	1937	0.9	s
Skaneateles	1983	0.66	s
Central Square Village	1996	0.45	s
Marcellus	1959	0.38	s
Tully	1970	0.226	s
Jordon	1983	0.16	s
Onondaga Harbour Heights	1966	0.15	s

Plant	Year	Design Flow (MGD)	Collection System*
Lysander/ Lyonsdale	1989	0.017	s
Oswego County (13)			
Oswego (eastside)	1971	5.35	c
Oswego (westside)	1939	4	sc
Fulton	1967	3.4	s
Pulaski	1971	0.65	s
Phoenix	1964	0.6	s
Mexico	1976	0.3	s
Minetto	1972	0.2	s
Cleveland	1991	0.15	s
Parish	1979	0.14	s
Hastings (Ft. Brewerton)	2004	0.125	s
West Monroe Big Bay	1989	0.056	s
Hastings (Caughdenoy)	1986	0.029	s
Oswego Sleepy Hollow	1998	0.007	s

Additionally 14% of the region's wastewater treatment facilities fall within the Chesapeake Bay Watershed and will be required to meet stringent new standards imposed by the Federal Government that will have costly impacts to local governments.

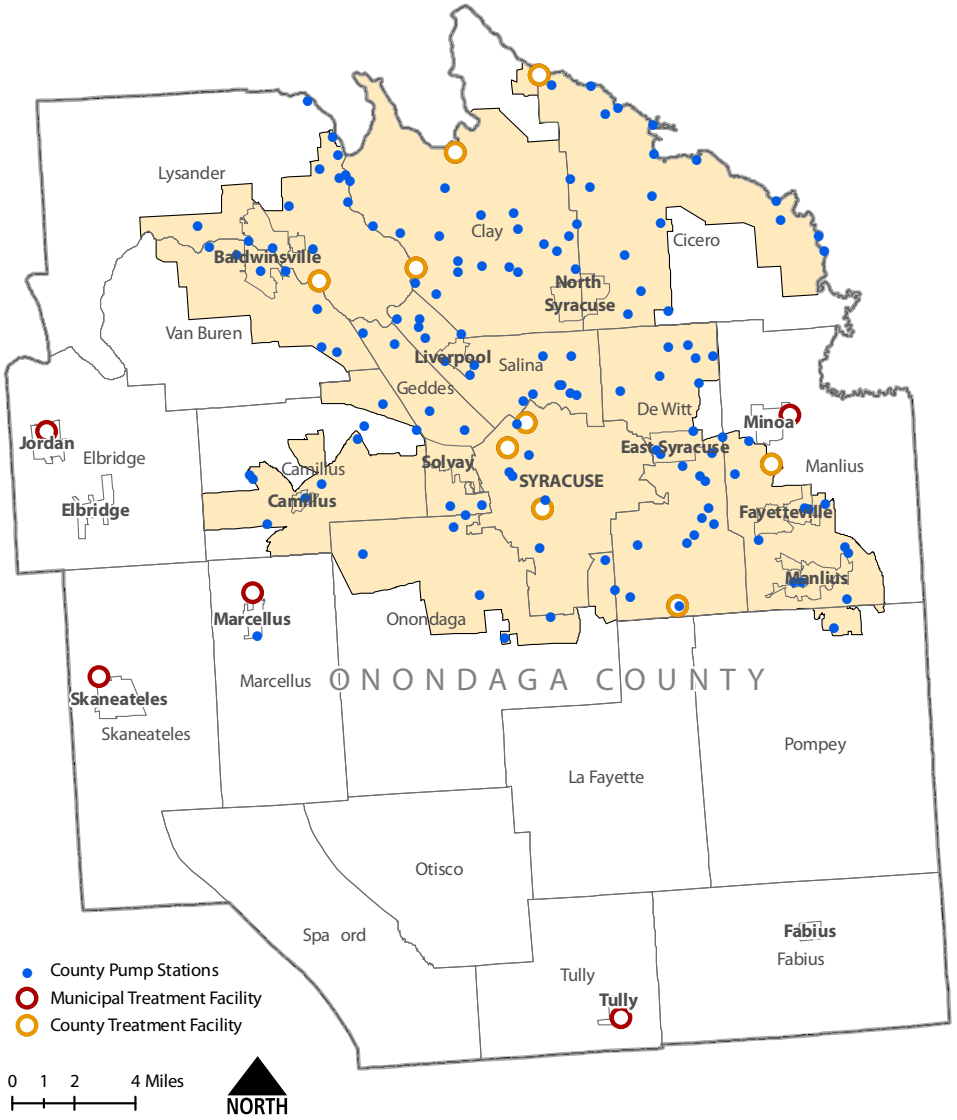
A few municipalities within the region (i.e. Onondaga County, City of Syracuse, and City of Oswego) are also working to address the impacts of combined storm water and sanitary sewers that contribute to nutrient loading, waterborne pathogens, and other contamination in the region's waterways.

As seen in Map 13, the majority of wastewater infrastructure within the region is located in Onondaga County and is managed by the Onondaga County office of Water Environment Protection (WEP). WEP has been experiencing rising user costs associated with expansion of the sewer system, as well as managing upgrades to the existing system. The most notable projects are associated with Onondaga County's response to the Amended Consent Judgment (ACJ) which ultimately are aimed at improving water quality in Onondaga Lake. Among the ACJ projects are upgrades to the Metro Wastewater Treatment Facility located on the shore of Onondaga Lake, as well as sewer system upgrades within the city of Syracuse including sewer separation and the Midland Avenue Regional Treatment Facility, underground storage facilities along Onondaga Creek and in Armory Square, and green infrastructure projects associated with the County Save the Rain program. The Onondaga County Sewer Unit charge has increased from $67.06 per unit in 1982 to $358.68 per unit in 2012.

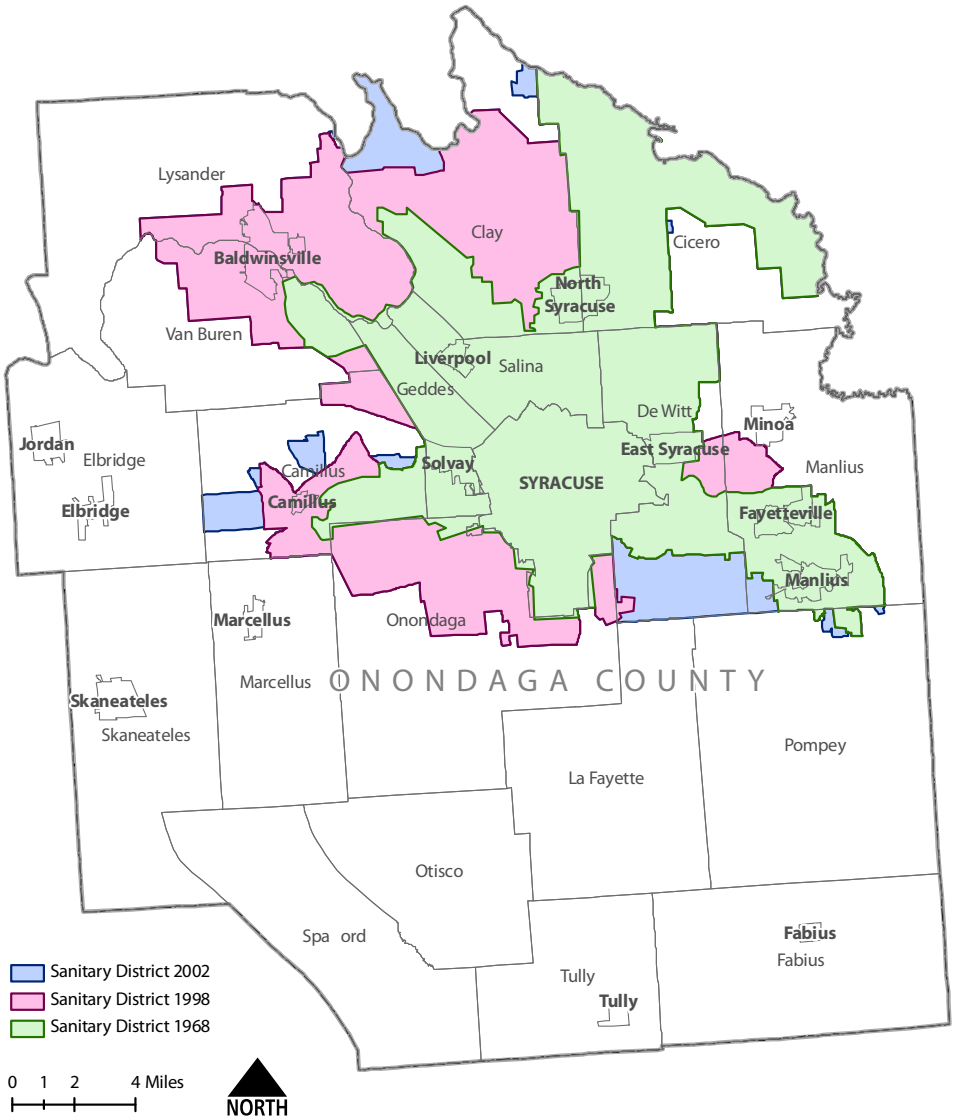
From 2001–2011, 39 miles of municipal sewers were added in the County; and the Onondaga County Consolidated Sanitary District has added 12,550 acres since 1998 (Map 14). All of this expansion in has occurred without accompanying population growth. The County's population is dispersing and redistributing around the County, often into previously undeveloped areas without existing infrastructure.

Additionally, although Onondaga County is responsible for wastewater treatment, it does not hold ownership of all sewer lines in the County and thus has minimal control over the addition of new lines to the satellite municipal systems that are tributary to the County owned infrastructure. This has resulted in a lack of consistent construction standards due to the fragmented nature of the system.

MAP 13– Onondaga County Sanitary District Wastewater Treatment Facilities and Pumping Stations



MAP 14–Onondaga County Sanitary District Change 1968–2002



In addition to expansion of wastewater pipes and treatment facilities, the County has also seen an increase in the number of pumping stations for new developments as locations that could take advantage of a gravity system have largely been developed. In Onondaga County, pumping for wastewater disposal was not commonly used until the 1960s, as most sanitary sewer systems used gravity sewer systems for waste conveyance. Wastewater pumping stations operated by WEP increased from 120 to 151 between 2001 and 2011, an increase of 21%, while at the same time, the number of properties supporting these wastewater systems has dropped 2% from the peak number of units in 2002.

3. Energy Production and Transmission Resources

Central New York is a major contributor to New York's total energy generation (Table 32). CNY generates approximately four times its annual consumption. This is largely due to Oswego County being the home to three of New York's six operating nuclear reactor units (Table 33). The annual generation from these reactors alone is 20.6 GWh, or 15% of the State's total annual electrical generation. Five of the state's six operating reactors were commissioned in the 1970s with the in-service date of Nine Mile Unit Two occurring in 1987. Since that time, no additional reactors have gone into service in CNY, although the existing units have increased their capability from efficiency "upratings" over the past several years. Oswego County's nuclear assets have received license extensions: Nine Mile Point Unit 1 (2029), Nine Mile Point Unit 2 (2046), and James A. FitzPatrick (2034). All three units are General Electric boiling water reactors. Unit 1, a BWR-2, went online in 1969 and is one of the two oldest nuclear reactors still in service in the United States. As noted in Chapter 2: Energy Management, the region's nuclear power facilities provide 82% of all electricity generated in Central New York so regional stakeholders must give serious consideration starting now to the investments that will be required to replace these energy production resources or to improve them in order to extend their useful life. It should be noted that these facilities employ hundreds of residents with a combined annual payroll well in excess of $100 million.

It is also noted that a sizable installed transmission capability resides in CNY that facilitates the movement of energy to markets. CNY sits at the transmission crossroads for energy that is not only produced here, but for energy that flows from Western New York as well (Figure 6). Several different entities provide transmission services across CNY:

TABLE 32–Central New York Generation by Location, Size, Production, and Age

Facility	In Service Date	Type	Capacity (MW)	Production GWh	Age
Cayuga					
Auburn- Mill St.	1981	Hydro			30.9
Auburn-No. Div. St..	1992	Hydro			19.7
Auburb- State St.	1995	NG	5.4	0.4	17.6
Montville Falls	1992	Hydro			20.0
Madison					
Munnsville Wind Power	2007	Wind	3.5	84.7	5.0
Fenner Wind Power	2001	Wind		26.1	10.7
Madison Wind Power	2000	Wind	1.2	18.0	11.9
Madison County LF	2010	Landfill	1.6	6.2	2.4
Onondaga					
Carr St. - E. Syr.	1993	NG	86.6	28.5	19.0
Project Orange 1	1992	NG		55.5	20.2
Project Orange- 2	1992	NG		78.3	20.2
Syracuse	1993	NG	87.5	6.5	18.9
Syracuse Energy ST1	1991	Coal	11.0	109.7	21.0
Syracuse Energy ST2	1991	Coal	62.8		21.0
Baldwinsville 1	1927	Hydro	0.3	1.4	85.6
Baldwinsville 2	1927	Hydro	0.3	0.7	85.6
Nottingham Highschool	1988	NG			24.2
Onondaga County	1994	Solid Waste	32.4	190.3	17.7
Onondaga Energy Partners	1987	Landfill		1.2	24.7
Oswego HY Partners	1990	Hydro		11.3	21.7
Seneca Limited	1985	Hydro		0.7	26.7
Oswego					
Oswego 5	1976	Fuel Oil	822.0	31.9	36.5
Oswego 6	1980	Fuel Oil	826.0	32.8	32.1
Oswego IC 1	1967	Fuel Oil			45.0
Oswego IC 2	1976	Fuel Oil			36.5
Oswego IC 3	1980	Fuel Oil			32.1

Facility	In Service Date	Type	Capacity (MW)	Production GWh	Age
Oswego (continued)					
Nine Mile Point 1	1969	Nuclear	628.2	5294.1	42.8
Nine Mile Point 2	1988	Nuclear	1141.0	8945.0	224.0
Indeck-Oswego	1990	NG	48.4	9.1	22.3
Fitzpatrick 1	1975	Nuclear	828.1	6361.5	37.1
Independence	1994	NG	930.8	3515.0	17.8
Benetts Bridge 1	1964	Hydro	6.4	5.1	48.6
Benetts Bridge 2	1966	Hydro	6.4	14.3	46.6
Benetts Bridge 3	1970	Hydro	7.0	34.5	42.6
Benetts Bridge 4	1970	Hydro	7.0	33.1	42.6
City of Oswego (HD)	1994	Hydro		41.9	18.5
Fulton 1	1924	Hydro	0.8	4.2	88.6
Fulton 2	1928	Hydro	0.4	1.4	84.6
Granby1	1983	Hydro	4.9	18.3	29.3
Granby2	1983	Hydro	4.9	21.4	29.3
Lighthouse Hill 1	1930	Hydro	3.7	13.7	82.6
Lighthouse Hill 2	1930	Hydro	3.7	6.2	82.6
Minetto 2	1915	Hydro	1.6	7.0	97.6
Minetto 3	1915	Hydro	1.6	7.2	97.6
Minetto 4	1915	Hydro	1.6	6.6	97.6
Minetto 5	1975	Hydro	1.6	5.2	37.6
Minetto 6	1975	Hydro	1.6	6.7	37.6
Oswego County	1986	Solid Waste		4.4	26.4
Oswego Falls E1	1914	Hydro	1.5	7.9	98.6
Oswego Falls E2	1914	Hydro	1.5	8.1	98.6
Oswego Falls E3	1914	Hydro	1.5	7.2	98.6
Oswego Falls W4	1914	Hydro	0.9	2.6	98.6
Oswego Falls W5	1914	Hydro	0.9	2.8	98.6
Oswego Falls W6	2007	Hydro	0.9	0.5	5.6
Oswego Falls W7	2007	Hydro	0.9	0.6	5.6
Varick 2	1926	Hydro	2.2	5.7	86.6
Varick 3	1926	Hydro	2.2	3.8	86.6
Varick 4	1926	Hydro	2.2	2.6	86.6
Varick 5	1926	Hydro	2.2	6.0	86.6

Source: NYISO

CNY ENERGY PRODUCTION AND TRANSMISSION

Central New York's residents, businesses, and industry receive its energy from a wide range of delivery companies. For most, National Grid and New York State Electric and Gas, provide a bulk of these services to the five county region and its population. Community based municipal energy systems deliver services in the villages of Hamilton, Skaneateles, Solvay, Marathon, along with Oneida-Madison Electric Cooperative.

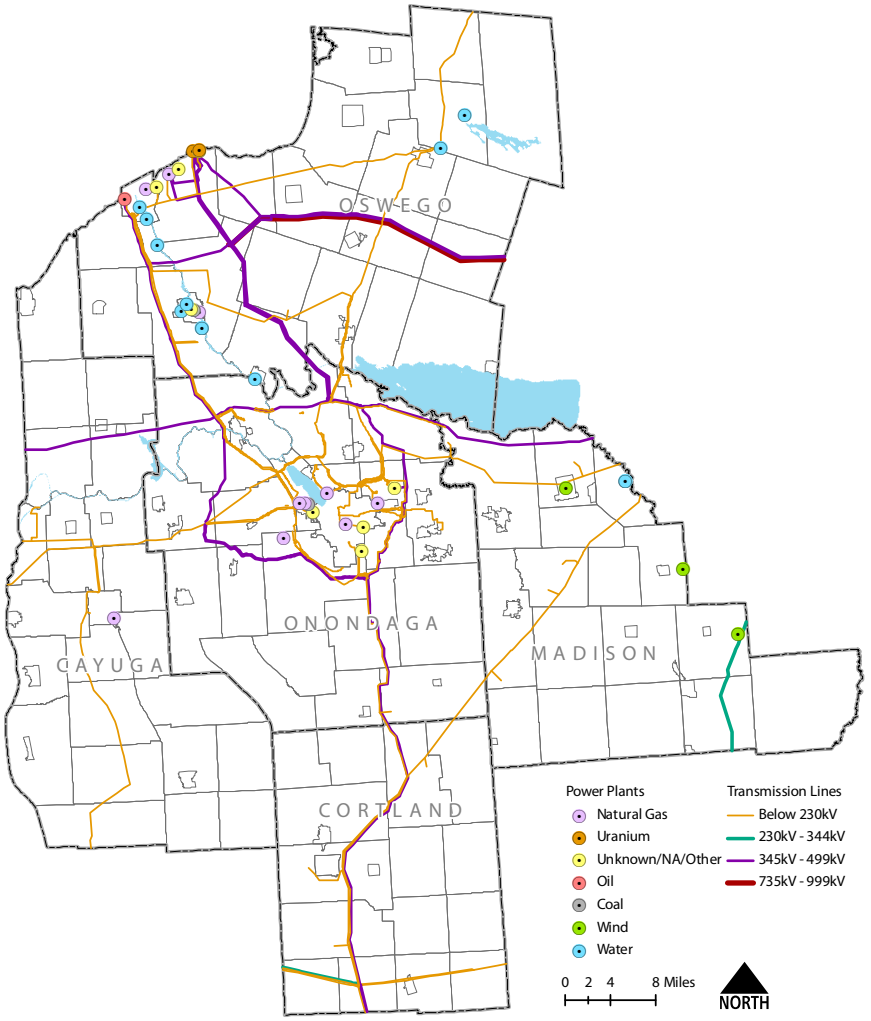
While natural gas is available in all of the five counties of Central New York, it does not enjoy the saturation levels of other areas within New York State. The natural gas distribution network serves a large majority of the population and industry (including power generation) in CNY, but is less prolific in rural communities across Oswego, Madison, and Cayuga counties.

Distribution within the CNY region is classified into two different categories: radial distribution and secondary network distribution. The secondary network is only found in the areas like Syracuse and Cortland well-suited for densely populated areas because they make for efficient distribution with fewer transformers and decreased distances between end users; however, they are run underground and therefore are expensive to install. Radial lines are found in all other parts of the region, as typical power lines that are seen in neighborhoods and along the sides of roads connecting directly to the end users.

Each of the local distribution companies (LDC) has identified projects to improve the networks within their service territories. Most are designed and implemented to improve reliability through the replacement of existing facilities or to accommodate expansion or load growth in specific regions within their territory. This is because, system peak capability is being exceeded on select circuits.

In fact, of 41 projects identified by National Grid across Upstate New York, only two are being performed to accommodate load growth, (in Western New York and the Capital Region); the 39 remaining projects are for reliability reasons. NYSEG and RGE (both utilities owned by Iberdola) have identified 256 projects across their service territories with only 17 projects, or 6.6%, located in the CNY.

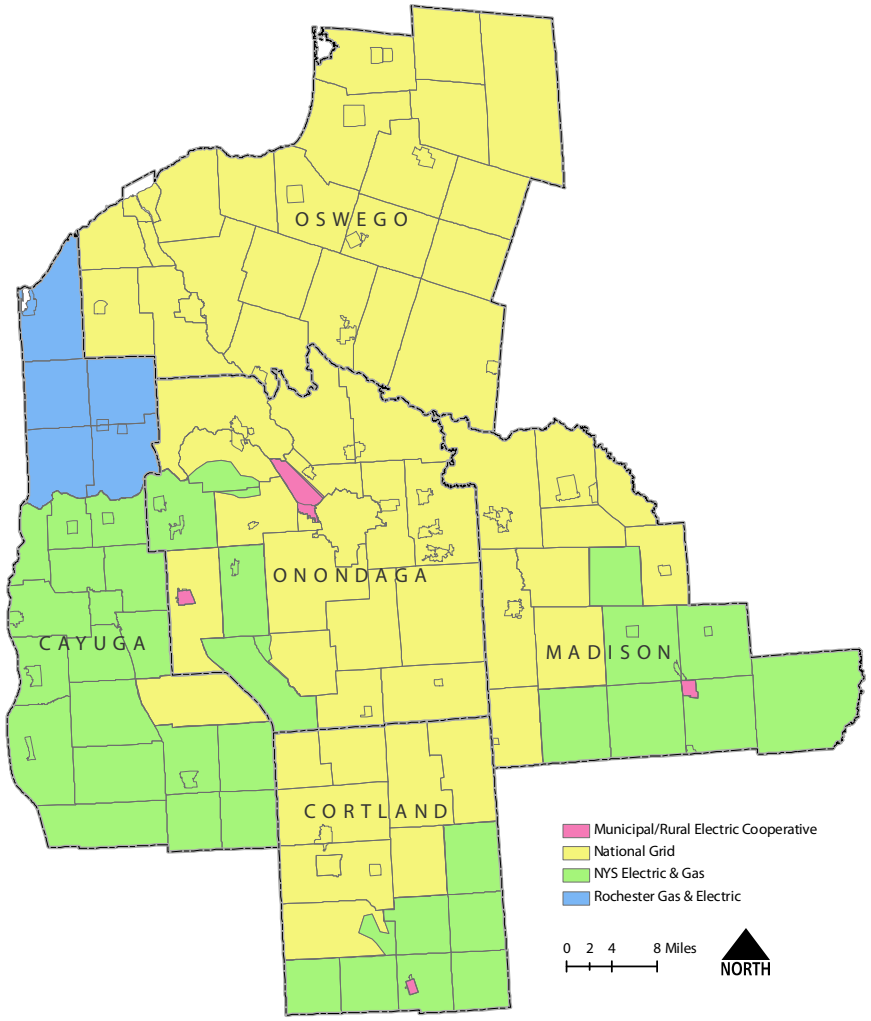
MAP 15–Central New York Power Plants and Transmission Lines



Source: CNY RPDB

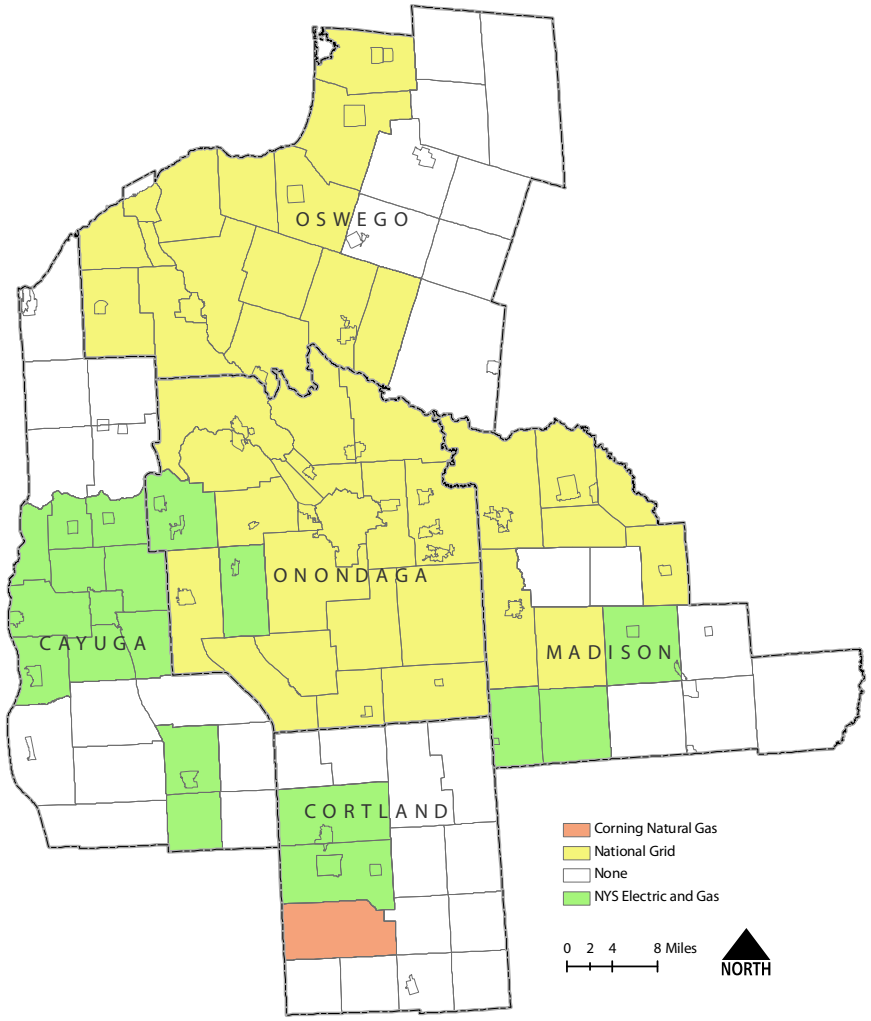
CNY ELECTRIC & GAS SERVICE TERRITORIES

MAP 16– Central New York Electric Service Territories



source: CNY RPDB

MAP 17–Central New York Gas Service Territories



source: CNY RPDB

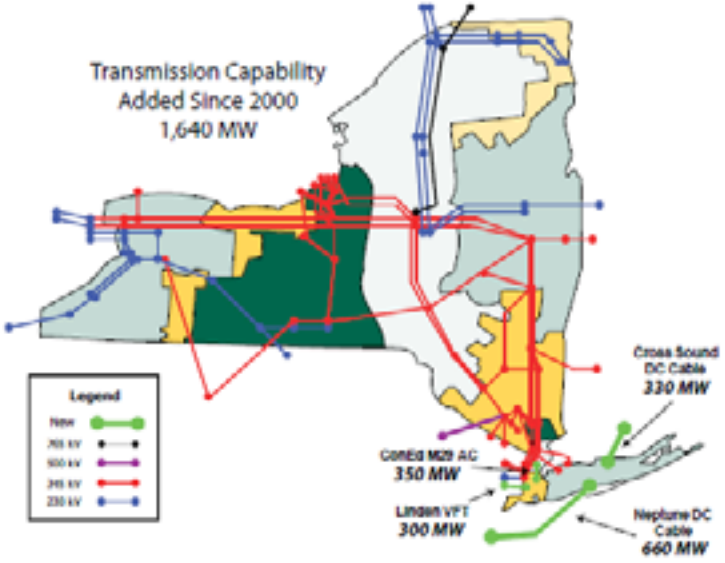
TABLE 33–Installed Capacity and Generation by County, 2010

	Cayuga	Cortland	Madison	Onondaga	Oswego	Total
Total Capacity (MW)	5.4		6.2	280.9	5,294.6	5,581.7
% of Total	0.1%	0.0%	0.1%	5.0%	94.9%	100.0%
Total Generation (GWh)	0.4		135.0	483.4	24,468.3	25,086.7
% of Total	0.0%	0.0%	0.5%	1.9%	97.5%	100.0%

Source: 2011 NYISO Gold Book

New York Power Authority (NYPA), New York State Electric and Gas Corporation (NYSEG), National Grid, Rochester Gas and Electric Corporation (RGE), and four municipal owned utilities. National Grid owns the majority of transmission lines in Oswego, Cortland, and Onondaga Counties, with the remainder serviced by NYSEG. Cayuga County is principally served by RGE and NYSEG. Madison County is serviced almost evenly by National Grid and NYSEG. Because transmission is quantified by NYISO zones which do not correspond to county lines, it is difficult to determine exactly how much transmission mileage is installed across the CNY region, but of the 11,500 miles across New York State, it is estimated that 720 of those miles (or 6.26%) are within CNY.

FIGURE 6–Transmission Capability Added Since 2000 in New York State 1,640 MW



The New York State Transmission Assessment and Reliability (STARS) report released on April 30, 2012 noted that the last major cross-state transmission project was built in the 1980s, and 85% of the state's transmission lines were built before 1980. It also concluded that nearly 4,700 miles of transmission, almost half of all circuit miles of 115/138kV lines and nearly three quarters of all 230 kV, will face the end of its useful life and may require replacement in the next 30 years. The STARS report highlights the location of the transmission infrastructure challenges (Figure 6). The STARS report also recommended the need to support local upgrades in support of wind generation to improve deliverability of energy from projects already under development.

Similarly, the capacity weighted age of generation in CNY is 30.2 years, which is significantly skewed since many of the larger capacity additions (nuclear and natural gas) were added in the last 30 to 40 years. Some of the region's oldest generation (hydroelectric) facilities are reaching 100 year milestones, although many have been rehabilitated during relicensing.

4. Telecommunications Services

CNY is well-served by the telecommunications industry (Map 18). Currently, there are four major incumbent local exchange carriers serving the region, led by Verizon. Numerous competitive carriers are also operating in the community. The area is served by several major network operations centers and fiber optic cabling is extensively deployed throughout the region, with heavy concentrations in the region's urban areas, intermediate population centers, and along major transportation corridors.

Fiber resources can also be found in selected rural parts of the region along routes which are used to connect various activity centers. Telecommunications carriers have developed 67 central offices[25] in CNY, strategically located throughout the region. A significant majority of these central offices are connected with fiber optic service. Wireless services are widely available in CNY through a network of over 600 registered cell tower locations. Satellite and microwave sys-

tems are also in operation in the region. The telecommunications services offered over these networks includes a full range of voice, video, and data transmissions utilizing such high bandwidth systems as ISAN, frame relay, digital subscriber line, DS1, DS3, SONET, and Ethernet technologies.[26]

The wire based and wireless services available in CNY are considered to be among the most advanced and desirable to the industry. A comprehensive array of telecommunications services and competition is widely available in the region. The telecommunications system in CNY is comparable to other major metropolitan areas in the United States and is a tremendous economic development resource for this region.

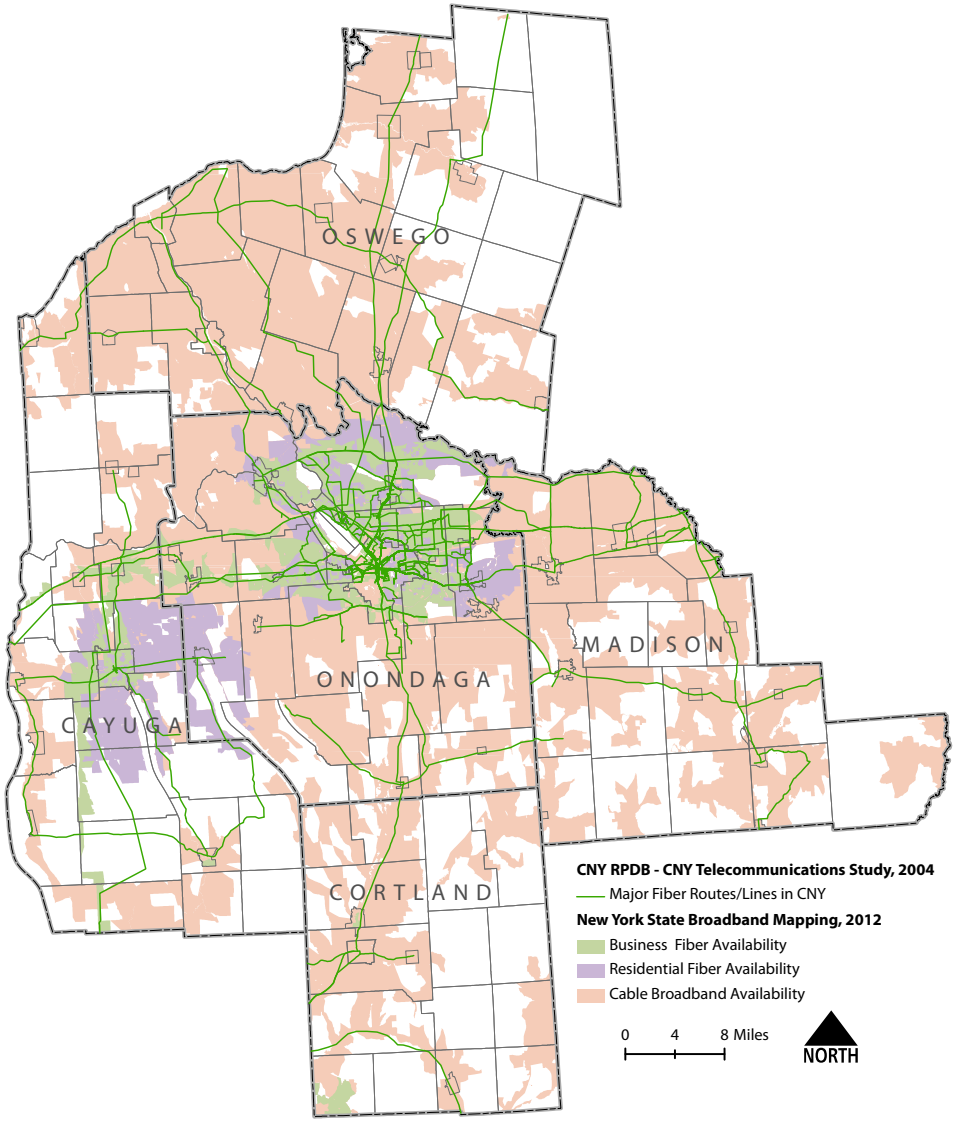
All telecommunications services require a certain amount of electronic bandwidth. Bandwidth is the combination of capacity and speed at which a signal is communicated across the network. Typically, voice transmissions require the least amount of bandwidth, then data, and then video. The type of signal transmission is based upon the equipment on the ends and everything in between.

Basic telecommunications services typically include such services as residential or business telephone lines, faxes, or dial up Internet access. These services generally operate over existing copper infrastructure and are widely available throughout rural and urban areas. The maximum transmission rate is 56kb/second which until the Internet wave of the 1990s took hold was considered sufficient capacity. The desire for increased Internet capacity and global economic competition has increased the dependence on higher capacity services.

High bandwidth (broadband) services, as defined by the FCC, are data communication services that support download transmission rates of at least 200kb/second. Telecommunications carriers provide high bandwidth services through a variety of systems. Most providers can offer T1, ISDN, Frame Relay and SONET services in the urban/suburban areas of the region.

CNY is primarily within the 315 area code and the Syracuse Local Access Transport Area (LATA), with the exception of Cortland County, which is in the Binghamton LATA's (607) area code. In addition to the traditional telephone companies serving the CNY region, there are many other local and long distance service providers, interconnect providers, Internet providers, wireless, and satellite service providers.

MAP 18–Telecommunications resources in CNY



source: NYS Broadband Study

Verizon has made a substantial investment in the region's infrastructure. Verizon's Network Operations Center in Syracuse, is a major node for interconnecting their CNY region with Western New York (Buffalo), Finger Lakes (Rochester), Southern Tier (Binghamton), and the Capital District (Albany).

Time Warner Communications also operates a major regional Network Operations Center in Syracuse. This Center interconnects and supports their operations in Western New York (Buffalo), Finger Lakes (Rochester), Southern Tier (Binghamton) and the Capital District (Albany). Time Warner currently provides broadband "Roadrunner" Internet access to businesses and residences in the region. By 2004, Time Warner also plans to make its telephone service "Line Runner" widely available directly competing with Verizon and other local telephone service providers.

Verizon Wireless, ATT, and Sprint PCS provide cellular and digital mobile services throughout the region. All three of these companies are making infrastructure upgrades from current 3G wireless networks to next generation 4G network technology. Satellite and microwave services are also operational throughout CNY, providing video as well as point to point high capacity private network services.

B. SUSTAINABLE FUTURE IN CENTRAL NEW YORK

1. Goal and Targets

In developing this Plan, stakeholders sought to capitalize on the region's strengths, identify a path to overcome the region's challenges, and seize the near-term opportunities and the longer-term potential that can be foreseen on the horizon by anticipating and tracking the trends and drivers of change affecting the region.

Central New York's road network is mature and few, if any, major expansions are expected over the next decades. At the same time, many of the region's roads and bridges are in need of improvement. To improve environmental, economic development and quality of life conditions for CNY residents and businesses, key investments are needed to maintain the region's transportation assets, to expand transit service, and to provide alternatives for moving people and goods by rail, walking and biking. Avoiding road expansions and extensions benefits rural areas by protecting open spaces, working farms, and the state's watersheds.

Similarly, the region is faced with aging wastewater and stormwater infrastructure but increasing expectations and requirements for environmental performance. Aging infrastructure causes extensive problems such as lost water, inflow and infiltration and, in some cases, sanitary sewer overflows. The average design life of sewer pipe is 50 to 70 years, and some systems within the region are approaching 100 years. Many wastewater treatment plants have reached or exceeded their expected useful life and therefore pose a threat to water quality.

Telecommunications infrastructure, specifically broadband networks, represents a powerful tool for economic development and an important opportunity for Central New York. Too many Central New Yorkers lack access to affordable broadband services.[27] Although New York's availability rate is approximately 96%, the number of New York citizens without access to high-speed Internet is more than the entire population of Vermont. New York State has a broadband adoption rate of 70%, which translates to 6.4 million people who cannot or do not subscribe to broadband. Approximately 67,500 in CNY do not have access to broadband with speeds higher than 6Mbps, and there are 31,750 people in CNY with no access to broadband. Many of New York's coverage gaps exist because of the costs associated with "last-mile" access. Simply put, providers generally have a presence in many New York unserved areas, but are unable to provide service to many New York residents due to the prohibitive costs of extending fiber to the home or business. This is especially true in rural areas, where housing densities are much lower. Most unserved citizens in Central New York live in small pockets such as those described above, which makes closing the availability gap a very challenging proposition.

The region's energy infrastructure is also aging, with the average life of the fleet of electric power plants at 30 years. More to the point, the three nuclear power facilities in Oswego County will be nearing the end of their expected useful life towards end of the VisionCNY Plan horizon in 2030. As described in Chapter 2: Energy Management, these facilities currently provide over 80% of the electricity generated in Central New York and four times what is consumed by residents and businesses in the region. It is critically important for the

region's stakeholders to carefully consider what types of investments will be needed to keep them in operation or, if they are to close, what energy sources will be available to replace these facilities. If they are to be replaced, and the region's energy infrastructure moves to a more decentralized network using renewable resources as called for in the VisionCNY Plan, attention must be paid beginning now to facilitate such a transition.

Over the next several decades, regional stakeholders will need to be much more strategic about how limited public dollars are spent on infrastructure. Fundamentally the region must continue to work together to protect and enhance existing historic assets and infrastructure, while making key investments in new technologies, thereby creating the foundation for a sustainable future. For example, a strategy that prioritizes investment in repair and maintenance rather than expansion of road networks can discourage the continuation of low-density development patterns. Past development patterns caused regions throughout Upstate New York to spend ever-increasing amounts on infrastructure and service extensions, adding increased fiscal burdens during a prolonged period of population decline. Improving the performance and energy efficiency of water and wastewater systems, extending the reach of broadband access, facilitating the transition to a new energy infrastructure based on renewable resources, and diversifying the transportation system in Central New York represent some of the biggest challenges and opportunities facing the region as it seeks to reduce greenhouse gas emissions and overall levels of pollution, provide sustainable economic development, and provide a world-class quality of life to attract and retain population and businesses.

Based upon public input and the information presented above, the planning team has established the following land use goal for Central New York:

GOAL: Provide infrastructure that reduces greenhouse gas emissions, revitalizes existing communities, improves the quality of life, strengthens targeted industry concentrations, and improves the region's competitiveness.
To achieve this goal, the following targets have been established for Central New York:

1) **Reduce the total vehicle miles traveled annually in the region by 25% by 2030.**

   Transportation makes up 43% of the greenhouse gas emissions in CNY. In 2009, the total vehicle miles traveled (VMT) was 7.96 billion miles. This represents an increase of 43% over the last twenty years, and residents of the Syracuse metro area drove more miles per capita than any other metro area in the state with the exception of the Capital District. Reducing the total vehicles miles traveled annually in the region by 25% by 2030 (to 5.97 billion miles) will make a significant impact in reaching the goal of reducing the regional greenhouse gas emissions per capita by 40% by 2030.

   Source: NYS DOT, SMTC and Central New York Regional Greenhouse Gas Inventory November 2012.

2) **Decrease the number of bridges and roads that are rated as "deficient" or "poor" by 25% by 2030.**

   The CNY road network is mature, with minimal new capacity projects and system additions in recent years. The majority of the money spent on the New York State Transportation Improvement Program (STIP) from the Federal Highway Administration is used for maintaining the road network. Currently in CNY, there are 19,000 bridges that are considered deficient and 709 miles of roads that are rated as poor in CNY. The goal is to decrease the number of bridges and roads that are rated as deficient or poor by 25% by 2030. As the region's annual VMT and commuting goals are achieved, the road and bridge goal will be more attainable. As fewer miles are traveled, and people choose alternate commuting modes, there will be less stress on the road network, and the updated roads and bridges will have a longer lifespan and be more sustainable.

   Source: NYS DOT and SMTC.

3) **Upgrade 25% of the region's water and wastewater treatment plants by 2030.**

   There are 43 wastewater treatment plants currently operating in CNY, with ages ranging from 8 to 88 years. Approximately 79% of

the wastewater treatment plants in CNY are over 30 years old and have reached or exceeded their expected useful life and therefore pose a threat to the quality of the waters they discharge into. The goal is to upgrade 25% (n=9) of the wastewater treatment plants in CNY by 2030. This will not only improve water quality and reduce the need for maintenance across the region, but it will also reduce energy consumption if the plants are updated with energy efficiency and renewable energy technologies in mind. There are various programs through NYSERDA and local utility companies that plants can take advantage of to improve energy efficiency.

Source: NYS DEC "Descriptive Data of Municipal Wastewater Treatment Plants in New York State."

4) Maintain the amount (no net decrease) of electric power production within the region that is derived from carbon-free sources.

Currently, about 15% of total electric power produced in CNY is derived from sources (natural gas facilities) that emit greenhouse gas pollution. Another 82% comes from the region's three nuclear energy facilities in the Town of Scriba in Oswego County that have no greenhouse gas emissions. The region's mix of relatively low-emissions sources of electricity generation contributes to its overall low per-capita greenhouse gas emissions (approximately 13 metric tons of CO2 equivalent per person) compared to the national average (approximately 22 metric tons of CO2 equivalent per person). Maintaining a low-emissions electricity production profile will be critical to meeting the target of reducing per capita greenhouse gas emissions by 40% by 2030.

Source: Energy Information Administration and NY Independent System Operator.

5) Increase the percentage of CNY residents with high-speed broadband service from 87% to 92% by 2030.

Central New York is relatively well served by the telecommunications industry, with heavy concentration in the region's urban areas, intermediate population centers, and along major transportation corridors. Fiber resources can also be found in selected rural parts of the region along routes which are used to connect various activity centers. About 87% of the CNY population, or 724,439 people, have access to high speed broadband. High speed broadband is broadband with speeds higher than 6Mbps. Moving forward, a target of increasing the percentage of residents in CNY with high speed broadband service to 92% by 2030 has been set. This expansion will take place in the rural areas that do not currently have access to high speed broadband.

Source: New York State Broadband Study 2008.

2. Strategies

Through group discussions with stakeholders, the planning team identified areas of key opportunities and challenges to achieving sustainable infrastructure in the region. After reviewing the goal, indicators and targets, and the key opportunities and challenges, a set of infrastructure strategies were identified for future implementation. Strategies were selected based on the contribution of each to advance the plan's overall infrastructure management goal and targets. In addition, strategies were evaluated for their overall benefits to the region, as well as the costs and feasibility for implementation.

In establishing an action plan for the region, these strategies were prioritized according to their readiness for implementation in the short-term opportunities or long-term initiatives, with short-term defined as 1-5 years and long-term defined as 5-10 years, as these opportunities may require additional time and effort to develop and implement.

Key strategies that have been identified to achieve the sustainable management of infrastructure resources include:

Short-Term Opportunities

a) Support a "fix-it-first" regional infrastructure policy

b) Encourage transit-oriented development and bus rapid transit service for priority corridors

c) Expand network of public transit park-and-ride facilities

Long-Term Initiatives

d) Develop a regional transportation demand management program

e) Develop "complete streets" to encourage walking and bicycling

f) Develop a network of CNG fueling stations and EV charging stations

g) Expand use of rail and barge systems in the region

h) Maintain a comprehensive water and wastewater infrastructure investment program

i) Develop safe and reliable energy production facilities and transmission resources that minimize greenhouse gas emissions

j) Expand the region's telecommunication broadband network

a) Support a "fix-it-first" regional infrastructure policy.

Central New York region's infrastructure is substantially mature, many infrastructure systems (i.e. roads and bridges, water and wastewater, as well as electrical transmission networks) have reached a point where substantial investments are required just to maintain the current level of service. Infrastructure systems have been expanded within the region over the past several decades in the face of a stable population base, placing added fiscal burdens on local governments. Local water and wastewater systems in the region require substantial investments in order to be considered in a state of good repair. A "fix-it-first" strategy will enable the region's historic centers to renew their infrastructure investments, support existing neighborhoods, at the same time, preventing further system expansions.

According to the American Association of State Highway and Transportation Officials (AASHTO), a dollar spent to keep a road in good condition avoids $6-14 later to rebuild the same road once it has deteriorated. In addition, poor roads add an average of $335 to the annual cost of owning a car due to damaged tires and suspensions and reduced fuel efficiency.[28] Prioritizing system preservation will save taxpayers hundreds of millions of dollars, while improving road and bridge conditions. The investment in maintaining infrastructure will also pay off in jobs. Numerous studies find that maintenance and repair creates even more jobs than building new roads. Sixteen percent more person-years of construction jobs are created for every dollar spent on fixing existing highways when compared to new road construction.[29]

The New York State Department of Transportation has incorporated a similar policy into its "Forward Four" strategies for a sustainable future, which identifies a "Preservation First" strategy focusing on "preventive, corrective, and demand work using Asset Management principles, and data driven decision making. A strategy that prioritizes investment in repair and maintenance rather than expansion of road networks and other supportive infrastructure can discourage the continuation of low-density development patterns. In an era of declining population, investments leading to expansion of water and sewer infrastructure should be extremely limited. The existing drinking water and wastewater systems could benefit from substantial upgrades that replace outmoded components, decrease system loss, improve water quality, improve energy efficiency, and seek to incorporate alternative energy production.

A regional strategy that prioritizes investment in repair and maintenance rather than expansion of road networks can discourage the continuation of low-density development patterns. Past development patterns caused regions throughout Central New York to spend ever-increasing amounts on infrastructure and service extensions, adding increased fiscal burdens during a prolonged period of population decline. Avoiding road expansions and extensions benefits rural areas by protecting open spaces, working farms, and the state's watersheds. In addition, a comprehensive asset management program which utilizes geographic information systems (GIS), and other tools including relational-database management, advanced financial analysis and optimization tools, combined with innovative data-collection technologies and increased computational power will enable public works asset managers to gain better understanding of infrastructure performance and the public's demand and expectations for its infrastructure. As a general construct, an integrated infrastructure-asset management system (IIMS) has five principal stages: data collection and analysis, performance modeling, scenario and management-policy generation, decision analysis, and management reporting. The system will serve decision makers at all levels:—policy development, in-

frastructure-system administration, and operations management, including the public at large who are the infrastructure's owners.

The VisionCNY Plan recommends that regional stakeholders including water utilities and asset managers collaborate to explore opportunities to implement this strategy. Major players in this effort include NYS DOT, NYS DEC, NYS EFC, Thruway Authority, Onondaga County, Onondaga County Water Authority, and the Metropolitan Water Board.

b) Encourage transit-oriented development and bus rapid transit service for priority corridors.

Public transit facilitates greater job density, knowledge agglomeration and the exchange of ideas — which can spur innovation. In knowledge-based industries, the per-capita invention rate or "patent intensity" of an urban region is positively correlated to the density of employment. Studies show that walkable places with urban character attract younger "knowledge talent," and that jobs near transit are more accessible to the increasing population of people in their twenties who are "transit-dependent by choice." National travel data from 2009 shows this age group drives an average of 7.7% fewer miles per year than the same age group did a decade ago, even as driving increased overall. Some jobs are more transit-oriented than others — including jobs in professional, scientific and technical services, and the financial and insurance industries. Economic and land use policies and investments can be used to encourage these sectors to locate near transit instead of in auto-dependent places, which will help foster sustainable growth.[30]

The Central New York Regional Planning and Development Board conducted an analysis of regional population density combined with jobs per acre to determine areas in the region where increased transit service might be viable (a minimum threshold of 10-25 Persons and Jobs/acre is considered appropriate for enhanced service) (page 100 and page 101). These areas were then further analyzed to identify potential service nodes that could serve as transit nodes. The core of the City of Syracuse exhibits the highest densities in the region – most notably the corridor from University Hill to the Destiny USA regional shopping center and the James Street Corridor (which has the highest transit ridership in the region). Additionally the NYS Route 11 corridor north of Syracuse, Route 57 through Liverpool, the NYS Route 5 corridor east and west, as well as the NYS Route 104 Corridor in Oswego (Figure 15) serve as potential examples. Multimodal corridor projects that incorporate a complete street approach to integrating roadway improvements, commercial and housing redevelopment, and transit system expansion along these corridors can have a positive effect on mobility while reducing the length of trips and limiting the need for new roads. This strategy can reduce congestion at major choke points and intersections, and improve multimodal choice within and between neighborhoods.

Multimodal corridor strategies identify an interconnected system of projects that can be implemented incrementally over time as funding is available. For example, new parallel road networks can be built by developers as part of redeveloping aging shopping centers. Limited public funding can be targeted toward connecting the dots of this private investment, with a transit-ready development approach to support improved transit service over time. Corridor strategies should incorporate complete streets strategies that make it possible for Central New Yorkers to drive less and use the region's streets to get around more easily on foot, bike, and public transit. The 2001 National Household Transportation Survey found that 50% of all trips in metropolitan areas are three miles or less and 28% of all metropolitan trips are one mile or less – distances easily traversed by foot or bicycle. Yet 65% of trips under one mile are now made by automobile,[31] in part because of incomplete streets that make it dangerous or unpleasant to walk, bicycle, or take transit. Complete streets would help convert many of these short automobile trips to multi-modal travel. Other studies have calculated that 5%–10% of urban automobile trips can reasonably be shifted to non-motorized transport.[32]

Places that are giving people options are seeing a reduction in their emissions. Boulder, Colorado is working to create a complete street network, with over 350 miles of dedicated bike facilities, paved shoulders and a comprehensive transit network. Between 1990 and 2003, fewer people in the city drove alone, more people bicycled, and transit trips grew by a staggering 500%. One approach to establishing complete streets that is becoming more popular in the U.S. is a "Road Diet." Essentially, a road diet reduces and/or reconfigures lanes in an effort to incorporate bike lanes and instill traffic calming measures. This approach has been utilized in a few instances within the City of Syracuse including East Genesee

Street between East Avenue and the eastern City line. The number of travel lanes was reduced from two in each direction to one in each direction with a center turn lane, and bicycle lanes were added. The City of Syracuse has implemented road diets in other locations (West Fayette Street and North Salina Street) and is currently reviewing the possibility of adopting road diets along other corridors. A study was completed in 2012 looking at the potential for completing a Road Diet along the James Street corridor from downtown Syracuse to the city line.

BRT is an innovative, high capacity, lower cost public transit solution that can significantly improve urban mobility. This permanent, integrated system uses buses or specialized vehicles on roadways or dedicated lanes to quickly and efficiently transport passengers to their destinations, while offering the flexibility to meet transit demand. BRT systems can easily be customized to community needs and incorporate state-of-the-art, low-cost technologies that result in more passengers and less congestion. BRT should be evaluated as a service option for developing high-capacity transit routes within CNY. Additionally, Centro has been piloting "Bus Time" LED signs along the Connective Corridor route; each sign provides visual and audible information on the arrival time of the next scheduled bus. Real Time bus signage systems have demonstrated success in increasing ridership for transit systems in Chicago, New York City, Chattanooga, TN and Richmond, VA.

According to a 2002 study by the California Department of Transportation, TOD has the potential to reduce annual greenhouse gas emissions by 2.5 to 3.7 tons per year for each household. In 2010, CTOD found that in the Chicago metropolitan region, the transportation-related GHG emissions of households within one-half mile of fixed-guideway public transportation are 43% lower than the regional average, and that the emissions of households located in central business districts — which typically have the highest concentration of transit, jobs, housing, shopping and other destinations — are 78% lower than regional averages. Moreover, money that households around stations would have spent on owning and maintaining one or more cars can be spent on consumer purchases instead, thereby boosting investment in the local economy. The nonprofit organization CEOs for Cities estimates that the 2 million people who live in the Portland, Oregon, region save a total of $1.1 billion a year by commuting 4 less miles per day than

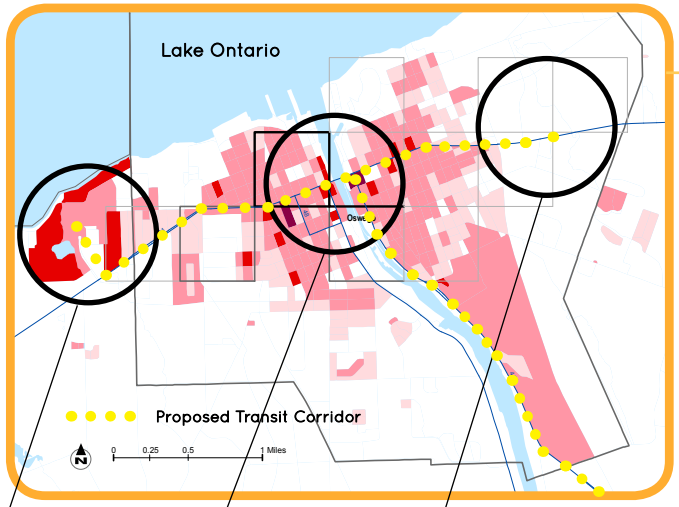
BUS RAPID TRANSIT



The Capital District Transportation Authority (CDTA) implemented a new limited stop bus service along the 17-mile stretch of Route 5 between downtown Albany and downtown Schenectady in April of 2011. The new service, called BusPlus, is the CDTA's version of Bus Rapid Transit (BRT) combining the benefits of commuter rail with the flexibility and cost advantages of buses. BusPlus ridership increased 25% and overall ridership on the Route 5 corridor increased by 13% in the first year of operation. BusPlus averages between 12,000 and 13,000 rides each weekday and connects with 30 other routes within the CDTA transportation network. The Route 5 corridor is the beginning of 40 miles of planned BRT service within the Capital Region.

TOD CORRIDOR ANALYSIS

FIGURE 7—City of Oswego Route 104 Transit Corridor



SUNY OSWEGO

The SUNY Oswego campus houses 6,000 full and part-time students and 1,000 faculty members

DOWNTOWN OSWEGO

The Stevedore lofts are located along the Oswego River in the city of Oswego. The project includes 49 loft apartments and 6,000 square feet of class-a commercial office space.

104 EAST SHOPPING DISTRICT

The shopping district at the eastern edge of Oswego contains multiple big-box retail stores that serve the residents of greater Oswego. This area could become a transit anchor.

The City of Oswego exhibits potential for enhanced service along the NYS Route 104 corridor that runs East to West through the city. This corridor connects the SUNY Oswego campus, Downtown Oswego, and the 104 East Shopping district.

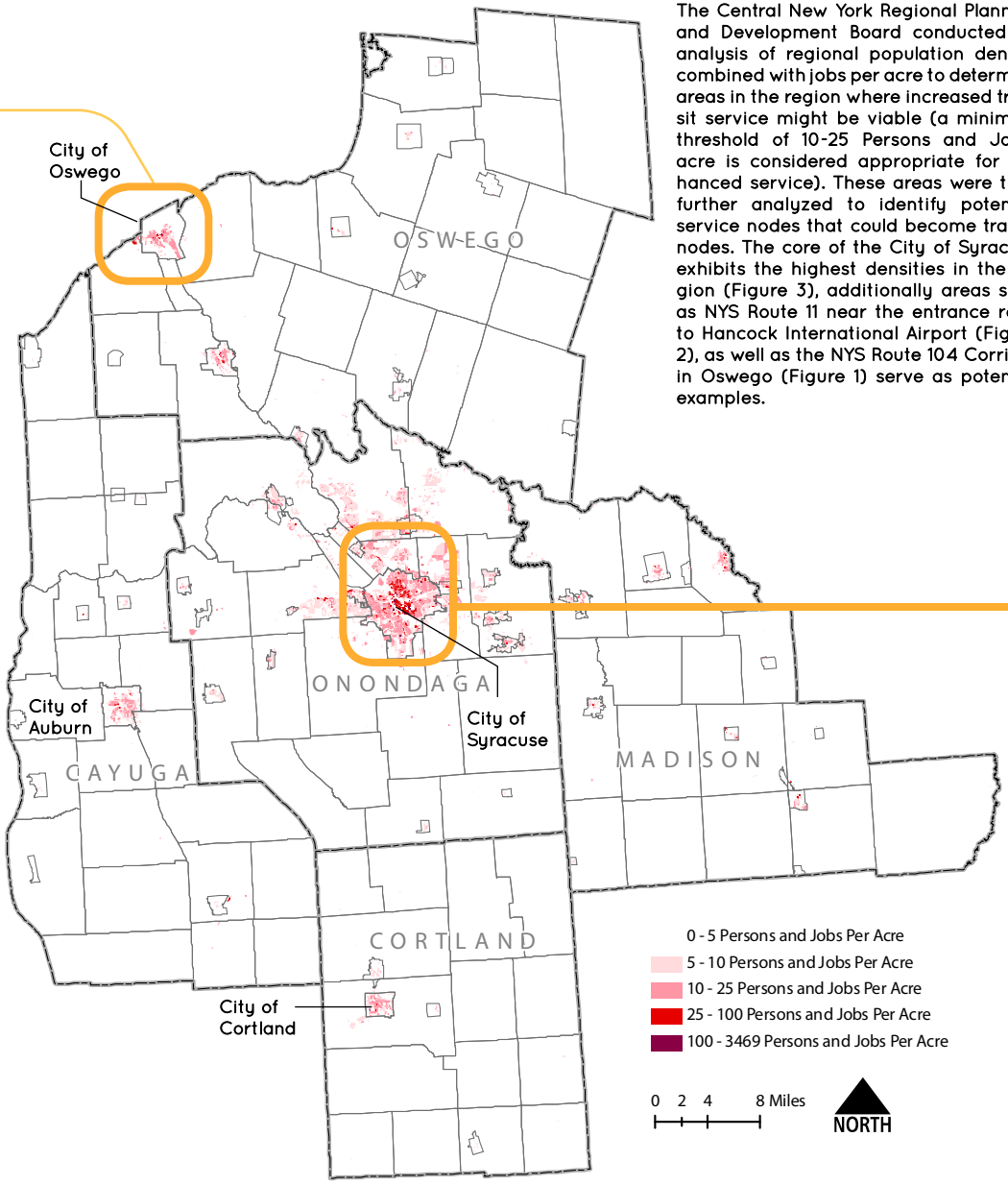
The City's Vision 2020 Vision Plan identifies the importance of the Route 104 corridor for the future growth and development of the city.

Oswego is currently pursuing a study of the Route 104 corridor that would identify design strategies for implementing a complete streets strategy along the corridor that would improve pedestrian and bicycle mobility, as well as enhance the transit service currently operated by Centro.

Combined with an updated wayfinding program the City of Oswego could become a model for small cities of how to incorporate alternative transportation mobility.

MAP 19—Regional Jobs and Persons per Acre Analysis

The Central New York Regional Planning and Development Board conducted an analysis of regional population density combined with jobs per acre to determine areas in the region where increased transit service might be viable (a minimum threshold of 10-25 Persons and Jobs/acre is considered appropriate for enhanced service). These areas were then further analyzed to identify potential service nodes that could become transit nodes. The core of the City of Syracuse exhibits the highest densities in the region (Figure 3), additionally areas such as NYS Route 11 near the entrance road to Hancock International Airport (Figure 2), as well as the NYS Route 104 Corridor in Oswego (Figure 1) serve as potential examples.



NOTE:
The analysis included the identification of potential service nodes by selecting service oriented land uses (i.e. grocery stores, retail, coffee shops) within a 1/4 mile grid overlay. The legend below depicts those nodes that exhibit the highest concentration of services.

- 5 - 9 Community Services
- 10 - 14 Community Services
- 15 - 31 Community Services
- Proposed Transit Corridor

Driver's Village
North Syracuse
Village of Liverpool
Liverpool
Mattydale
Onondaga Lake
Carrier Circle
Eastwood
East Syracuse
Solvay
Shoppingtown Mall
Wegmans DeWitt
Widewaters Office Park
Syracuse
0 0.5 1 2 Miles

FIGURE 8—Transit Node Concept

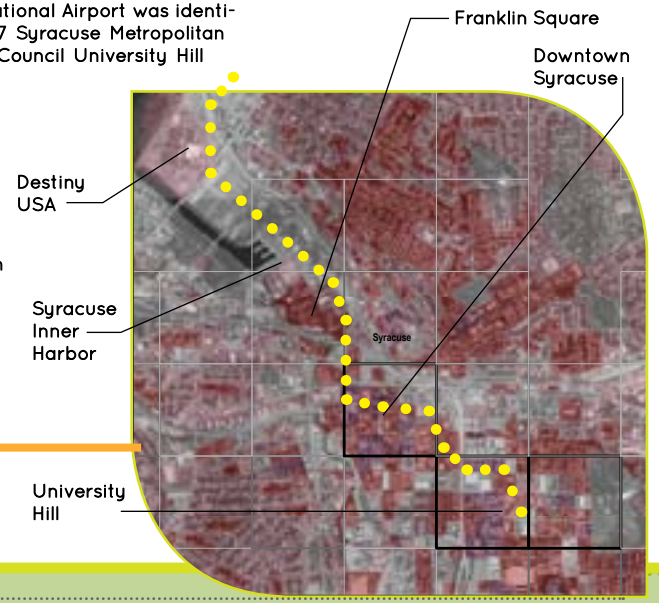
The section of NYS Route 11 between Interstate 81 and Taft Road presents the opportunity for a transit node that would incorporate mixed use development, walkability, and an improved relationship with the entrance to Hancock International Airport.





FIGURE 9—Downtown Syracuse Transit Corridor

An enhanced transit service corridor connecting University Hill, Downtown Syracuse, Destiny USA, and Hancock International Airport was identified in the 2007 Syracuse Metropolitan Transportation Council University Hill Study.



the national average of 24.3 miles. While most of the money spent on cars and gasoline travels out of the state, this transportation savings can be spent in restaurants or on homes or other purchases that have a multiplier effect in the local economy.

The VisionCNY Plan recommends that regional stakeholders including Centro, local governments, the SMTC, colleges and universities, major employers such as hospitals, and other businesses collaborate to identify ways to implement this strategy. First steps may include further analysis of likely corridors, identification of possible locations for TOD investments, and measurement of consumer demand for such services.

c) Expand network of public transit park-and-ride facilities.

Due to the decentralized nature of the residential populations of Central New York in relation to major employment centers (often located in the historic core cities of the region), it is difficult to provide adequate transit service. The majority of Centro's most active routes are located within the city of Syracuse where population densities are highest. At the same time Centro has demonstrated success in developing ridership for destination events like the New York State Fair (this 12 day service represents approximately 7% of Centro's annual ridership), Oswego's Harborfest Celebration, and Syracuse University sporting events. This past year Centro saw a 13% increase in ridership during the NYS Fair, representing over 270,000 riders (or 7% of Centro's annual ridership total). Centro has expressed interest in developing an expanded network of visible park and ride lots for commuters, combined with transit service enhancements to facilitate movement from suburban townships to employment centers throughout the region. Following the successful model of the Fair with predictable, frequent service, it may be possible to consolidate Centro's suburban routes to designated Park and ride facilities that can be co-located along major commuter routes with existing service destinations (e.g. big box stores, suburban malls, etc.). Providing a safe, reliable, and predictable public transit environment has been demonstrated to improve transit ridership throughout the U.S.

Because a regional network of transit-oriented destinations enables people to drive less and produce less GHG emissions, regions and cities increasingly view coordinated transportation and land use strategies as essential components of an effective climate action plan (Figure 3). For this reason, some MPOs support station area plans and development to reduce GHG emissions. For example, in Atlanta, local governments can apply for grants from the Atlanta Regional Council's Livable Centers Initiative to complete station areas plans, and then apply for capital funding to implement their plans. As of 2009, 34 station area plans had been adopted and will reduce greenhouse gas emissions in all but one station area. As the success of the newly opened Centro Transit Hub demonstrates, investment in actual "station" locations can help to enhance the overall usability of Centro's system.

The VisionCNY Plan recommends that regional stakeholders including Centro, local governments, the SMTC, colleges and universities, major employers such as hospitals, and other businesses collaborate to identify ways to implement this strategy. First steps may include further analysis of likely corridors, identification of possible locations for park-and-ride facilities, and measurement of consumer demand for such facilities.

d) Develop a regional transportation demand management program.

Transportation Demand Management (TDM) is defined as a wide range of policies, programs, services and products that affect whether, why, where and how people travel. TDM programs and strategies are meant to encourage greater use of sustainable modes of transportation and trip decision making that reduces, combines or shortens vehicle trips. A study completed in 2011 for Downtown Syracuse identified potential strategies for reducing VMT including the following: coordinate with NYSDOT to utilize its carpool matching website, create a guaranteed ride home program, identify and promote careshare opportunities, advocate for transportation system improvements, and develop a bike parking system.

The study concluded that some of the necessary elements for successful TDM programs do not currently exist as a whole in Downtown Syracuse. Traffic congestion, for example, is not a problem in downtown, while parking availability can be an issue in certain areas. While overall traffic congestion was not identified as

an issue, the study did recommend working with larger employers (i.e. St. Joseph's Hospital, SUNY Upstate, and Syracuse University) to develop strategies to reduce parking demand.

Carsharing and ridesharing can reduce GHGs. Providing on-demand vehicle access to people who can make most trips without a car reduces the likelihood that they will purchase one, which in turn reduces their vehicle-miles traveled and the associated emissions. One-way carsharing enables members to leave the shared vehicle at a location different from where they picked it up. Peer-to-peer carsharing, in which individual car-owners lend their cars to members of the peer-to-peer network, eliminates the need for centralized carsharing locations, facilitating penetration into suburban markets, and expanding urban markets. Growth in the popularity of collaborative consumption, which utilizes sharing, trading, and renting instead of ownership, is also facilitating growth in carsharing. Similarly, new technologies have increased the appeal of public bikesharing programs and made them more cost-effective and easier to manage.[33]

Pilot programs have propelled rapid growth in carsharing and bikesharing programs. One exemplary bikesharing program is "Denver B-Cycle," which began in 2007 and has grown to 52 stations with 520 bikes supported by government and foundation grants, corporate subsidies, and user fees. New and innovative carsharing programs are being piloted, such as "car2go's" one-way carsharing service. At present, there are eight peer-to-peer carsharing programs operating in the U.S., with three operating in the pilot phase. Finally, formal linkages between bikesharing and carsharing are planned to launch in Buffalo and San Francisco in 2012.

CNY colleges and universities such as SUNY-ESF are actively exploring bikesharing programs and many participate in carsharing programs such as ZipCar. The VisionCNY Plan recommends that regional stakeholders, particularly local governments, colleges and universities, non-profit and neighborhood organizations and businesses consider ways to implement programs with a focus on larger population centers and communities with significant concentrations of students and other groups who are likely to participate in such initiatives.

e) Develop "complete streets" to encourage walking and bicycling.

A complete street may include: sidewalks, bike lanes (or wide paved shoulders), special bus lanes, comfortable and accessible public transportation stops, frequent and safe crossing opportunities, median islands, accessible pedestrian signals, curb extensions, narrower travel lanes, roundabouts, and more.

Strategies geared towards reducing vehicular trips can have a positive impact on reducing region-wide emissions, and the Intergovernmental Panel on Climate Change (IPCC) recommends modal shifts from driving to walking and bicycling as a key mitigation strategy.[34] Reducing vehicle miles traveled by increasing active forms of transportation, such as walking and bicycling can also produce significant economic benefits. Similarly, evidence is increasingly emerging of the health benefits of reducing vehicle miles traveled, both in terms of improved air quality and increased levels of physical activity. Less vehicular travel places less stress on the regions road network as well.

At this time the transportation infrastructure in Central New York is not diverse enough to accommodate an increase in pedestrians, bicyclists, and transit users. According to data from the 2010 U.S. Census, less than 5% of total commuting trips within Central New York occur by cycling and walking combined, with an additional 2% of trips via public transportation. Many trips are made by automobile because of incomplete streets that make it dangerous or unpleasant to walk, bicycle, or take transit. In fact, a national survey found that bike lanes were available for less than 5% of bicycle trips, and more than one-quarter of pedestrian trips were taking place on roads with neither sidewalks nor shoulders.[35] Other surveys have found that a lack of sidewalks and safe places to bike are a primary reason people give when asked why they don't walk or bicycle more.[36]

At the same time, the historic development patterns of villages and cities within Central New York are conducive to pedestrian and bicycle mobility. Traditional street grids intermingled with an organic web of roads help to create a pattern of relatively short blocks that make it easy to navigate on foot between multiple destina-

tions. Known as connectivity, these road systems have many short links, numerous intersections, and minimal dead-ends which allows for more direct routes between destinations. Based on these existing patterns the region can employ strategies that would combine to reduce overall VMT and facilitate the utilization of alternative transportation including the implementation of "Complete Streets" and the development of "Safe Routes to School."

Complete Streets are essential in order to make it possible for Central New Yorkers to drive less and use our streets to get around more easily on foot, bike, and public transit. The 2001 National Household Transportation Survey found that 50% of all trips in metropolitan areas are three miles or less and 28% of all metropolitan trips are one mile or less – distances easily traversed by foot or bicycle. Yet 65% of trips under one mile are now made by automobile,[31] in part because of incomplete streets that make it dangerous or unpleasant to walk, bicycle, or take transit. Complete streets would help convert many of these short automobile trips to multi-modal travel. Other studies have calculated that 5%–10% of urban automobile trips can reasonably be shifted to non-motorized transport.[32]

A recent national push for Complete Streets and the development of Complete Streets policies has also been gaining momentum locally. Recently the Onondaga County Health Department was awarded the "Creating Healthy Places to Live, Work, and Play" grant by the New York State Department of Health. The goal of the grant is to prevent obesity, type 2 diabetes, and other chronic diseases in Onondaga County by implementing sustainable policies, systems, and environmental changes in communities where people live, work and play. One of Onondaga County's objectives through this grant is to work on Complete Streets policies and/or legislation, and to promote bicycling and walking within Onondaga County.

New York State has adopted a Complete Streets policy to improve the conditions that allow people to feel comfortable walking and bicycling on roads. Some municipalities such as the City of Syracuse are implementing "road diets" and other traffic-calming measures to reduce vehicular speeds and are increasing the number of dedicated bicycle lanes. While communities outside of the City of Syracuse exhibit a lack of dedicated bicycle infrastructure, the prevalence of university or college towns within the region provides on impetus for the further development of linkages between campus and community through improvements to bicycle, pedestrian, and transit infrastructure. New York State Route 104 through the City of Oswego linking SUNY Oswego to downtown Oswego to the retail center east of the Oswego downtown is just one example. Other communities are looking at measures to implement "Safe Routes to School" so that children can walk to school. In addition to extending pedestrian trail networks, as described in Chapter 4: Land Use, these measures are critical to improving quality of life and to reducing greenhouse gas emissions in the region's communities and should be pursued further by local government in cooperation with NYS DOT and the SMTC (for municipalities within the MPA).

f) Develop a network of EV charging stations and municipal CNG fueling stations.

While the vehicle mix of the future will depend on a variety of factors beyond the region's control, there are a number of actions that can be taken now to support new technologies. One of the most promising technologies is electric vehicles. Electric vehicles are propelled by an electric motor (or motors) powered by rechargeable battery packs, instead of a gasoline engine. Unlike hybrid vehicles, the electric vehicle is powered exclusively by electricity, rather than being partially powered by gasoline. Electric cars are able to produce an approximate driving range of 100 miles before needing to be to be recharged and produce no tailpipe emissions. They also have substantially lower energy costs, while gasoline costs about 12 cents or more per mile driven, electric vehicles may have an energy cost as low as 2 cents per mile driven.

While some obstacles to greater EV penetration such as the bulk, weight and cost of batteries are beyond the influence of regional stakeholders, one of the key actions that can be taken at the local and regional level is the development of electric vehicle supply equipment (EVSE), particularly publicly accessible charging stations. Access to conveniently located charging stations is critical to addressing the "range anxiety" that current or prospective EV owners may face. As Level III or so-called "Quick Charging" sta-

tions, which are capable of adding 50 to 60 miles of driving range in about 15 to 20 minutes, become more available, EV drivers will become more comfortable and more dependent on public charging as opposed to charging at home. Already, with limited availability of Level III stations, the U.S. DOE-sponsored EV Project, which tracks the electric car driving and charging patterns of 6,300 EV drivers, recently reported that in the third quarter of 2012 Nissan Leaf owners did only 67% of their charging at home, down 11% from the 78% of home charging that took place earlier in 2012. The EV Project further reported a 20% increase in average charge times, suggesting trip distances are growing.

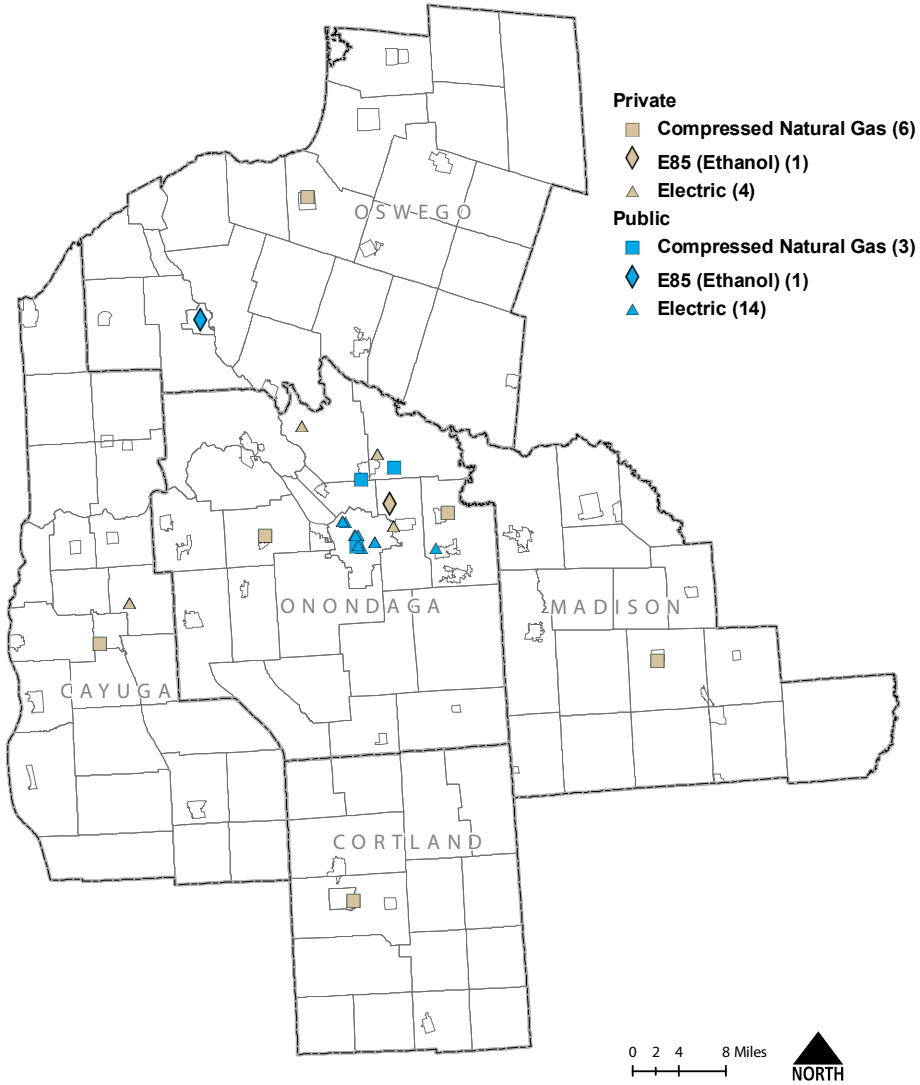
While there are only about 30 all-electric or plug-in electric hybrid cars registered in Central New York as of June 2012 and only 962 statewide according to the NYS Department of Motor Vehicles, the market for EVs is growing with 5,909 sold in September 2012, up from 1,754 sold in September 2011. Over 25,000 were sold in the first eight months of 2012, greater than the number of hybrid electric vehicles sold in all of 2001, the second year in which they were widely available.[37] Nissan recently announced that the retail price of the Leaf will drop by nearly 20%, which may lead to increased sales in 2013. There are currently about 800 installed or planned electrified parking spaces in the state. Central New York already enjoys a relatively high concentration of electric vehicle charging stations as a result of the project funded by the American Recovery and Reinvestment Act (ARRA) and administered by Synapse Sustainability Trust, which resulted in the installation of 62 electric car charging units throughout CNY. As part of the state's Charge NY initiative, NYSERDA awarded $3.6 million in April 2013 to install more than 260 EV charging stations across the state. By 2018, the Charge NY initiative aims to create a statewide network of 3,000 public and workplace charging stations to support up to 40,000 plug-in vehicles on the road. This state leadership provides Central New York with an opportunity to build momentum and should be pursued further.

Moving forward, the region should focus on installing EVSE in places with high visibility, increasing usage by current EV owners, and persuading potential owners that there are sufficient public charging opportunities, even if that owner may not use the public EVSE in question. Ideal locations for installation of EVSEs include office buildings or parks because of consistent patterns and long dwell times, government or public facilities such as commuter lots, airports, and parks because of the leadership and public demonstration effect, colleges and universities because of the higher educational attainment of likely EV owners, and retail and leisure destinations such as hotels because of the marketing opportunity to draw in potential customers or extend their stay.



Level II EV Charging Station, Syracuse, NY

MAP 20–Locations of Alternative Fueling Stations in CNY



Source: CNY RPDB

The region stands to benefit greatly from the widespread adoption of EVs, including lower costs of ownership and reduction of greenhouse gas emissions. According to a recent report from the Union of Concerned Scientists, EVs cost much less to fuel than internal combustion engines (ICEs), with a typical Nissan Leaf owner saving nearly $13,000 over the life of the vehicle compared with an owner of a gasoline-powered car that achieves 27 mpg. While EV driving does move pollution to the point of energy generation, ICEs would need to achieve at least 115 mpg in Central New York to achieve a GHG emission level equivalent to that of a BEV, due to the relatively low carbon content of the region's electricity grid.[38] Even larger emissions reductions can be achieved when EVSE is powered by renewable sources of electricity generation such as solar PV, as has been proposed in the Village of Skaneateles for its new village hall.

It is recommended that the region prepare a feasibility study to examine to ways that the City of Syracuse and other municipalities can support and promote the use of EVs. This Electric Vehicle Feasibility Study should aim to identify what actions must be taken to make the region "EV Ready" including both policy and charging station location recommendations. It should also include information on EV use and demand, existing charging infrastructure, best practices on becoming an EV Ready city, and a checklist for EV readiness. The City of Albany, as part of its overall sustainability planning efforts, recently completed such a study with support from NYSERDA and NYS DOT.

Additionally municipalities and regional businesses can invest in CNG fueling stations for utilization of municipal fleets. If upfront investments in fueling station infrastructure and vehicle conversions are undertaken, significant long-term cost savings can be realized.

g) Expand use of rail and barge systems in the region.

CNY is a transportation hub within New York State and offers easy transfer points between road transport, rail, air, and water. The region can continue to explore techniques to encourage shippers to use rail and water for their shipping needs. Efforts to expand inland port opportunities are underway and should be supported

HIGH SPEED RAIL

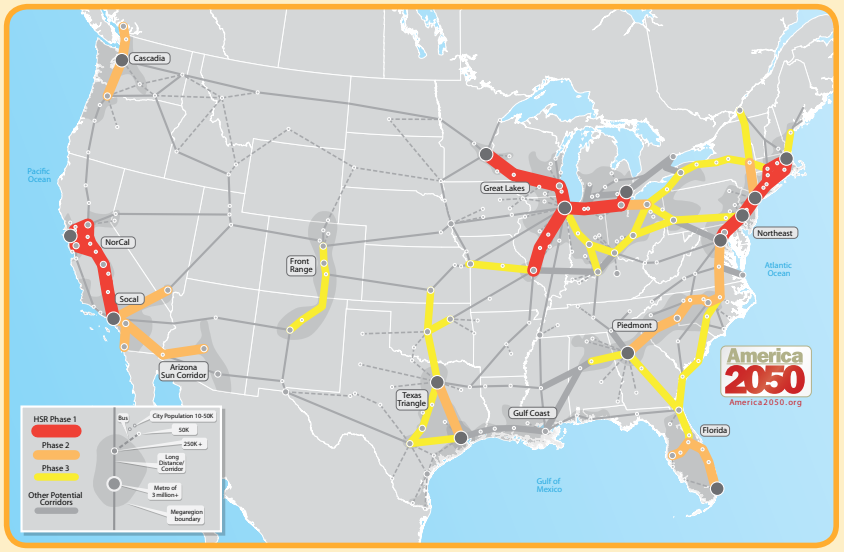
The preliminary findings from a market analysis and ridership forecast conducted by New York State have indicated that a market clearly exists for enhanced passenger rail service on the Empire Corridor. The analysis determined that under a 110 mph scenario annual boardings in Syracuse would more than triple by 2035, and under the 125 mph scenario would increase by 20 times.[39]

NYS is currently developing a Tier 1 Environmental Impact Statement (EIS) for the Empire Corridor to evaluate the potential benefits and impacts of investments in improving rail speeds to a minimum of 110 mph along the corridor. As part of the alternatives analysis the project team is evaluating impacts to the natural and man-made environment. The results of this analysis will be documented in the Tier 1 EIS. The project team has documented the existing conditions identifying the resources that could be impacted by the alternatives (acres of wetlands, locations of parks, or community facilities, etc.) along the corridor. The Tier 1 EIS focuses on a high level constraints analysis, identifying potential areas for detailed evaluation in the Tier 2 analyses.

The Buffalo to New York City Empire Corridor was recently ranked 11th out of the top 17 corridors in the northeast for its potential to support high speed rail. With a length of 439 miles and an employment base of 18.2 million people within 25 miles of major nodes (i.e. potential station centers), this corridor is competitive with many nationwide. The Albany to NYC leg of the Empire is characterized as the highest performing rail corridor off of the mainline routes on the eastern seaboard, and outranks most other corridors around the U.S.

FIGURE 10—America 2050 Proposed Trans-American Rail Network

America 2050's High-Speed Rail Phasing map illustrates the results from the "Where High-Speed Rail Works Best" analysis as well as taking into account the current state of rail planning across the united states. It prioritizes the connection of major metropolitan centers within 500 miles with high levels of economic activity and integration.



as ways to reduce emissions related to trucking, further examination of the existing freight rail infrastructure to assess possibilities for increasing the proportion of goods transported by rail could be undertaken. Additionally, support for efforts to introduce high-speed rail to the region are important both for improving connections to the thriving downstate economy, and reducing overall emissions by transferring air and automobile trips to rail (a lower emissions mode).

Work is underway throughout the region to improve rail access at commercial sites, as well as to provide intermodal connections between rail, truck, and water transportation. One of the most significant projects is the planned CSX intermodal rail project to be located in the towns of DeWitt and Manlius. The project is, in part, in response to the "inland port" initiative that was announced by the Port Authority of New York and New Jersey several years ago. The effort is also designed to capitalize on the opportunities which communities on the east coast may realize from the expansion of the Panama Canal and the related increase in import and export

traffic which may result from the shift of cargo away from West coast ports in favor of lower cost ocean transport offered by an all-water routing to ports such as NY/NJ. Bigger locks currently under construction will open the Panama Canal to ships with nearly three times the capacity. The larger ships will overwhelm the handling capacity of ports like the port of NY/NJ, which will create opportunities for inland ports to process imports and exports.

Water borne commercial shipping is 300% more energy efficient than moving freight by truck, and also uses less fuel than trains.[40] The Army Corps of Engineers and the EPA found, in separate studies, that commercial marine navigation has a relatively minor effect on air quality. A study by Canadian National Railways showed that barges produce 33% less pollution than diesel trains and 373% less pollution than trucks. The strategic location of the Port of Oswego along the Great Lakes and with access to the NYS Barge Canal system, as well as Rail is an important aspect of regional sustainability. The Port has been pursuing projects to improve the overall sustainability of its operations including portside electrification, and the installation of a solar photovoltaic system. Additionally, as the enlargement of the Panama Canal is set to open in 2015, the addition of container handling equipment will become more important.[41]

In recent years local roads in the CNY region have been inundated with truck traffic transporting landfill waste from NYC to the Seneca Meadows Landfill. Available landfill space exists at Seneca Meadows less than a mile from the Canal, the entire trip could be made by barge from NYC. Water transport is the safest mode of surface transportation, exhibiting the fewest number of incidents, fatalities and injuries. It is also a gentle mode, absent the shocks and vibrations common with wheeled travel. According to US Coast Guard statistics, water vessels have fewer accidental spills and collisions than any other transportation mode.

Supporters say a high speed rail network in the Empire Corridor, linking the full 463 miles from Niagara Falls to New York City, would reduce fuel costs for people and freight, cutting a train trip from Syracuse to New York City by two hours, down to 3.5 hours or less – faster than a trip by car. Mayors in every large Upstate city are on board, saying high-speed rail could help create at least 21,000 new jobs and $1.1 billion in new wages across the state.[42]

The federal government launched an ambitious funding program for implementing high speed rail in key markets throughout the U.S. in 2008. The 463-mile Empire Corridor, which stretches from Niagara Falls to New York City has been shown to demonstrate potential for increased ridership. Thus far New York State has received $557.7 million in federal funding for improvements along the Empire Corridor that will allow for increased speeds and will reduce congestion along the corridor.

For high speed intercity passenger rail to be competitive, the following must be accomplished:[43]

+ Increase service frequency—There are only 4 round trips between Albany and Buffalo per day; at 110 mph round trips would double to 8 between Albany and Buffalo per day

+ Improve on-time performance—On-time performance is only 77% on average, and only 64% from Buffalo/Niagara Falls to Albany

+ Provide travel times that are comparable with other modes—At 110 mph the total travel time between Buffalo and NYC would be seven hours and 20 minutes, travel time from Syracuse to NYC would be close to three hours.

Major partners in this effort include CSX, Amtrak, NYS Susquehanna and Western Railway, Finger Lakes Railway, the Port of Oswego, the Federal Department of Transportation, and NYS DOT.

h) Maintain a comprehensive water-wastewater infrastructure investment program.

Central New York has invested hundreds of millions of dollars over the years to build an extensive network of drinking water, wastewater and stormwater infrastructure to provide the public with safe and clean water. While some of that infrastructure is now 100 years old or older, much of this network of water treatment plants, distribution lines, sewer lines and storage facilities was built after World War II. While the larger water systems within the region have been working hard to move toward greater infrastructure sustainability, the level of renewal and reinvestment within the water sector (es-

pecially for smaller service providers) has not kept pace with the need. This leaves the region with a burgeoning gap between what needs to be spent to achieve a sustainable pace of renewal and the revenues available to support those needs.

Historically, the region (and the nation) has underinvested in the ongoing need to maintain and renew these systems. Over the coming decades, the pattern of underinvestment must change to put practices in place that ensure that this infrastructure and the utilities that provide CNY with water services, are sustained for the long term. Doing so is vital to the health of the regional economy, the public at large, and to that of the region's water resources.

Aging infrastructure causes extensive problems such as lost water, inflow and infiltration and, in some cases, sanitary sewer overflows. The average design life of sewer pipe is 50 to 70 years, and some systems within the region are approaching 100 years. When wastewater infrastructure is beyond its design life it operates at reduced levels of efficiency, and this has negative impacts on the water quality of receiving water bodies. Water quality declines are often caused by nutrient loading from stormwater runoff as well, this is especially true for older combined sewer systems where stormwater and sanitary waste combine and often proceed untreated into the receiving water body.

Water and wastewater treatment facilities require significant energy to power pumps, aeration systems, treatment, conveyance and other operations. Drinking water and wastewater services account for an estimated 3% of national energy consumption. The national average energy consumption for wastewater treatment facilities is 1,200 kWh per million gallons (MG) of wastewater generated (1 MG of wastewater is generated by 10,000 people per day). NYSERDA conducted a statewide energy assessment of the water and wastewater sector in New York State and found that it consumes 2.5 to 3 billion kWh/year (approximately 2 billion kWh/year for wastewater treatment and 1 billion/year for drinking water). The sector spends between $250 and $300 million per year, and savings of 10% to 15% are easily achievable.[44]

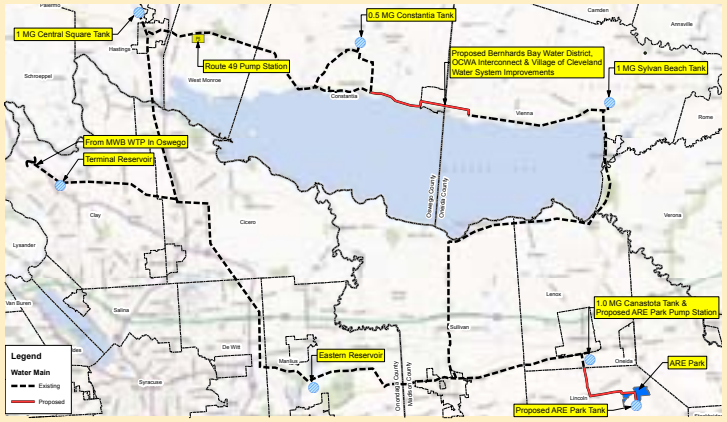
Reducing leaks within a water supply system has the additional potential for significant energy savings. The actual energy savings

OCWA NORTH SHORE WATER TRANSMISSION SYSTEM

Since 2006, communities of the North Shore of Oneida Lake have been working with the Onondaga County Water Authority (OCWA) to undertake the planning, design and construction of the North Shore Water System. The project consists of new water transmission and distribution infrastructure along the Route 49 corridor of the Towns of West Monroe, Constantia, Vienna and the Village of Cleveland. The North Shore Water System consists of the following key project phases:

+ Phase 1: Construction of the Constantia and Toad Harbor Water District Facilities ($14 million, Status: complete)
+ Phase 2: Construction of the Bernhards Bay Water District Facilities ($3.4 million, Status: commencing district formation and securing funding)
+ Phase 3: Construction of Interconnection Facilities (OCWA Interconnect) through the Village of Cleveland to Vienna ($1.7 Million, Status: planning phase, lacks funding)
+ Phase 4: Construction of Village of Cleveland Water System Improvements ($3.4 million, Status: planning phase, lacks funding)

With Phase 1 complete and Phase 2 moving toward securing funding, communities are now focusing on efforts to complete the third and fourth phases of the project. The OCWA Interconnection is the missing link to an uninterrupted northern water transmission pathway and the positive impacts such regional water supply improvements would provide regarding system redundancy. In addition, the project will increase the capacity of OCWA's facilities to meet the projected needs of future growth and development in southern Oswego, western Oneida, and northern Madison County, including development of the Madison County Agriculture and Renewable Energy (ARE) Park in the Town of Lincoln.



achieved by reducing leaks will depend on the overall energy intensity of the system and how far down the water supply chain the leak occurs. Embedded energy accumulates as water moves down the supply chain. For instance, water saved at the local distribution stage will embody the energy of all previous stages, including treatment and conveyance. But water saved during conveyance will not have been embodied with the energy of later steps. Water is heavy at 8.34 pounds to the gallon and energy is required whenever it is moved, treated, heated or pressurized. For many communities, the energy required for supplying and treating water and wastewater constitutes the largest municipal energy cost.[45] Public use and lost water is unaccounted for and represents 15% of all public water demands, a staggering volume that should be better tracked in order to minimize lost water.

A generally accepted estimate for water lost due to supply system leakage is estimated to be on the order of 10% of total supply, or 5.48 billion gallons daily. It is believed that an aggressive national program aimed at reducing system loss could achieve a 5% reduction in leaks, equal to 0.5% of total water supply.[46] This effort would save 270 MGD of water and 313 million kWh of electricity annually, equal to the electricity use of over 31,000 homes. In addition, approximately 225,000 metric tons of CO2 emissions could be avoided.[47]

Energy efficiency and renewable energy technologies such as solar electric or anaerobic digesters to capture biogas, can reduce energy use, energy costs, and greenhouse gas emissions. Energy efficiency improvements at water and wastewater treatment facilities can have high rates of return, and can significantly reduce overall costs at a facility since energy costs typically constitute 25%–30% of the operations and maintenance costs at water & wastewater facilities. In some cases, clean energy coupled with a change in process technology can result in even more benefits including increased treatment efficiency, potential for increased treatment capacity, and better capability to meet effluent standards.

Fortunately water supply and wastewater treatment facilities in New York State can benefit from participation in NYSERDA programs to improve energy efficiency, they may also benefit from utility sponsored programs such as lighting retrofits. New York State has made available $57 million in funding to support the installation and operation of anaerobic digester gas-to electricity systems through 2015, which would be a good fit for many of the region's treatment plants. Through a comprehensive survey of New York's wastewater treatment facilities NYSERDA discovered that treatment facilities that have participated in energy efficiency programs tend to be more energy efficient than their non participating peers.

The NY Clean Water State Revolving Fund (CWSRF) is the primary funding source for water quality protection projects including wastewater treatment infrastructure projects. The NY Drinking Water State Revolving Loan Fund (DWSRF), makes funding available to drinking water systems to finance infrastructure improvements. Both programs are managed by the New York State Environmental Facilities Corporation (EFC) with an annual budget of $20 million. Together, the low interest loans available under the CWSRF and the DWSRF are the primary funding sources for needed infrastructure improvement projects in NYS.

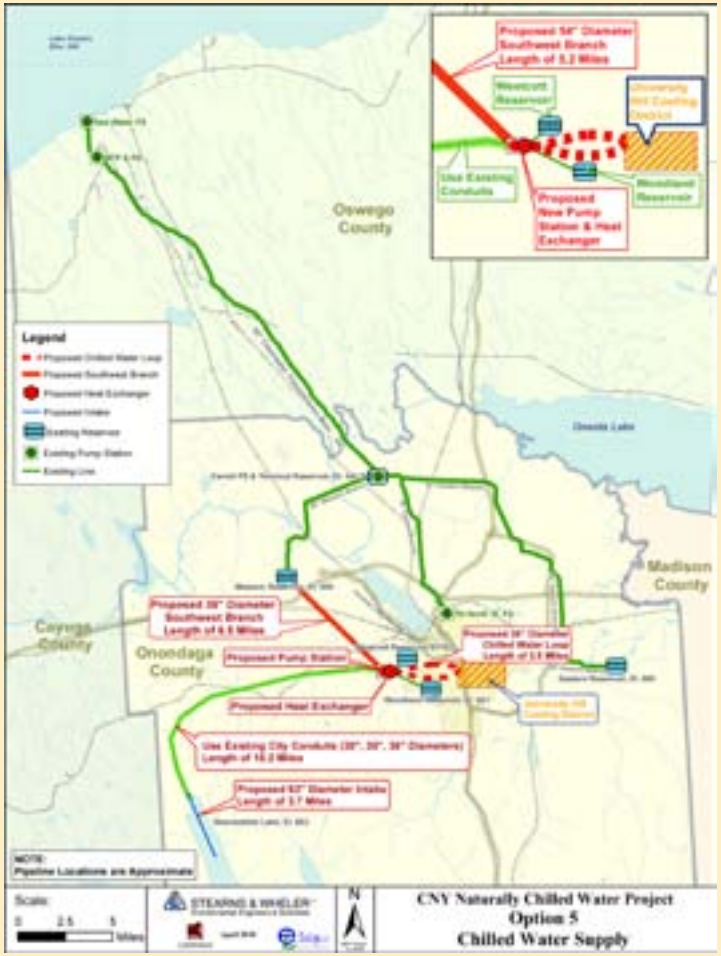
The EFC is a major provider of public financing for drinking water, wastewater, and water quality protection in NYS. EFC has begun to promote energy efficiency for all of the projects that it supports through financing and is working with NYSERDA to fund energy efficiency studies and modifications for facilities. At the same time the needs far outweigh available funding, in 2009 the CWSRF need was identified at $4.5 billion, while available funding was $740 million. In 2008 the DWSRF need was identified at $1.9 billion, while available funding was $162 million.

Major utility providers engaged in this investment program include MWB, OCWA, and the Cities of Auburn, Cortland, Oneida, Syracuse, Oswego, and Fulton.

i) Develop safe and reliable energy production facilities and transmission resources that minimize greenhouse gas emissions.

Central New York's current mix of energy production facilities is relatively free from dependence on fossil fuels, with 82% of the electricity generated in the region coming from the region's three

CNY DISTRICT ENERGY FEASIBILITY STUDY



Based upon funding secured by former Congressman James T. Walsh from the federal Environmental Protection Agency, a study was commissioned by SUNY College of Environmental Science and Forestry on behalf of the Metropolitan Water Board regarding the feasibility of establishing a regional district cooling energy system in Central New York. The study was completed in 2011.

The initial study concept consisted of a deep water intake in Lake Ontario, a pumping station and pipeline from Oswego to Central New York, use of the naturally chilled water for existing facilities and as an economic attractor for new growth in Central New York. As part of the study, the project team evaluated the Metropolitan Water Board and Onondaga County Water Authority's water transmission and distribution network in Central New York. The purpose of the review was to learn of and evaluate opportunities to use existing infrastructure so as to minimize project construction and operations and maintenance (O&M) costs. The project team concluded that either Lake Ontario or Skaneateles Lake could provide naturally chilled water through its existing potable water system infrastructure, in a system configuration similar in general to the Toronto Deep Lake Cooling System. Chilled water customers would be served by a closed loop conveying water from the heat exchanger to users, and back to the heat exchanger. This closed loop is separate and distinct from the potable water system. Water in this loop is not potable water, and the system would be designed to prevent mixing of potable and non-potable water.

The project team identified five options for further study. The options include one or the other source lake, and different degrees of overlap with existing water distribution infrastructure. All options were based on transport of chilled water to the University Hill/Downtown Core for cooling use, as this area of the county has the highest density of potential chilled water customers. The project team conducted a preliminary evaluation of the technical features of Options 1 - 5, and concluded there were no technical obstacles that would remove any of the five options from further consideration. The projects consist of proven technologies employed by both Cornell University and Toronto NCW systems. While construction of some system components would be challenging (e.g., intake pipeline), the experience gained from the Cornell and Toronto systems would provide important guidance if the project moves forward. The preliminary total project cost estimates are based on experience with the Toronto and Cornell chilled water projects, actual 2009 bid results from a large force main project in central New York, published estimating guides, and professional judgment. Cost estimates ranged from $125 to $250 million.

The project team also reviewed the administrative structure for existing and proposed cooling (and heating) districts. Four administrative models were identified. They include: (1) privatization of chilled water districts; (2) establishment of not-for-profit cooperatives by governmental and private entities to manage a chilled water district; (3) employing private management schemes for all or part of a chilled water district and (4) establishment of a for-profit corporation by a municipal entity.

nuclear power facilities located in the Town of Scriba in Oswego County and only 15% coming from natural gas facilities. In NYS, nuclear energy facilities supply over 60% of the state's emissions-free electricity, with hydroelectric facilities supplying more than 25% and the balance coming from solar, wind, and geothermal sources.

The operating license of one of the region's three nuclear power facilities, Nine Mile Point Unit 1, is expected to expire in 2029 which is within the timeframe of the VisionCNY Plan. The licenses of the other two facilities, James A. FitzPatrick and Nine Mile Point Unit 2, are expected to expire in 2034 and 2046, respectively. As noted in Chapter 2: Energy Management, these three nuclear power facilities collectively provide 82% of all electricity generated in Central New York. The closing of any or all of these facilities will have profound effects on the region's energy infrastructure.

The VisionCNY Plan's sustainability target related to energy production facilities is to maintain the amount (no net increase in absolute terms) of electric power generation within the region that is derived from sources that emit greenhouse gas pollution. Currently, 15% of the electricity generated in the region comes from natural gas facilities. Even if Central New York successfully meets the associated target described in this chapter—to produce 25% of the region's electricity from renewable energy resources such as solar and wind by 2030—then regional stakeholders will have to choose from one of several scenarios:

Constellation Energy Nuclear Facility in Oswego County



+ One or more of the region's three nuclear energy facilities will be decommissioned and replaced with current Generation III or newer nuclear power facility designs. Such an outcome could substantially maintain the total amount of electricity produced in Central New York and the region's historic role as a center of energy production and export throughout NYS.

+ One or more of the region's three nuclear energy facilities will be decommissioned and replaced with non-nuclear sources that do not emit significant amounts of greenhouse gas pollution such as centralized natural gas or coal facilities that use a form of carbon capture and storage (CCS) technology. It should be noted that CCS technology may significantly increase the fuel needs and the cost of the energy produced. It should also be noted that large-scale CCS deployment is as-yet unproven and may be decades away from being commercialized.

+ One or more of the region's three nuclear energy facilities will be decommissioned and replaced with centralized facilities and/or distributed (behind-the-meter or on-site) systems that use renewable energy resources (solar farms, wind farms, biomass CHP, etc.). This would require significant increases in the amount of power generated with renewable energy far beyond the 25% target established by the VisionCNY Plan if the absolute level of regional electricity production, currently at 25,000 GWh, is to be maintained. It should be noted that recent academic research argues that all of NYS' power needs could technically be met with wind, water and solar resources, although the economic costs of such a scheme may be quite large.[48]

+ One or more of the region's three nuclear energy facilities will be decommissioned and not be replaced. Such an outcome would substantially reduce the total amount of electricity produced in Central New York, considerably limiting CNY's historic role as a center of energy production and export throughout NYS with associated impacts on economic growth and jobs. If the region were to meet the VisionCNY target of reducing per capita energy consumption by 40% by 2030, then it is expected

that the region's own energy needs could likely be reasonably met.

+ Some combination of the above.

Given the profound economic, environmental and community impacts that are involved with any of these scenarios, the New York Poser Authority, Entergy, and National Grid must give serious consideration to the investments that are required to improve and/or to replace Central New York's nuclear power facilities. Regardless of whichever path CNY chooses to pursue, it is likely that significant investments will be required to improve and/or replace the region's aging transmission infrastructure in order to accommodate new power production facilities, whether they are nuclear or non-nuclear, centralized or distributed. The NYS Energy Highway initiative represents an important opportunity and it is recommended that regional stakeholders including local government, investor-owned and municipal utilities, and owners of power production and transmission assets work together and with federal and state agencies and regulators to develop a strategic plan that identifies needed investments to develop a sustainable energy infrastructure over the next 20 years.

j) Expand the region's telecommunication broadband network to provide reliable and fast internet access for the region's residents.

The telecommunications industry is a catalyst for today's global economy. Industry, commerce, public safety, education, research and development, and financial investments are all increasingly dependent upon accessible, responsive, reliable, and affordable communications – anywhere at any time. Broadband facilitates transformative change in a wide range of key sectors from power, transportation, buildings, education, health and agriculture. Networked information and communication technologies can help to achieve a sustainable development model, as broadband-enabled innovation in applications and services promote the integration of 'smarter' and more energy-efficient economic growth, social development and environmental protection the three pillars of sustainable development.

TABLE 34–Wireless Broadband Service Deficiencies in Central New York

County Name	Area (sq miles)	Population 2010	Estimated Population Speeds w > 6 Mbps	Estimated % Population Speeds w >6 Mbps
Cayuga	882	80,026	58,750	73%
Cortland	501	49,336	42,000	85%
Madison	661	73,442	66,250	90%
Onondaga	805	467,026	452,500	97%
Oswego	1,401	122,109	110,000	90%

Source: NYS Broadband Study

While there is minimal loss of coverage regionally, there are wider disparities regarding access when you look at individual counties in CNY, Cayuga County has the largest disparity of residents without access to broadband above 6Mbps (Table 34). This level of service is critical because broadband speeds of more than 6 Mbps are required to conduct most online activities and the most comparable speed tier to the FCC's definition of broadband (4 Mbps download / 1 Mbps upload).

Many of New York's coverage gaps exist because of the costs associated with "last-mile" access. Simply put, providers generally have a presence in many New York unserved areas, but are unable to provide service to many New York residents due to the prohibitive costs of extending fiber to the home or business. This is especially true in rural areas, where housing densities are much lower. Most unserved citizens in New York live in small pockets such as those described above, which makes closing the availability gap a very challenging proposition. As would be expected, current broadband mapping data illustrates a strong correlation between low population densities and lower broadband availability.

"Connect NY" provides $25 million in grants available through the Regional Councils and Empire State Development to expand promote and expand high-speed Internet access in rural upstate

Syracuse Inner Harbor



and underserved urban areas of the State. With over 700,000 New Yorkers unable to access broadband, and another six million citizens facing significant obstacles to connect, expanding high-speed internet was identified by many Regional Councils as a priority to stimulate local business growth. The "Connect NY" Broadband Grants are designed to spur investment by broadband service providers and expand broadband connectivity and economic development in each region.

The VisionCNY Plan calls for telecommunication providers such as Verizon, ATT, Time-Warner Cable, and the Finger Lakes Communication Group to pursue opportunities to expand the telecommunications network in CNY. The efforts can be supported with programs at the federal and state level—including the Connect New York program for which funding announcements were recently announced.

3. Alignment of Strategies and Targets

The following table illustrates the alignment of infrastructure strategies and targets.

TABLE 35—Alignment of Infrastructure Strategies and Targets.

Strategies	TARGETS				
	1	2	3	4	5
	REDUCE THE TOTAL VEHICLE MILES TRAVELED ANNUALLY IN THE REGION BY 25% BY 2030.	DECREASE THE NUMBER OF BRIDGES AND ROADS THAT ARE RATED AS "DEFICIENT" OR"POOR" BY 25% BY 2030.	UPGRADE 25% OF THE REGION'S WASTEWATER TREATMENT PLANTS BY 2030.	MAINTAIN THE AMOUNT (NO NET DECREASE) OF ELECTRIC POWER PRODUCTION WITHIN THE REGION THAT IS DERIVED FROM CARBON-FREE SOURCES.	INCREASE THE PERCENTAGE OF CNY RESIDENTS WITH HIGH-SPEED BROADBAND SERVICE FROM 87% TO 92% BY 2030.
Short-Term Opportunities					
a. Support a "fix-it-first" regional infrastructure policy.	●	●	●		
b. Encourage transit-oriented development and bus rapid transit service for priority corridors.	●	●			
c. Expand network of public transit park-and-ride facilities.	●	●			
d. Develop a regional transportation demand management program.	●	●			
Long-Term Initiatives					
e. Develop "complete streets" to encourage walking and bicycling.	●	●			
f. Develop of network of CNG fueling stations and EV charging stations.	●	●			
g. Expand use of rail and barge systems in the region.	●	●			
h. Maintain a comprehensive water and wastewater infrastructure investment program.			●		
i. Develop safe a reliable energy production facilities and transmission resources that minimize greenhouse gas emissions.				●	
j. Expand the region's telecommunications broadband network.					●

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Franklin Square Redevelopment, Syracuse

Chapter 4: Land Use

***Land use** is the intentional design and organization of space through the use of well-crafted policies and responsible development practices.*

The implementation of a comprehensive land use policy and sound development practices can have a strong influence on the quality of life experienced by citizens across an entire region. Because New York State is a "Home Rule" state, authority over land use decision-making resides largely with local municipal boards. However, local land use decisions have consequences across municipal boundaries and can have significant impacts to shared resources like lakes, rivers, streams, air quality, and view sheds. Many of the region's most valued resources lie across several municipal jurisdictions. Protecting these shared resources from imprudent development decisions is a very challenging task and requires the cooperation of public and private officials at the federal, state, and local level.

The typical regulatory criteria for shaping development in communities (e.g. the dimensions and number of required parking spaces for a commercial business, types of allowable uses, or codes addressing renewable energy systems) result in decisions that shape our communities. The criteria set for land use decisions are not inconsequential. The smallest such decisions based on local municipal regulation, applied regionally, become big picture acts of design that accumulate and shape environments that are either enjoyed or suffered by individuals and communities. Because land use regulatory decisions determine how much land surface is rendered impermeable to rainfall and stormwater runoff, they directly impact surface and groundwater quality as well as water reserves and downstream flooding. Land development location, type, and densities determine where wastewater discharges are concentrated, the availability and quality of agricultural products, where traffic congestion or other traffic issues occur, and whether people have opportunities for transportation, employment, housing, public space, walking, or biking safely in their communities. Because of these interconnections, thoughtful, well-crafted land use tools and controls have enormous potential to both transform communities and to preserve those things most valued about them. For these reasons, effective implementation of sustainable land use practices requires a broader regional or multi-municipal approach that addresses limitations of home rule governance, especially where shared resources are concerned.

Sustainable land use means implementing effective planning and development policies focused on maintaining the region's natural and cultural capital for future generations even as they are used and enjoyed today. It means making choices in what, where and how land is developed based on protecting biodiversity, human health, cultural resources, as well as air, water and soil quality at standards sufficient to sustain human life and well-being for current and future

generations. The kind of development that ensures a healthy cycle of use and replenishment of resources requires land use efficiencies that arise from compact development patterns, public transport, and energy conservation. These efficiencies are inherent in the re-use of existing buildings and sites, infill development in underperforming areas, and mixed uses. Inter-agency working partnerships are needed to establish and implement a more broadly effective planning effort that ensures local regulatory authorities have the tools that lead to sustainable land use patterns.

A. EXISTING CONDITIONS

1. Land Use

Central New York includes the five counties of Cayuga, Cortland, Madison, Onondaga, and Oswego and measures 4,146 square miles (2,653,440 acres) of land and waters from the southwest shore of Lake Ontario to the Chenango River in eastern Madison County, and from the southwest shore of Oneida Lake to the eastern shore of Cayuga Lake south to the Town of Marathon in Cortland County. The region, rich in surface water bodies in corridors between rolling glacial moraine and drumlin land forms, is unique ecologically due to its glacial geology, topography, climate, and cultural history.

Prior to the earliest colonial settlement in the region and New York State land purchases of 1795 and 1807, Central New York was the home and seasonal hunting and fishing grounds of the Haudenosaunee, Native Americans of the Iroquois Confederacy. The earliest colonial settlers established water-powered saw mills across the region for processing harvested lumber as forests were cleared and farmlands established. By the mid-nineteenth century, grain mills producing flour, and creameries producing milk and butter, along with cheese, meat, wool and other local products were being shipped by rail and canalway from settlements in the region to markets as distant as New York City, Chicago, Philadelphia and Boston.

The New York State Barge Canal (completed in 1825) and an extensive system of railroads (beginning in 1826) laced across the region providing direct connections between the smallest rural settlements of Central New York to bustling metropolitan centers of the northeast.



Historic map of the Erie Canal

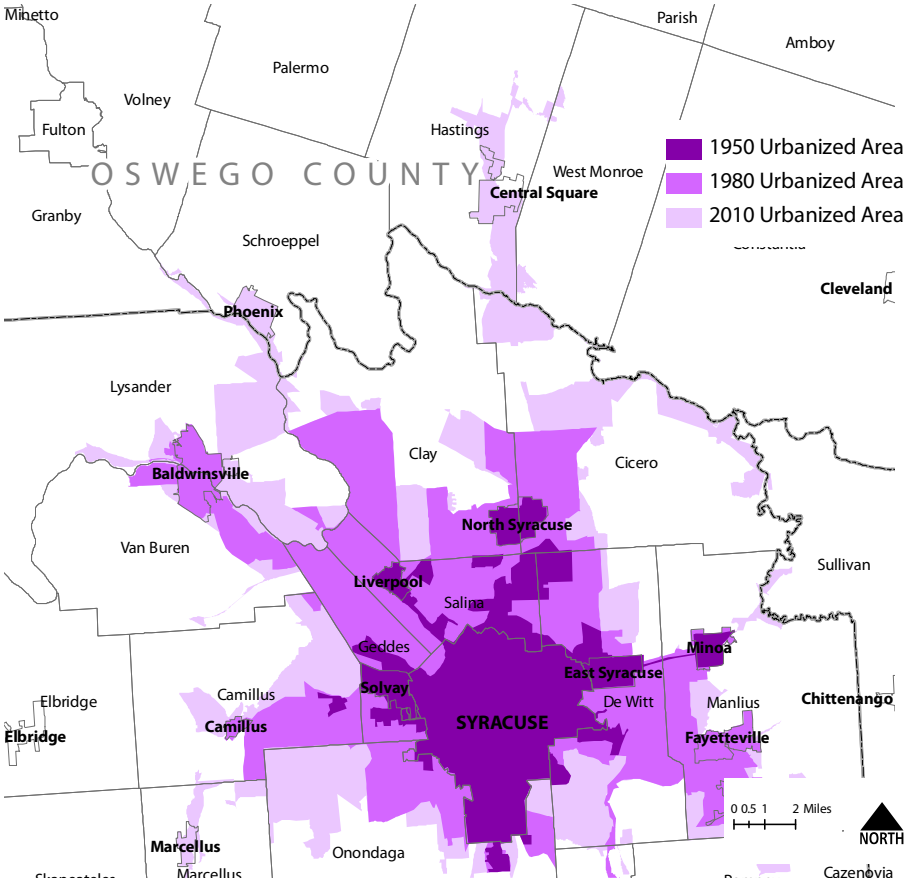
This connectivity, along with the wealth of natural resources, ingenuity, available immigrant labor and talent in traditional trades, brought an influx of commerce, land use development, and the growth of bustling communities, productive farmlands, and commercial ventures across the region.

By the early-twentieth century, Central New York had become a collection of productive, small- to mid-sized commerce- and industry-driven settlements located along major waterways, with the City of Syracuse its' center. Surrounded by vast acres of farmland, mainly producing field crops and dairy cows, communities in the region were growing, but remained centered on their churches, schools, post offices and libraries. The most robust employment centers in the region historically were Syracuse, Auburn, Cortland, Oneida, Oswego, and Fulton. Rural centers located along primary travel routes, active canalways and railways included Pulaski, Skaneateles, Cazenovia, Phoenix, Elbridge, Canastota, Moravia, and Homer. Baldwinsville, Springport, Aurora, and King Ferry also experienced impressive development through the early twentieth century.

With the rise of the automobile and the decline of the extensive railroad system and use of the barge canal system in the region, rural centers that once hosted diverse and thriving businesses lost their transit-connected competitive advantage, and many soon returned to less vibrant and less populated agricultural centers. The realities of urban residential life, congested and old, with limited space and heavy industrial environmental conditions combined with the long-term impacts of 1930s federal policy resulting in disinvestment in the region's urban centers. Postwar population growth and 1950s federal highway policy together spurred continued movement of urban populations toward developing suburban areas in outlying areas with now easy commuting, attractive larger lots, scenic views, and newer schools. To meet the demands of this new suburban development, infrastructure, commuter roadways and school district services expanded across the region (Map 21).

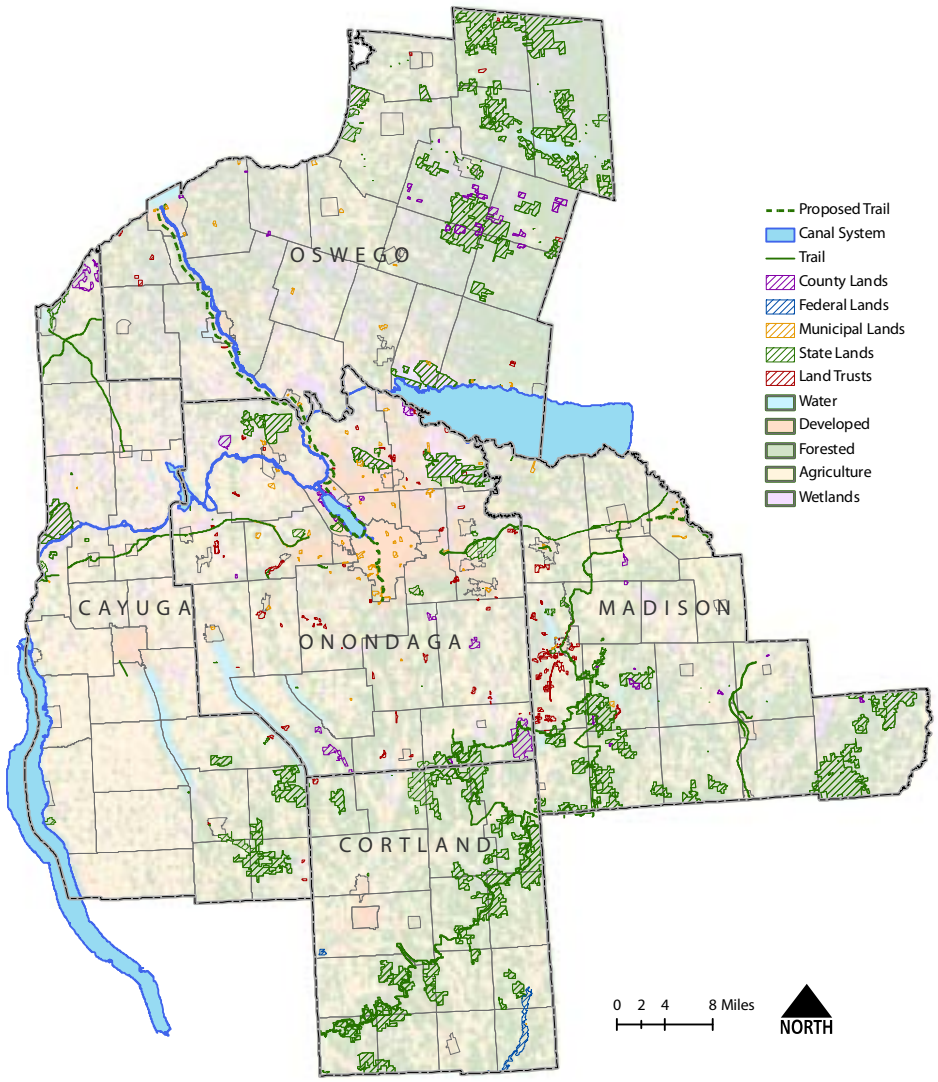
Central New York today is characterized by land uses ranging from farm fields, lakes and forested lands to sparsely settled rural areas, compact rural hamlets and villages, suburban residential developments, industrial nodes, commercial strips, and dense urban clusters. Land use in the region is comprised of 31% residential use, 29% agricultural use, 21% vacant land (land that is not classified in any other category), 11% wild, forested, conservation lands and public parks, 1.5% commercial services, 1.5% public services, 1.5% community services, 1.0% recreation and entertainment, and 0.7% industrial use. Population of the region increased considerably over the past 100 years growing from 373,970 residents in 1900 to over 760,000 people by 1970. Twenty years later, the region reached its peak decennial population of the twentieth century at 791,140. By 2010, the region's population reached a new high totaling 791,939 residents (Map 22).

MAP 21–Change in Urbanized Area, 1950 to 2010



Source: CNY RPDB

MAP 22–Central New York Land Critical Land Resources



Source: CNY RPDB

In reviewing the region's development activities, it is important to note that Central New York continues to benefit from a wealth of freshwater resources, an abundance of lakes, rivers, and perennial streams; scenic open space and unique glacial landscape form; compelling history as a center of the abolition and women's rights movements; vibrant arts and cultural life; and a wealth of prime agricultural soils and picturesque working landscapes. Several New York State Scenic Byways cross the region, including Route 3 (The Seaway Trail), Route 13 (The Revolutionary Trail), and Scenic Routes 20 and 90. These scenic waterways and roads connect the region's historic settlements and diverse collection of national, State and local natural and cultural heritage trails and areas, wineries, rural villages, and 3,000 working farms. Between them, an extensive network of public parks and recreational trails provide a basis for four season outdoor recreation including hiking, cross country skiing, horseback riding and snowmobiling. Water trails in the region where former canals connect to rivers, lakes and wetlands provide kayak and canoe enthusiasts opportunities to enjoy the region's rich aquatic and riparian wildlife habitats and a few hours on the water. For these many reasons, Central New York receives consistently high marks on quality of life indicators and was recently ranked fourth on Forbes' list of "Best Places to Raise a Family".

Central New York has experienced many years of land development patterns typical of industrial era metropolitan areas with population loss and concentrated poverty in its urban center and in many smaller cities and rural villages. Analysis of land development in the region (from the MRLC National Land Cover Database) between 1991 and 2006 indicated a near doubling of land consumption in Central New York from approximately 0.11 to 0.24 acres per person. Between 1980 and 2000, Onondaga County experienced a 32% decrease in population density, the highest of any region in upstate New York, and between 1992 and 2006 about 100,000 acres (156 square miles) were urbanized. This is a trend in land consumption that has continued in Onondaga County with almost 7,000 new residential parcels created including 147 major subdivisions over 2,600 acres since 2000. In 2003, CNY had the 8th highest ratio of new residential construction to household formation (Bier and Post 2003).

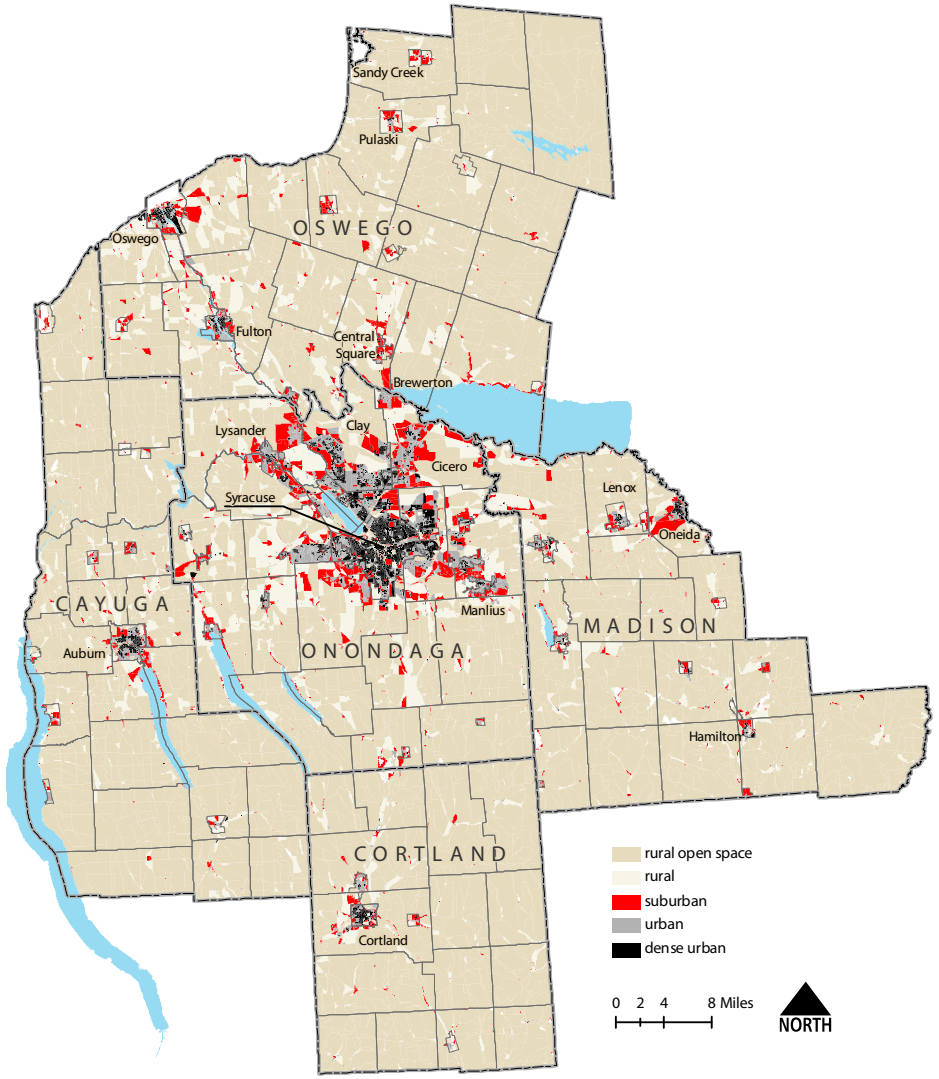
The Smart Growth Network's Measuring Sprawl and Its Impact report, a multi-dimensional analysis of sprawl in 83 metro areas nationwide, ranked Central New York as the 16th most sprawled region in

the US. In the last 20 years, land development has largely occurred in former farmlands in Onondaga County, southern Oswego County, western Madison County and eastern Cayuga County. According to a Brookings Institution study, the region ranks 33rd out of 100 metropolitan areas in highest per capita carbon footprint at 2.682 metric tons, and 9th in terms of highest automobile-based emissions at 1.333 metric tons per person (Brown et al. 2008). While the region, with its historic development pattern of rural villages and hamlets, exceeds national levels of "centeredness," it has very low levels of density, mixed use and accessibility of its street network (Ewing, Pendall and Chen 2002; Map 23).

Despite these historic development trends, many urban and rural centers in the region today retain a healthy mix of public, community, commercial and industrial land uses that were historically (and in some cases still are) surrounded by vast areas of agriculture and forested lands. The 2010 census indicated a reversal in previous population loss trends in Onondaga County with 2% growth in population since 2000. The Downtown and Lakefront neighborhoods within the city of Syracuse experienced significant growth over the past decade. These most recent figures may indicate a trend that mimics national trends in the housing market. Young professionals, empty nesters (e.g. retiring baby boomers with no more children at home), and other households without children are beginning to repopulate urban centers throughout the U.S.[1] In fact, market-rate rental properties within Downtown Syracuse are at 99% occupancy with nearly 1,350 units, and an additional 570 in the planning stages or under construction. It is important to note that forty percent of downtown residents are associated through employment with University Hill.[2] Since 2000, the City of Oswego has also experienced an increased interest in loft-style development within the central city. A housing market analysis conducted by the city in 2011 indicated a 99% occupancy rate within all market rate housing units in the city. Business Improvement Districts and Downtown Partnerships in the Cities of Cortland and Auburn are also working to ignite a healthy mix of downtown development.

Over the past sixty years, many initiatives have contributed important successes in regional land use and development. Conservation efforts to preserve valued cultural and natural resources across the region have been ongoing between State agencies, municipalities, land trusts and private organizations. Land acquired by New York State

MAP 23–"Centeredness" and Density of Developed Lands in CNY



Source: CNY RPDB

and protected as state forests, along with municipal and land trust conservation easements that protect critical habitat and recreational parks and trails now totals nearly 250,000 acres (390 square miles or 11%) of land in the region. The Central and Finger Lakes NYS Parks regions include twelve State Parks and Historic Sites in Central New York in addition to the Erie Canalway National Heritage Corridor, the North Country National Scenic Trail, the Finger Lakes Trail, and many County Parks and Land Trust preserves that offer myriad hiking, camping, picnicking, boating, fishing, bird watching, swimming and site seeing experiences in the region. There are 2,950 miles of recreational trails in Central New York, however, nearly 75% (2,193 miles) of these are snowmobile trails.

Regarding urban revitalization, numerous projects have been undertaken in communities across Central New York. Perhaps the most noteworthy has been the redevelopment of the Syracuse lakefront with the development of Destiny USA, a major commercial shopping center that was constructed on a former brownfield in the City of Syracuse. Catalytic projects which have been developed in the region's urban center include construction of the Carrier Dome, revitalization of the CNY Regional Market, the historically-sensitive redevelopment of Armory Square, and the downtown Civic Center. More recent development efforts include the Oncenter, Near West Side Initiative, the Connective Corridor linking University Hill with downtown (via a transit, bike and pedestrian corridor), SUNY Upstate Medical University housing, many new downtown residential and commercial developments, Phase One of the Onondaga Creekwalk (2.6 miles) from Onondaga Lakefront to Armory Square, and the planned Inner Harbor Development. Syracuse has added 1.5 million square feet of developed space on University Hill, the Syracuse Center of Excellence, CNY Biotechnology Center, the new WCNY headquarters, St. Joseph's Hospital Developments, and the CENTRO Downtown Transit Hub.

Ongoing efforts in community development and downtown revitalization across the region include the North Jefferson Street Revitalization project in the historic village of Pulaski, where a c. 1938 theater is being rehabilitated to become a regionally significant 400 seat performance and event space (the Pulaski Performing Arts Center) along the Salmon River Greenway Trail. The City of Oswego

Destiny USA



is working to revitalize the downtown and waterfront areas of the region's own international port of call on the St. Lawrence Seaway. West Linear Park in Oswego provides shore access to the west side of the Oswego River with wheelchair accessibility. Riverwalk in Brewerton is a 215 acre residential development site that includes 100 acres of forested walking trail preserve owned and stewarded by the Central New York Land Trust with access to the Oneida River and 5 acres of river-side land owned by the State of New York. The downtown Auburn Arts District will be the home of the Finger Lakes Musical Theatre Festival, a 15,300-sf art, education and performance center, and a 10,000-sf scenic design and set production facility on the former site of a downtown Auburn building. The Schwartz Family Arts Education and Performance Center in Auburn is one of four venues for the Finger Lakes Musical Theatre Festival, and will be the home of a new 384-seat arts education and performance Center to be shared with Cayuga Community College during the academic year as additional classroom and workshop space and used by the festival during its summer season. The City of Cortland has recently launched a Gateway Development Project. The 18-acre Canal Landing Park in the Village of Fayetteville will include a parking area for visitors, rest room facilities, a pavilion, recreation trails and a playground. The Town of DeWitt has implemented several "green" land use initiatives including the planting of 85 trees along Town's right-of-way, and installation of rain gardens and rain barrels at Ryder Park Pavilion and the Town Hall Building.

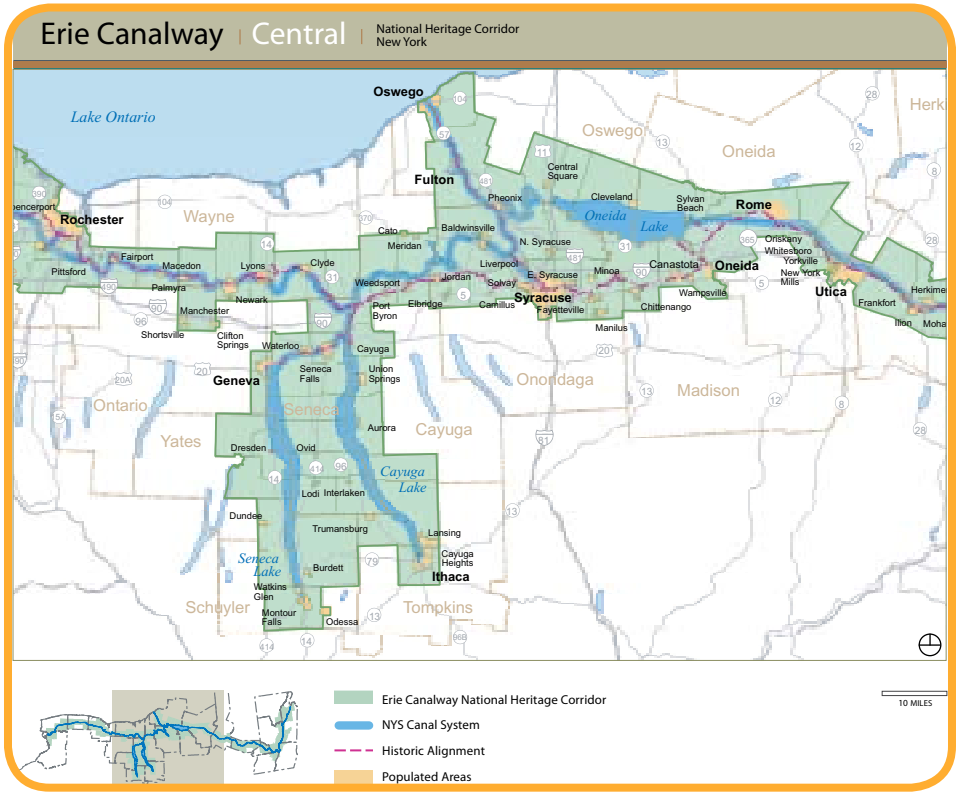
2. Regional Plans

Analysis of previous planning studies and existing conditions in the region provide the basis for identifying prime targets and a plan for working toward regional land use sustainability. As a part of the land use inventory for the region, several relevant reports were reviewed including; *The New York State Historic Preservation Plan, The New York Statewide Comprehensive Outdoor Recreation Plan, 2009 New York State Open Space Conservation Plan, Syracuse Land Use & Development Plan 2040, and Syracuse Sustainability Plan*, both components of the *Syracuse Comprehensive Plan 2025.*

(a) The Erie Canalway National Heritage Corridor 2011–2016 Strategic Plan

In this plan, the National Park Service is proposing to work through a wide range of partnerships, to preserve and interpret our nation's past, provide world class recreational and educational opportunities, foster economic revitalization, improve quality of life in Corridor communities, and guide the reemergence of the Erie Canalway as a 21st century "River of Commerce and Culture." The plan recommends activities including partnership building, inventory, documentation, mapping, preservation, management, promotion, and linking of corridor communities and sites via car, rail, boat, bike and pedestrian routes.

The Erie Canalway National Heritage Corridor follows the New York State Canal System and the historic Erie Canal stretching 524 miles



across upstate New York and through a large swath of Central New York including northern Madison, Onondaga, central and western Oswego and Cayuga Counties. In Central New York, this National Heritage Corridor encompasses four cities, 19 towns, and 24 villages across four Counties, and represents an important collective historic and recreational resource.

The National Park Service has called the heritage corridor "a place with stories to tell, great works of architecture to see, history to be learned, and hundreds of miles of scenic and recreational waterway and trails to explore." Central New York communities within or adjacent to the Erie Canalway National Heritage Corridor are just beginning to realize some of the potential economic and cultural benefits of the preservation and development of this unique historic resource. The Oswego Canal corridor alone, connecting Central New York's metropolitan center at the City of Syracuse with the International port City of Oswego on the St. Lawrence Seaway, passes by historic sites, waterfront parks, and rail infrastructure through 15 municipalities in two counties by way of three navigable rivers.

(b) 2009 New York State Open Space Conservation Plan

In this plan, several important focus areas in Central New York are specifically designated for open space planning. The following areas are the region's identified priorities for conservation efforts: Tug Hill Core Forests and Headwater Streams; Lake Ontario Shoreline; Camillus Valley and Nine Mile Creek; Carpenter Falls and Bear Swamp Creek Corridor; development of a State Park in Cortland County; Fair Haven Beach State Park; the Link Trail including links to the Finger Lakes Trail, the North Country National Scenic Trail, and the Erie Canal Trail; Nelson Swamp; The North Shore Oneida Lake Open Space Project; Erie Canal State Historic Park Trailhead Buffer and Historic Protection; the Onondaga escarpment; Peter Scott Swamp; the Salmon River Corridor; Summerhill Fen and Forest Complex; Cayuga, Owasco, Skaneateles, and Otisco Lake Shorelines; Finger Lakes Water Trails network; Owasco Flats; Camp Barton on Cayuga Lake; and the Northern Montezuma Wetlands.

One important natural resource in Central New York deserving of special consideration and protection in future land use planning efforts is the approximately 17-mile stretch of land referred to as the Eastern Lake Ontario Dune and Wetland Complex On the eastern shore of Lake Ontario. A unique and delicate natural resource, the area is designated as a NYS Natural Heritage Area (one of only two in the State of New York), and is an integral part of a coastal barrier system consisting of beaches, sand dunes, embayments and wetlands. This barrier system contains the largest and most extensive freshwater sand dune formations in New York State. The dunes in this unique coastal area form a barrier that absorbs the energy of storm-driven lake waves, creating calmer conditions in the low-lying expanse behind the barrier where extensive high quality wetlands have developed. The Eastern Lake Ontario Dune and Wetland Complex is home to two rare or threatened plant species, and the highest concentration of state designated Significant Coastal Fish and Wildlife Habitats in New York State, yet remains threatened with development-related impacts due to ineffective or lacking regulatory tools and practices.

(c) The New York State Historic Preservation Plan

The NYS Historic Preservation Plan calls attention to the value of historic building, structure, and landscape types across the region recognized for their important cultural capital and potential role in community development and economic growth.

One such type of development in need of protection and creative alternatives to their loss are formerly important civic buildings and religious properties found at the heart of most cities, villages and hamlets throughout the region. Another is the working landscapes and farmlands that have characterized rural CNY and its scenic byways for over 200 years.



Opendore, the Isabel Howland House in Sherwood

(d) The New York Statewide Comprehensive Outdoor Recreation Plan

Specific actions recommended in this plan include improving present trail systems; constructing additional miles of single and multipurpose trails; rehabilitating and constructing additional miles of public forest access roads; expanding, improving or constructing recreational facilities such as lean-tos, horse-stabling areas for the public and for people with disabilities; developing Recreational Management Plans (RMP)s for International Paper/Lyme Timber conservation easements utilizing the public recreation management planning process; identifying and allocating funding for the development of recreational facilities on easements with approved final RMPs; and beginning development of recreational facilities. The vision for recreation in New York State is "to provide a system of safe and enjoyable recreational and interpretive opportunities for all New York State residents and visitors and to protect and improve the quality of the valuable natural, historic and cultural resources."

The Preservation League of New York State has identified buildings and landscapes in Central New York to be listed on its "Seven to Save Endangered Properties" list. The statewide list draws attention to the plight of New York's agricultural landscapes and structures, architecture of the recent past, early public housing complexes and the need for appropriate revitalization. Resources listed are in danger of disappearing because of insufficient funding and financial incentives, insensitive public policies, general neglect, disinvestment, and in some cases, demolition. In Central New York, these important historic resources include the Hop Kilns in Madison County, where 35 kilns remain from the estimated 100 once in use, and five of these are in danger of collapse; U.S. Route 20, the Cherry Valley Turnpike, is a National Scenic Byway that crosses Central New York and is threatened with inappropriate development, economic decline, and a lack of coordinated planning; the Hamlet of Sherwood, in the Town of Scipio, has been designated a National Register-Listed Historic District, the "Sherwood Equal Rights Historic District," but continues to face threats of vacancy and neglect.

The Central New York Regional Economic Development Council's *Strategic Plan 2012-2013* cited several land use related projects, priorities, strategies and transformational initiatives including supportive development of arts and culture with potential to generate increased visitation to the region and play a far larger economic role as a key regional employment cluster. Tourism, arts, and cultural land uses can together generate economic synergies in the region to catalyze substantial growth. In "Onondaga County alone, 5,117 jobs are directly supported by $133.4 million in economic activity generated by arts and cultural institutions [and] in the CNY region, tourism generated $1.1 billion in visitor spending in 2011, a 6.2% increase from the previous year."[3] Central New York's natural and cultural assets already generate substantial economic benefit, but the most important economic benefit of planning for nature- and culture-based tourism is the potential they offer to transform places that support both tourist visitation and quality of life based on stewardship of the region's unique assets.

The Onondaga County Sustainable Development Plan highlights recommended practices for smarter growth and more sustainable and fiscally responsible development patterns. Key policy areas in the Plan call for the protection of the environment through the support and enforcement of practices to protect the natural environment; strengthen and support the City of Syracuse as the regional center of commerce, culture and innovation; maximize the use of existing infrastructure; protect the region's strong agricultural tradition; conserve rural landscapes; reduce energy demand; embrace cleaner energy options; use resources wisely; and create quality places and opportunities for all. The County's Sustainability Plan offers specific guidance in support of these policy areas in its Action Plan.

F.O.C.U.S. Greater Syracuse's *Citizens' Strategic Plan – A Road Map for Action* sets prioritized strategies to meet citizen-identified challenges including to: provide safety for walkers, hikers, and wheelchair users; provide safety and security for cyclists; teach everyone how to share the road safely; and encourage walkable communities and accessible urban trails.

B. SUSTAINABLE FUTURE IN CENTRAL NEW YORK

1. Goal and Targets

Community spatial planning and thoughtful land use regulation can make substantial improvements in meeting GHG emissions reduction goals, water quality, health and community development goals. The 2010 New York State Climate Action Council Climate Action Plan Interim Report notes that fuel combustion-generated emissions are the largest source of state-wide greenhouse gas emissions, and with 35% of those emissions generated on-site, they are a function of land use. Local municipal ordinances and zoning, subdivision regulations, and site plan review processes are the instruments of land use decision-making, and therefore are the determining factor in achieving sustainable land use in Central New York.

Inter-municipal and interagency collaboration and working partnerships between local, state and federal agencies, the public, and private organizations with shared resource concerns will be critical in facilitating planning that protects Central New York's shared resources. State statutes provide that zoning regulations must be in accordance with a municipal comprehensive plan, however; there is no requirement that municipalities adopt a comprehensive plan, or establish zoning regulations. The New York State Legislative Commission on Rural Resources published the Survey of Land Use Planning & Regulations in NYS in 2008. The survey found that, of the 147 land use regulating municipalities in Central New York, 66% had a Comprehensive Plan in place, and 74% had any zoning at all in place. 72% had a site plan review process, 77% had subdivision regulation, and 89% had Planning Boards. When municipal bodies lack effective land use planning and regulatory tools, the door is open to potentially destructive development and its impacts and costs to communities.

"Home Rule" in the region grants authority over land use decision-making to local municipal boards within local boundaries, but it does not provide those authorities with sufficient guidance or tools in support of decisions that result in sustainable land use. Implementing effective planning and development policies focused on maintaining

Onondaga Lake Park



the region's natural and cultural capital for future generations, even as it is used and enjoyed today, requires a healthy cycle of use and replenishment of resources. Where and how land is developed based on protecting biodiversity, human health, cultural resources, as well as air, water and soil qualities at standards sufficient to sustain human life and well-being for future generations requires sensible limits. Sustainable development relies on the efficiencies of public transport and energy conservation that is inherent in lower per capita land consumption. This can only be achieved through reuse of developed sites, infill and mixed use development. To ensure sustainable development in Central New York, new standards and criteria for sustainable development must be made available to local planning authorities through new working partnerships and a more broadly effective land use planning effort across Central New York.

Based upon public input and the information presented above, the planning team has established the following land use goal for Central New York:

GOAL: Manage the region's economic and physical development through the efficient and equitable use of land to conserve its natural and cultural resources and revitalize its urban cores, main streets and existing neighborhoods.
To achieve this goal, the following targets have been established for Central New York:

1) **Reduce the amount of land occupied in Central New York on a per capita basis to 0.225 acres per person.**

   CNY is a region known for the "centeredness" of its communities. Currently, per capita land consumption is at 0.25 acres per person, and the target is to decrease per capita land consumption 10% by 2030 to 0.225 acres per person. This will allow CNY to maintain its highly-valued compact hamlet and village form with rural-agrarian surroundings.

2) **Increase the number of acres of critical conservation areas in Central New York by 25%.**

   There are currently 156,297 acres of conserved lands in CNY. The target is to increase this number 25% to 195,371 acres by 2030. Conserved lands are considered to be public parks and lands owned by land trusts. Interconnected green and blue networks that allow wildlife migration, habitat protection and biodiversity, and accessible public access to natural resources for low impact recreation is critical to regional sustainability. Trees in the landscape also provide valuable ecosystem services in the form of clean, oxygen-rich air and maximum filtration of pollutants in the atmosphere and pollutants and sediments in stormwater runoff.

3) **Create 50 new miles of dedicated cycle tracks along major commuting corridors by 2030.**

   Encouraging alternative commuting modes such as bicycling are important to decreasing VMT in CNY. Currently, there is less than a half-mile of cycle tracks (separate bicycle facilities than run alongside a roadway) throughout CNY. The target is to create 50 new miles of cycle tracks along major commuting corridors by 2030. By strategically placing these cycle tracks along major commuting corridors, using a bicycle for transportation will be a much safer and more logical choice for residents of CNY.

4) **Reduce the percentage of household income spent on housing and transportation costs in Central New York by 10%.**

   Households in CNY spend more than half of their income on housing and transportation. Currently, in Cayuga County, households spend 52.52% of their income on housing and transportation, in Cortland County 56.08%, in in Madison County 54.82%, in Onondaga County 51.32%, and in Oswego County 52.40%. The target is to reduce the percentage of household income spent on housing and transportation to below 50% region-wide by 2030.

5) **Support activities that maintain or increase the level of farmland in the region, currently at 815,000 acres.**

   Agriculture is a pillar of the economy and rural character in Central New York. There are currently 815,000 acres of farmland in active use in the region, and the target for 2030 is no net loss in farmland. No net loss in farmland is important to protect and grow the region's capacity for sustainable agriculture and local food resources.

2. Strategies

Through group discussions with stakeholders, the planning team identified areas of key opportunities and challenges to achieving sustainable land use in the region. After reviewing the goal, indicators and targets, and the key opportunities and challenges, a set of land use strategies were identified for future implementation. Strategies were selected based on the contribution of each to advance the plan's overall land use goal and targets. In addition, strategies were evaluated for their overall benefits to the region, as well as the costs and feasibility for implementation.

In establishing an action plan for the region, these strategies were prioritized according to their readiness for implementation in the short-term opportunities or long-term initiatives, with short-term defined as 1-5 years and long-term defined as 5-10 years, as these opportunities may require additional time and effort to develop and implement.

Key strategies that have been identified to achieve the sustainable management of land use include:

Short-Term Opportunities

a) Implement a community-based urban infill program.

b) Implement a regional pedestrian and bicycle trail access program.

c) Implement a regional main street revitalization program.

Long-Term Initiatives

d) Assist communities with the implementation of a smart growth regulatory and incentive program.

e) Support a regional natural area conservation protection program.

f) Develop a regional recreation and cultural heritage protection program.

g) Support a regional agriculture land protection program.

h) Implement a comprehensive brownfield redevelopment program.

i) Support an ECNHC waterfront revitalization program.

j) Promote municipal adoption of a complete streets program.

NEW YORK STATE LAND BANK PROGRAM

To assist municipalities with local efforts to implement a comprehensive community development program, Governor Cuomo signed into law in July 2011 the New York State Land Bank Program. The Land Bank program empowers local entities to transform urban blight into a source of economic development by returning vacant and tax delinquent properties to productive use. The program permits municipalities to apply for and create land banks in their communities through the use of not-for-profit corporations created to take control and redevelop abandoned properties for productive use and the public interest.

Pursuant to the law, the number of land banks permitted to be formed in the State is ten. During the first round of applications in 2012, five applications from communities were chosen to participate in the program. These communities included: the Cities of Buffalo, Lackawanna, Tonawanda and Erie County; City of Syracuse and Onondaga County; City of Schenectady, County of Schenectady and the City of Amsterdam; Chautauqua County, and the City of Newburgh.

Building on their selection for participation in the State Land Bank program, the City of Syracuse and Onondaga County have entered into an Intermunicipal Agreement establishing the Greater Syracuse Property Development Corporation as an independent, nonprofit corporation that is governed by a five-member board of directors appointed by the City and County. The GSPDC is currently in the process of hiring an executive director and is seeking proposals for property management services.

a) Implement a community-based urban infill program.

Because Central New York is a region that retains much existing built infrastructure and formerly developed lands from a productive industrial past, as well as once largely self-sufficient rural settlements, there is a wealth of opportunity for community-based urban infill development, re-development, and repurposing of existing buildings and sites. Studies have shown that the economic health of an entire region, from property values to its ability to attract new business investment depends on the vitality of its downtown cores. Programs and policies that promote infill redevelopment are key, particularly mixed use projects that add residential units in core downtown areas, increase density, and enable greater public transit service and use. Projects to rehabilitate and reuse vacant industrial structures such as Camillus Cutlery, c. 1895, and former houses of worship throughout the region can bring new life to inactive urban spaces. Redevelopment and reuse of both existing buildings and previously developed sites through targeted tools such as local, state and federal tax credits and other incentives are important, and can slow the pace of "greenfield" development that is removed from urban or rural centers. The implementation of improved land use and transportation standards and criteria that promotes urban infill and compact development will result in opportunities for more sustainable, self-sufficient communities.

In addition to increasing the density and diversity of uses in urban centers through infill development, the material composition of the built urban environment is also important. Significant cumulative environmental impacts from dark thermal masses of non-permeable material such as asphalt parking lots and black rooftops include the divergence of large volumes of unfiltered rainfall, mixed with petroleum and other pollutants, directly into tributary waters that supply public drinking water resources and contribute to declining water quality. Retrofitting surface parking lots with permeable pavements allows rainfall to filter through the surface, a process that removes pollutants and contributes cleaner water to subsurface water supplies (aquifer recharge). Through 'greening' inactive urban spaces, or moving toward the use of high albedo (highly reflective) materials in urban structures, summertime urban temperatures and cooling costs can be reduced, and the survival rates of urban trees increases. Urban infill can include the addition of trees which improve air quality, reduce symptoms of some respiratory diseases, increase quality of life, and support biodiversity.[4] In the warming environment of the years ahead, cities, and those who live, work, and play in cities will benefit from the reactivation of vacant or inactive urban spaces through infill and strategic green retrofits.

Urban infill and re-development opportunities are the new frontier of sustainable land use and community planning. Major players in this arena include municipally-based community development offices, non-profit organizations such as Housing Visions, and local real estate developers.

b) Implement a regional pedestrian and bicycle trail access program.

Central New York features ideal geography for bicycling, and it has been noted by cyclists that the region has the potential to draw cyclists from around the world to tour the scenic region. Currently the region has only approximately 12 miles of bike lanes,



Onondaga Lake Loop the Lake Trail (Source: The Post Standard)

sharrows (arrow placed in the center of a travel lane to indicate that a bicyclist may use the full lane), and cycle tracks (separate bicycle facilities that run alongside a roadway). The development of "recreational corridors" with coordinated pedestrian and bike infrastructure and programmatic linkages between urban and rural centers, and recreation-related land uses and events could capitalize on the region's inherent strengths and catalyze a new sector of economic growth across the region. A connected network of natural, historic and cultural resources and public access as part of a regional recreational development network should be coordinated with conservation planning for open space, scenic resources, viewshed protection, improved bike routes, and coordinated and attractive wayfinding.

The connecting 15-mile link of the Erie Canal National Heritage Corridor Multi-use Trail between Camillus and DeWitt should be implemented through the City of Syracuse, with connections to a completed Onondaga County Loop the Lake Trail, the NYS Fairgrounds, and Onondaga Creekwalk. Land use planning and development for specific touring corridors such as a scenic southern hills recreation corridor connecting hamlets, hiking trails, state and county parks, festival sites and events from downtown Syracuse to Tully, for example, would establish individual legs of a regional network. This kind of planning should encourage scenic corridor protections, bike touring infrastructure and services, event promotions, hamlet revitalization, B&Bs and other low impact recreation-related economic development. The Oneida Community Pedestrian Trail would construct 10.5 miles of multi-use trail around and through the heart of downtown Oneida mostly along city-owned rail bed corridors and connect to the Village of Wampsville to the west and the Village of Sherrill to the east as well as to Oneida High school, parks and the City's downtown. Linking trail projects such as this with public access areas for waterfront recreation along the region's many lakes would substantially increase the economic development and quality of life benefits of bicycle and pedestrian trails. The NYS Canal Corp., the NYS Office of Parks and Recreation, and county-based parks departments can help facilitate development of these resources.

c) Implement a regional main street revitalization program.

Central New York has a legacy of compact settlement centers that provide a strong foundation for sustainable development initiatives. Historic settlement patterns featured a concentrated mix of uses, including residential uses, centered in cities and villages with a population density much greater than surrounding towns. This historic settlement pattern resulted in central business districts in the region that still account for a substantial share of metropolitan employment with the region's largest employers in close proximity to a high concentration of affordable housing and highly accessible public transportation. This is a healthy pattern of development that accounts in large part for the scenic rural-agrarian character the region's residents enjoy, and one that can be reinforced through the implementation of main street revitalization efforts. Although there are downtown areas in the region that are currently experiencing economic growth and revitalization, many Central New York main streets in cities, villages, and hamlets are facing significant vacancy issues, and a continuing decline of core downtown environments and population. Main street housing stock in the region is often in need of significant repairs that could be supported through local and state policies that incentivize housing rehabilitation and mixed use development coupled with energy- and location-efficiency.

With the proportion of the population over age 65 in Central New York expected to significantly increase over the next two decades along with the desire to age in place, the need for community-centered, affordable and accessible housing options and local supportive services is critical. Revitalization of the region's main streets, including housing for all demographics, maximizes the value of existing infrastructure. It also allows households to save on transportation costs while reducing environmental impacts. Repurposing existing buildings and developed sites can catalyze needed community development and enhance economic competitiveness. A collaborative technical assistance program that would inventory and incentivize priority main street redevelopment and reuse projects could begin a renaissance of Central New York main streets and inject new life into communities.

d) Assist communities with the implementation of a smart growth regulatory and incentive program.

Land use strategies that will contribute to long-term sustainability and help Central New York communities retain, improve, and pass along a high quality of life to future generations, are employed through thoughtful development in terms of spatial pattern, structure, scale, and relational processes. Because spread-out, low den-

sity development cannot be accessed easily or affordably by alternative transportation, it leads to ever increasing VMTs, the result of which has been increased CO_2 warming our atmosphere, reductions in air quality, and declining public health; yet this type of development persists in the rural reaches of Central New York Towns. In Onondaga County, between 1960 and the year 2000, the urbanized area around the City of Syracuse doubled from 61 square miles to encompass 122 square miles with just 10% population growth. Compact development that leads to a smaller footprint of developed land and creates interlinked paths and trails to facilitate more walking and bicycle use, can be achieved through the implementation of land use tools such as conservation subdivision design requirements, purchase or transfer of development rights (PDRs, TDRs), incentive zoning, planned unit development, overlay zoning, and prioritized infill development.[6] Introduction and incentives for the use of smart growth regulatory tools will help to limit the growth of low density development and the accompanying expansion of costly infrastructure and loss of farmland.

Well-conceived land use regulatory tools ensure significant benefits to communities through access to clean water, safe roads, protection of valued community character and property values, and the expansion of the tax base. These are powerful incentives for progressive planning and development instruments, and good local land use regulation. Proactive land use efforts taken by local governments entrusted with the authority to regulate land use not only assure the protection of public health, safety and welfare, but can also manage the development of land in a community in a way that brings new economic and cultural benefits to the community. Key to these efforts is establishing zoning, subdivision regulation, or site plan review that is well-suited to a particular community's needs; encouraging a healthy mix of land uses like residences over shops in downtown locations; and special purpose zoning controls that promote particular community development goals.

A demonstration design project for a wetland treatment system that supports a hamlet-centered reuse project at a rural hamlet center such as Locke in Cayuga County, or La Fayette in Onondaga County, could kick-start the kind of community-centered sustainable development many small rural municipalities are struggling with due to their lack of public sewer infrastructure. A region-wide "Circuit Rider" technical assistance program to assist municipalities with Comprehensive Planning and updates to existing, and new land use regulatory frameworks would be an effective approach to implementation of local smart growth policies. To help with this effort, communities can access resources from the NYS Department of State, the NY Planning Federation, Pace University, and county planning departments.

e) Support a regional natural area conservation protection program.

Sustainability in the region depends on open space conservation; reestablishing interconnected green and blue networks that allow wildlife migration, habitat protection and biodiversity; and universal public access to natural resources for low impact recreation. Projects to connect, buffer, and expand State forests and wildlife areas and water resources through the implementation of conservation districts, agricultural best management practices, and linkages between regional natural resources through low impact blueway (water trails), greenway trails, and public access to waterfront areas will advance regional conservation goals.

Aside from the intrinsic value and beauty of healthy forested lands, trees in the landscape provide valuable ecosystem services in the form of clean, oxygen-rich air, maximum filtration of pollutants in the atmosphere and pollutants and sediments in stormwater runoff. These natural services support human health and a diversity of life in the region with critical habitat support for a diversity of species. The forests and wetlands of Central New York serve as carbon sinks that offset a significant portion of the region's greenhouse gas emissions. Carbon sequestration strategies can be expanded to include vulnerability protections to assure continued forest species diversity and health. A diverse and healthy regional tree canopy is critically important for regional sustainability. Changing environmental conditions continually challenge our forests with new biological threats from disease and infestations like the emerald ash borer and the hemlock woody adelgid. As of 2012, the invader species that threatens our Hemlock trees is at the region's doorstep in Seneca, Tompkins, Tioga and Broome Counties.[5] Local land use regulatory measures that encourage tree inventories and vulnerability assessments focused on specific threats to species diversity and health, and ordinances that allow municipalities to deal with infested trees on private property will help to prevent public safety risks and other associated costs of devastating wide-spread tree losses that can occur suddenly.

Steep slope zoning protections, local tree preservation incentives, greenspace incentive zoning, no till farming, and conservation subdivision design process are all important land use tools municipalities can implement to include conservation priorities in their land use decision-making. A regional incentive zoning program to assist municipalities in establishing local watershed preservation overlay districts (buffer strips) delineated along agricultural land waterways would provide needed protection from pollution and eutrophication of some of the region's most valued water resources. Establishing local watershed preservation overlay districts (buffer strips) that will protect critical waterways such as Great Gully and Yawgers creeks at Cayuga Lake from agricultural runoff and sedimentation plumes is critically important sustainable land use practice.

Systematic conservation easement purchase programs should target and protect productive farmland, undeveloped lakeshore and steep slopes like southern Skaneateles Lake Forest, Bear Swamp Creek Corridor, and the regions many potential scenic overlooks such as along State Route 41 in Onondaga County. The region's only NYS Natural Heritage Area, Eastern Lake Ontario Barrier Beach and Wetland Complex should benefit from the development of a Master Plan for the Restoration and Protection of entire dune and wetland complex as defined by the NYS Natural Heritage Area designation, including the EPA funding priorities of invasive species eradication and stream bank restoration for high priority areas, but also multi-municipal land use planning, and educational and recreational program development.

In CNY there are a number of organizations engaged in natural resource conservation initiatives. Some of the more notable players include the NYS DEC, the Nature Conservancy, the Finger Lakes Land Trust, the CNY Land Trust, and Ducks Unlimited.

f) Develop a regional recreation and cultural heritage protection program.

Central New York has a strong foundation for sustainable land use and community development in its traditional settlement patterns, abundant forested lands and natural areas, pristine lakes, streams, and prime farmland. The region is also home to a rich cultural history associated with the development and use of the Erie Canal, agriculture, and early abolitionist and women's rights movements. Planning for future preservation of existing historic places and downtowns must include their transformation into vibrant areas that draw visitors from near and far. Land use policy that encourages historic preservation, place-making initiatives linked to recreation opportunities, and compact mixed-use development is key to regional sustainability and critical to retaining and attracting residents and workers.

Historic buildings, sites, and neighborhoods form the core of economically stable and attractive areas that make an important contribution to the quality of life in Central New York. The Certified Local Government (CLG) program, administered by NYS Historic Preservation Office (SHPO), helps communities protect, preserve and celebrate their historic resources by assisting communities to achieve their preservation goals through the development of an action plan. CLGs are eligible to receive a variety of services from the SHPO, including technical preservation assistance and legal advice, assistance in identifying properties that may be eligible for listing in the State and National Registers of Historic Places, training opportunities that increase the ability of communities to protect their historic resources and integrate them into short- and long-term planning initiatives, and participation in grants that are designed exclusively for CLG projects. Growing the number of CLGs in Central New York will assure that necessary planning tools are in place for municipalities to benefit from historic preservation opportunities.

With an abundance of hiking trails and scenic roadways including NYS Route 3 Scenic Byway—The Seaway Trail, and NYS Route 13 Scenic Byway—The Revolutionary Trail, and other scenic routes such as NYS Routes 41, 13, 80, and U.S. Route 20 National Scenic Byway, there is a unique opportunity in the region to interlink sight-seeing and touring opportunities across the region from biking to scenic drives. Without protections from the negative impacts of poorly conceived development, the region's scenic byways are at risk. A regional Recreation and Heritage Plan would lay the groundwork for preservation of the region's rural-agrarian landscape setting and a connected network of natural, historic and cultural resources and recreational public access as part of a regional greenspace and heritage tourism development network.

Such a plan would map optimum development areas with conservation planning for open space, scenic resources and corridors with viewshed protection, and bike routes. The National Parks Service Finger Lakes Water Trails & Water Access Planning project should be linked to the eastern Finger Lakes communities in Central New York and implement safe, well-designed recreational boating infrastructure, and improved public access to the region's key waterbodies (i.e., Owasco Lake in City of Auburn and Town of Scipio, Otisco Lake, the Oswego River and Lake Ontario). The Erie Canal National Heritage Corridor Multi-use Trail between Camillus and DeWitt with connections to the Onondaga County Loop the Lake Trail, the NYS Fairgrounds, and Onondaga Creekwalk are important components of such a plan. The Sherwood Equal Rights National Historic District, in southern Cayuga County should have the benefit of a Preservation Master Plan to protect the unique rural historic hamlet.

To facilitate the development of this program the CNY RPDB should work closely with county planning departments and municipally-based community development offices. These efforts must be closely coordinated with the NYS Historic Preservation office, NYS DEC, and local preservation interests.

g) Support a regional agriculture land protection program.

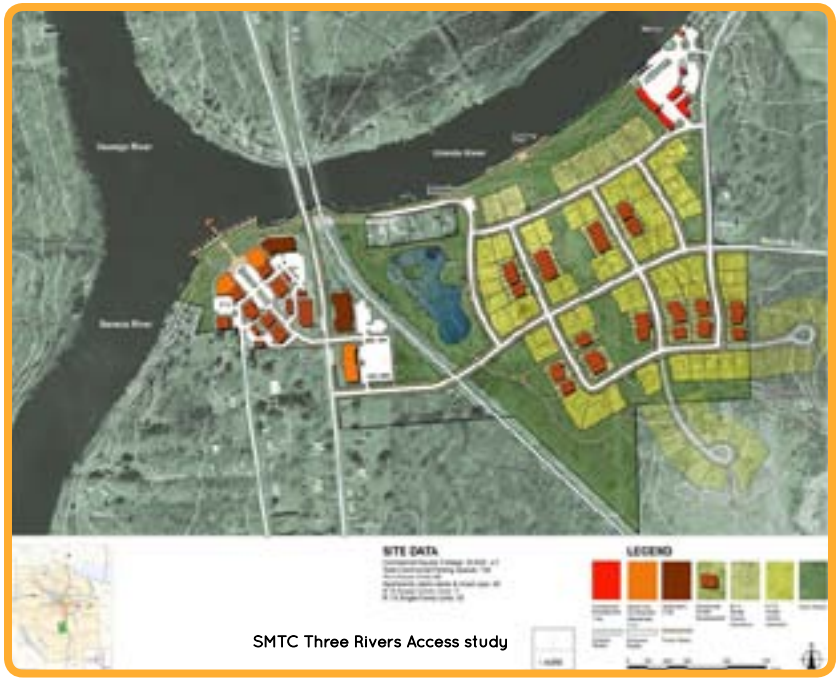
Agriculture is a pillar of the Central New York economy and rural character, both highly valued by Central New York residents. A regional agricultural land protection program should seek to achieve no net loss in the region's farmland. There are currently 25 agricultural districts in the five county Central New York region. One of the most important benefits of the Agricultural Districts Program is the opportunity provided farmland owners to receive real property assessments based on the value of their land for agricultural production rather than on its development value. Farmers receiving agricultural assessment in New York State collectively save over $70 million annually.

Protecting prime agricultural soils and productive agricultural operations that employ environmental best management practices must be a priority land use concern in the region. To protect and grow the region's capacity for sustainable agriculture and local food resources, municipal governing authorities must have land use planning guidance and access to ag-supportive land use tools such as local Conservation Advisory Councils, agricultural business (AB) districting, buffers to incompatible uses, purchase or transfer of development rights (PDR, TDR) programs, regional food hub opportunities, and local agriculture market incentive programs. Preservation of Central New York farmland can be best accomplished through the development and implementation of local municipal farmland protection plans that identify designated growth areas, inventory existing farms, agricultural assessments, zoning and subdivision regulations, and establish Town Agricultural Advisory Committees to help implement these plans. In addition, communities should enlist the assistance of Cornell Cooperative Extension Offices, county planning departments, and the farm bureau. Additional assistance in this effort is available from the NYS Department of Agriculture and Markets.

h) Implement a comprehensive brownfield redevelopment program.

A brownfield site is any real property where the redevelopment or reuse of the land may be complicated by the presence, potential or perceived presence of a contaminant such as hazardous waste and/or petroleum. Brownfields blight communities and pose both health threats and obstacles to economic redevelopment. Urban land that remains unused for these reasons and unproductive in terms of job creation, revenue generation, or contribution to the tax base leaves communities with a fiscal burden. Cleaning up and reinvesting in brownfield properties protects the environment, reduces blight, and takes development pressures off of greenspaces and working lands in the region. Regulation, environmental cleanup and safe brownfield redevelopment is accomplished through programs of the NYS DEC's Division of Environmental Remediation. In the last ten years of the State's Brownfield Cleanup Program, only 114 sites have been remediated with the benefit of $1 billion in tax credits.

A more comprehensive brownfield redevelopment program is needed to assure that the many remaining brownfield sites in communities across the region, especially in struggling neighborhoods, can also be addressed. The communities most in need of investment and cleanup, with unemployment levels of over 10% and family poverty rates above 20%, in particular must be targeted for the benefits of brownfield redevelopment. Currently,



SMTC Three Rivers Access study

brownfield tax credits are refundable, allowing the state to cut a check for the remaining amount once taxes owed are deducted. Tax credits can be claimed for up to five years for remediation and up to 10 years for costs related to redevelopment and total millions of dollars. The Brownfield Cleanup Program could be more effective for more broadly distributed community redevelopment efforts if eligibility for the Brownfield Cleanup Program was not tied to eligibility for tax credits. Incentives should be targeted to focus on neighborhoods in need with eligibility criteria to include conformity to a Brownfield Opportunity Area Plan, location in an environmental zone, or inclusion of affordable housing or energy efficiency components.

As a part of brownfield redevelopment efforts, it is also critical to reduce the footprint area of development, including impermeable surfaces like roads and parking lots. Re-growth and development can occur sustainably through the recovery of brownfields that increases land area dedicated to green infrastructure systems that mitigate stormwater pollution and the potential for downstream flooding events. Onondaga Lake Honeywell Lakeshore Development continued brownfield cleanup and enhancements to the lakeshore along Onondaga Lake will allow more public access, and return historically contaminated property to community use. The Clay Three Rivers Waterfront Redevelopment Waterfront Revitalization plan, recently completed, includes brownfield redevelopment with several suggested projects including enhancements to waterfront access and redevelopment of several parcels for commercial and residential use.

i) Support an ECNHC waterfront revitalization program.

A regional program to catalyze revitalization of Erie Canalway National Heritage Corridor communities could identify key opportunities to re-establish the regions historic waterfront communities as valued components of an up and coming world class recreation and heritage tourism region. Especially in densely populated communities with sustained physical deterioration, decay, neglect, or disinvestment, or where a substantial proportion of the residential population is of low income or is otherwise disadvantaged and is underserved with respect to the existing recreational opportunities, revitalization is critical. Planning for waterfront revitalization, amenities, recreation and heritage development to be established in these communities should place an emphasis on preservation and the addition of public space and universal accessibility.

The Erie Canalway National Heritage Corridor Preservation and Management Plan notes that the protection and enhancement of the natural, cultural, recreational, and historic resources along the corridor requires regional mechanisms to promote investments that respect local character and identity and contribute to placemaking. The success of the Erie Canalway National Heritage Corridor will bring together public and private investments to reinforce each other, increase individual competitiveness, and advance the region. Some examples of opportune ECNHC waterfront revitalization efforts in the region include **c**omplete waterfront improvements in the Village of Brewerton to remove barriers and enhance public access to the waterfront; Oswego Midtown Plaza Redevelopment plans for 68,000 square feet in mixed-use commercial and residential at a critical location in the City adjacent to the riverfront. There is also potential for a cooperative regional redevelopment initiative and masterplan for the Oswego Canal corridor, from the City of Oswego to Onondaga Lake. This could be accomplished through collaborative partnerships with local municipalities, the NYS Canal Corporation, and the Erie Canal

National Heritage Corridor Commission. Such efforts can be targeted to abandoned industrial sites, improving the quality of the undeveloped areas with recreational areas, hiking and biking trails, art, and natural areas linking diverse components of a green corridor that follows the former industrial canal and rail lines.

j) Promote municipal adoption of a complete streets program.

Complete streets are roadways with their rights-of-way that are designed to provide for safe and convenient travel and crossings by users of all ages and abilities including pedestrians, bicyclists, motorists and transit riders. Complete streets policies are recognized as an important element in achieving the region's sustainable land use goal. In the City of Syracuse, the "Connective Corridor" project, referred to as a signature strip of cutting-edge cultural development connecting University Hill with downtown Syracuse, represents the first "complete street" project to be implemented in the region. Syracuse's Connective Corridor project, currently extending from University Ave. to Almond St., uses a complete street strategy to create a 'Civic Strip' with facilities to promote bike, pedestrian and transit movement together with art installations, creative lighting, public space improvements.

Throughout the region, the local adoption of policies that provide a planning and political framework for using transportation investments to ensure that rights of way are routinely designed and operated to enable safe access for all users is important to ensure long-term construction and maintenance savings, public safety, health, economic and quality of life benefits. Complete streets policy frameworks and mechanisms for their implementation need to be better understood by local governing authorities. In addition, related benefits to communities of implementing complete streets policies can be maximized through comprehensive downtown master plans or corridor plans. One such strategy to enhance pedestrian and bicycle comfort and use, and create a more attractive and green streetscape and urban gateway, is the City of Oswego Route 104 Corridor Plan for a compete street design that will seek to improve the quality of life for downtown residents and workers, provide for more efficient and alternative modes of transportation, as well as develop safe routes to school along the corridor.



To properly implement a complete streets program, several departments at the State and local level must work cooperatively to target resources in selected locations around the region. These partnerships should include the NYS DOT, county- and city-based transportation departments, and local community development offices.

3. Alignment of Strategies and Targets

The following table illustrates the alignment of land use strategies and targets.

TABLE 36—Alignment of Land Use Strategies and Targets.

Strategies	TARGETS				
	1	2	3	4	5
	REDUCE THE AMOUNT OF LAND OCCUPIED IN CENTRAL NEW YORK ON A PER CAPITA BASIS TO 0.21 ACRES PER PERSON	INCREASE THE NUMBER OF ACRES OF CRITICAL CONSERVATION AREAS IN CENTRAL NEW YORK BY 25%	CREATE 50 NEW MILES OF DEDICATED CYCLE TRACKS ALONG MAJOR COMMUTING CORRIDORS BY 2030	REDUCE THE PERCENTAGE OF HOUSEHOLD INCOME SPENT ON HOUSING AND TRANSPORTATION COSTS IN CENTRAL NEW YORK BY 10%	SUPPORT ACTIVITIES THAT MAINTAIN THE CURRENT LEVEL OF FARMLAND IN THE REGION AT 815,000 ACRES
Short-Term Opportunities					
a. Implement a community-based urban infill program.	●			●	●
b. Implement a regional pedestrian and bicycle trail access program.			●		
c. Implement a regional main street revitalization program.	●			●	
Long-Term Initiatives					
d. Assist communities with the implementation of a smart growth regulatory and incentive program.	●	●		●	
e. Support a regional natural area conservation protection program.					●
f. Develop a regional recreation and cultural heritage protection program.		●		●	
g. Support a regional agriculture land protection program.	●	●			●
h. Implement a comprehensive brownfield redevelopment program.	●				
i. Support an ECNHC waterfront revitalization program.	●				
j. Promote municipal adoption of a complete streets program.	●		●		

ENDNOTES

1. Smart Growth America

2. CenterState CEO. Syracuse, NY Center City Investment Report. 2012 [Online] PDF.

3. The Central New York Regional Economic Development Council's *Strategic Plan 2012-2013*. http://regionalcouncils.ny.gov/content/central-new-york

4. Earth and Space Research, a Non-profit Research Institute, http://www.esr.org/outreach/glossary/albedo.html

5. New York Invasive Species, http://www.nyis.info/index.php?action=invasive_detail&id=24

6. NYS Legislative Commission on Rural resources, 2008 NYS Land Use Planning and Regulations



Pike Block, Salina Street, Syracuse, New York



Owasco Lake

Chapter 5: Environment

The natural environment provides the foundation for the sustainable development of a community and thus must be protected for future generations.

Evidence suggests that the global environment is deteriorating due to natural and man-made pressures including climate variability, population growth and rising consumption trends that are leading to over-harvesting of resources and the pollution of air, water and land. These environmental changes impact human livelihoods by reducing food security, increasing vulnerability to natural hazards and disease, and limiting opportunities for economic growth. Society is continually challenged by a number of complex and ever changing realities including:

+ Greenhouse gas emissions are having an increasingly detrimental impact on the atmosphere
+ Urban air pollution is a growing health concern, triggering or exacerbating respiratory and cardiac problems
+ The growing frequency and intensity of natural disasters is impacting the consistency of surface and groundwater quality and quantity
+ Aging water and wastewater infrastructure threatens the health of community water resources
+ Native species are becoming endangered or extinct
+ Wetlands are being drained and filled for development resulting in the loss of critical floodwater storage and water quality protection
+ Invasive species are being introduced at an ever increasing rate
+ Land degradation is accelerating and intensifying as a result of unsupported sprawl
+ Forest ecosystems are being degraded, fragmented and cleared
+ Urban centers are increasingly impacted by air and water pollution and solid waste disposal

There have been many efforts to protect and improve the environment over the past 70 years beginning with the passage important legislation. The Federal Water Pollution Control Act was enacted in 1948 to address point source water pollution that was threatening public health. The Act established a 55% cost sharing mechanism for the construction of wastewater treatment plants. This funding supported the construction of many wastewater treatment plants operating in CNY today. Following several amendments, the FWPA became known as the Clean Water Act (CWA) and was termed a "technology-forcing" statute because of the rigorous and successful demands it placed on

regulated dischargers to achieve increasingly higher levels of point source pollution abatement. In 1987, the focus of the Act was expanded to address nonpoint source water pollution.

Groundwater quality in NYS is monitored as part of a cooperative program between the New York State Department of Environmental Conservation (NYS DEC) and the US Geologic Survey (USGS) established under section 305(b) of the CWA. Each year, a total of 60 wells in two to three major hydrologic basins are sampled for bacteria, nutrients, inorganics, organics (including pesticides and VOCs), radiochemicals and a number of field and physical parameters. The annual program is jointly planned by NYS DEC and USGS and designed so that all major drainage basins in the state are monitored once every five years.[1]

The Great Lakes Critical Programs Act of 1990 (GLWQA) is an international agreement between the U.S. and Canada to reduce toxic pollutants in the Great Lakes. The GLWQA addressed localized environmental problems in Areas of Concern (AOCs) where significant pollution problems exist through individual Remedial Action Plans (RAPs) to address. Six Areas of Concern (AOCs) were identified in New York: Buffalo River, Niagara River, Eighteen Mile Creek, Rochester Embayment, Oswego River/Harbor, and St. Lawrence River at Massena. The Oswego AOC is the only U.S. AOC to have been delisted.

The Great Lakes Restoration Initiative (GLRI), enacted in 2009 is a federally funded, multi-year, multi-agency program that uses outcome-oriented performance goals and measures to target problems and track progress protecting, maintaining, and restoring the integrity of the Great Lakes. Eligible projects must address one of five core focus area identified in the 2010–2014 Great Lakes Action Plan: Toxic Substances and Areas of Concern; Nearshore Health and Nonpoint Source Pollution; Habitat and Wildlife Protection and Restoration; Accountability, Education,Monitoring, Evaluation, Communication and Partnerships; and, Invasive Species. GLRI represents the largest investment in the Great Lakes in two decades. GLRI annual funding for the past three years was as follows: 2010: $474 million; 2011: $300 million; 2012: $300 million.

Prior to 1975, New York had lost almost half of its historic wetlands. The loss of wetlands has slowed in recent years as the result of laws that prohibit draining and filling or require mitigation for losses due to development. At the Federal level, Section 404 of the Clean Water Act established the authority of the US Army Corps of Engineers (USACE) to regulate by permit, the discharge of dredged or fill material into water of the United States, including wetlands. The USACE uses the 1987 Corps of Engineers Wetlands Delineation Manual to identify wetlands for the Section 404 permit program.

The principal New York State regulations affecting development activities in and near wetlands is the Freshwater Wetlands Act (FWA). The Act regulates wetlands that are a minimum of 12.4 acres in size or which have been designated as being of "unusual local importance". The Act also regulates a 100-foot-wide buffer adjacent to these wetlands.

Other state laws that may apply to activities in or near wetlands include the State Environmental Quality Review Act (SEQRA), the Waterfront Revitalization of Coastal Areas and Inland Waterways Act, the Coastal Erosion Hazard Areas Act, and the Use and Protection of Waters Program. In addition, the New York Uniform Procedures Act applies to procedural aspects of the review and permitting process. The Water Quality Certification program requires NYS Department of State certification that federal permits meet state water quality standards.

In addition to addressing the nation's water resources, efforts have also been directed to issues concerning air quality in the United States. Initially enacted in 1963, the Clean Air Act (CAA) established funding for the study and cleanup of air pollution; however, it was not until the CAA was amended in 1970 that a comprehensive federal response to address air pollution was put in place. That same year, Congress created the U.S. Environmental Protection Agency (EPA) and gave it primary responsibility for carrying out the law. In 1990, the CAA was revised and expanded with an emphasis on cost effective approaches to reducing air pollution and the EPA was given broader authority to implement and enforce emissions regulations.

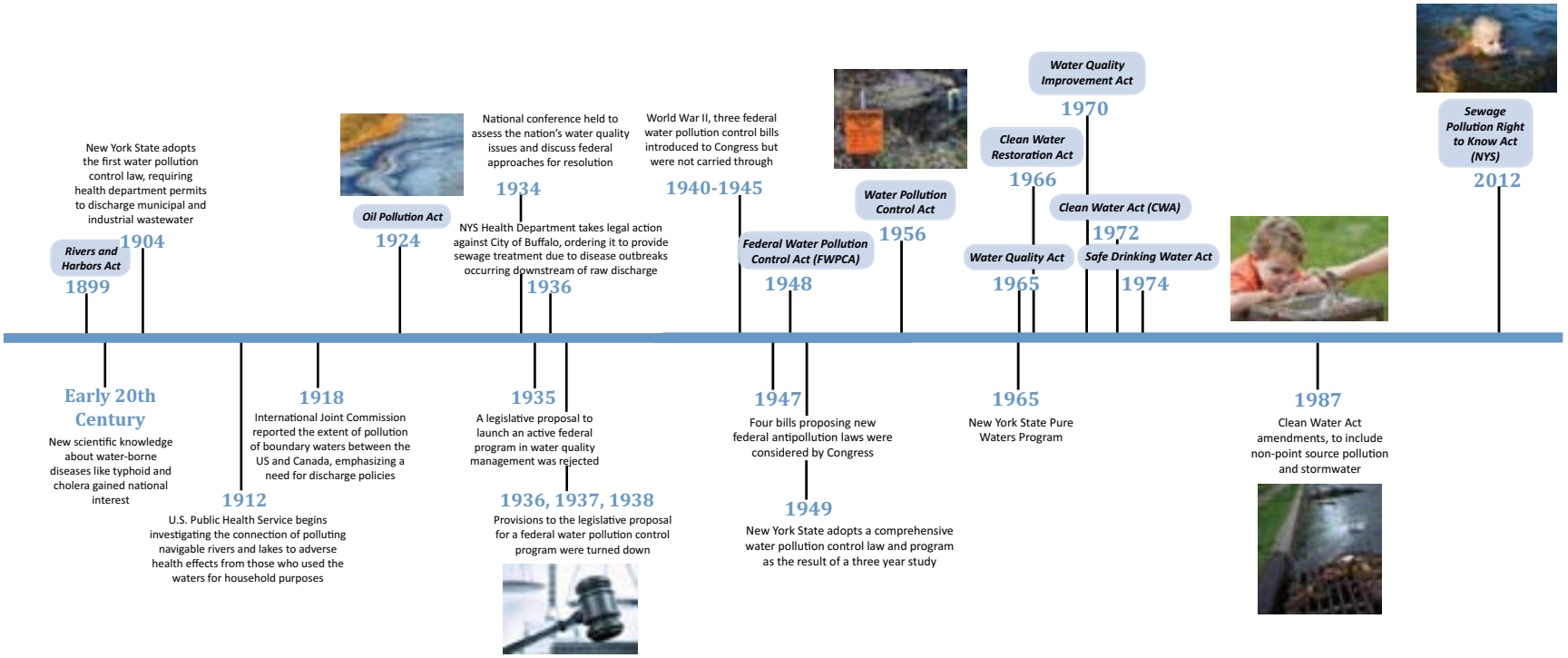
The CAA requires EPA to set health-based standards for ambient air quality, sets deadlines for the achievement of those standards by state

and local governments, and requires EPA to set national emission standards for large or ubiquitous sources of air pollution, including motor vehicles, power plants, and other industrial sources. The CAA mandates emission controls for sources of 187 hazardous air pollutants, establishes a cap and-trade program to limit acid rain, requires the prevention of significant deterioration of air quality in areas with clean air, requires a program to restore visibility impaired by regional haze in national parks and wilderness areas, and implements the Montreal Protocol to phase out most ozone-depleting chemicals.

Under the CAA, states are required to develop State Implementation Plan (SIPS) that outline how they will control air pollution using specified regulations, programs and policies. The NYS DEC Division of Air Resources administers the state air program. Under the NYS air permitting program, most large sources require a full air pollution permit, while smaller sources are covered by NYS DEC's air source registration program.

The disposal of hazardous waste poses significant threats to human health as well as the environment. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 was enacted in the wake of the discovery of toxic waste dumps in the 1970s. It allows the EPA to clean up such sites and to compel responsible parties to perform cleanups or reimburse the government for EPA-led cleanups. Superfund is the name given to the environmental program established to address abandoned hazardous waste sites. The

FIGURE 11–National and Statewide Wastewater Regulation Timeline



Source: Wastewater Management Handbook for Local Representatives, Second Edition,

Superfund cleanup process is complex and long term. It involves steps to assess sites, place them on the National Priorities List, and establish and implement appropriate cleanup plans. Invasive species infestations are a growing concern at the national, state and local levels.

A. EXISTING CONDITIONS

Situated in the heart of New York State, the 4,146-square-mile region is comprised of Cayuga, Cortland, Madison, Onondaga and Oswego Counties. Onondaga County is the center of the region and the most urban county, accounting for almost 59% of region's population. Each of the four counties surrounding Onondaga County has at least one large city surrounded by open and agricultural lands. The region is recognized for its abundant water resources, clean air, scenic vistas, forests, woodlands and natural wetland areas. The region's natural resources provide a variety of social and environmental benefits and recreational activities that support a robust tourism industry.

Nine Mile Creek



1. Water Resources in Central New York

Central New York's surface and groundwater resources adequately meet the collective municipal, residential, business and commercial water needs of the region, while supporting the local economy through recreational opportunities such as fishing and boating. Most lakes and rivers in the region are multipurpose waterbodies ranging from public water supply and wastewater assimilation, to recreation and hydroelectric power generation. High-yielding groundwater aquifers, such as those located in Cortland County and in the Tug Hill Plateau, serve as primary drinking water sources for many communities. More than 4 million acres of wetlands provide stormwater control and flood protection and serve as critical natural habitat for a diverse collection of plants and animals including many rare and endangered species such as the sand dune willow (Salix cordata) and the Massasauga Rattlesnake.

(a) Surface Water

There are 6,229 miles of streams and 104 lakes (with a surface area of 131,081 acres) within in the five-county region. The majority of the region's water supply is drawn from Lake Ontario and three Finger Lakes (Owasco, Skaneateles, and Otisco Lakes). Surface drinking water sources also include rivers, streams and ponds.[2] Approximately 60 million gallons of surface water is withdrawn per day to meet the domestic, industrial, agricultural and mining needs of CNY. Currently, there is a greater than 100% surplus in available public water.

Approximately 73% of the region's population is served by public water systems with 27% of the population on self supply. Table 37 shows the total water withdrawals by sector for region by county.

Per capita water withdrawals in the region increased by 6% between 1995 and 2005 primarily due to a significant increase in nonconsumptive withdrawals for thermoelectric production. Despite relatively small increases in industrial and irrigation withdrawals during that same period, total per capita consumptive withdrawals declined by 13% as shown in Table 38.[3]

TABLE 37–2005 Water Withdrawals Per Sector (MGD)[4]

County	Public Supply	Domestic Supply	Industrial	Irrigation	Livestock	Aquaculture	Mining	Thermo-electric
Cayuga	9.48	7.44	1.44	0.46	1.22	0.00	0.12	0.00
Cortland	5.00	4.46	1.68	0.22	0.59	0.00	0.22	0.00
Madison	1.93	5.31	1.47	0.53	0.92	0.11	0.20	0.00
Onondaga	115.91	56.42	19.80	2.08	0.77	0.78	0.93	0.00
Oswego	10.99	11.14	2.71	0.69	0.26	2.76	0.38	1,233.66
Total	143.31	84.77	27.10	3.98	3.76	3.65	1.85	1233.66
Percent of Total	9.5	5.6	1.8	0.3	0.3	0.2	0.1	82.1

Source: USGS, 2005

(b) Groundwater/Aquifers

The groundwater resources underlying CNY are significant. 36.6 million gallons of groundwater per day are withdrawn from 115 square miles of Primary and 676 square miles of Principal Aquifers to help meet the domestic, industrial, agricultural and mining needs of the region.

The Cities of Fulton and Cortland, in addition to a number of small village systems and many individual residences rely on groundwater as a primary source of supply. Groundwater is also is the source of base flow for most rivers and streams in the region (Map 24). Portions of two Sole Source Aquifers (SSAs), totaling 390 square miles, underlie the region—the Cortland-Homer-Preble (CHP) Aquifer System in Cortland County, and the Tug Hill Aquifer, in the north-northeastern portion of Oswego County. SSAs supply at least 50% of the drinking water consumed in the overlying area. Designation as a SSA provides additional review for projects at the federal, state and local levels to endure groundwater protection measures are built into the project.[5]

The CHP is the sole source of drinking water for approximately 30,000 residents in the City of Cortland, the Towns of Cortlandville, Homer, Preble, and Scott, and the Villages of Homer and McGraw. The overall quality of the groundwater is good, although there has been contamination of several private wells in the southwestern portion of the area by organic solvents. All public water supply wells meet or exceed State and Federal drinking water standards.

The Tug Hill Aquifer spans 47 miles in the western and southwestern area of the Tug Hill region including the counties of Jefferson, Lewis and Oswego. The northern section of the aquifer and its tributary system was designated as a Federal SSA in 2006. The Villages of Sandy Creek, Lacona and Pulaski, and the Town of Orwell in Oswego County rely on the Tug Hill Aquifer as the drinking water source for both municipal and private water systems.

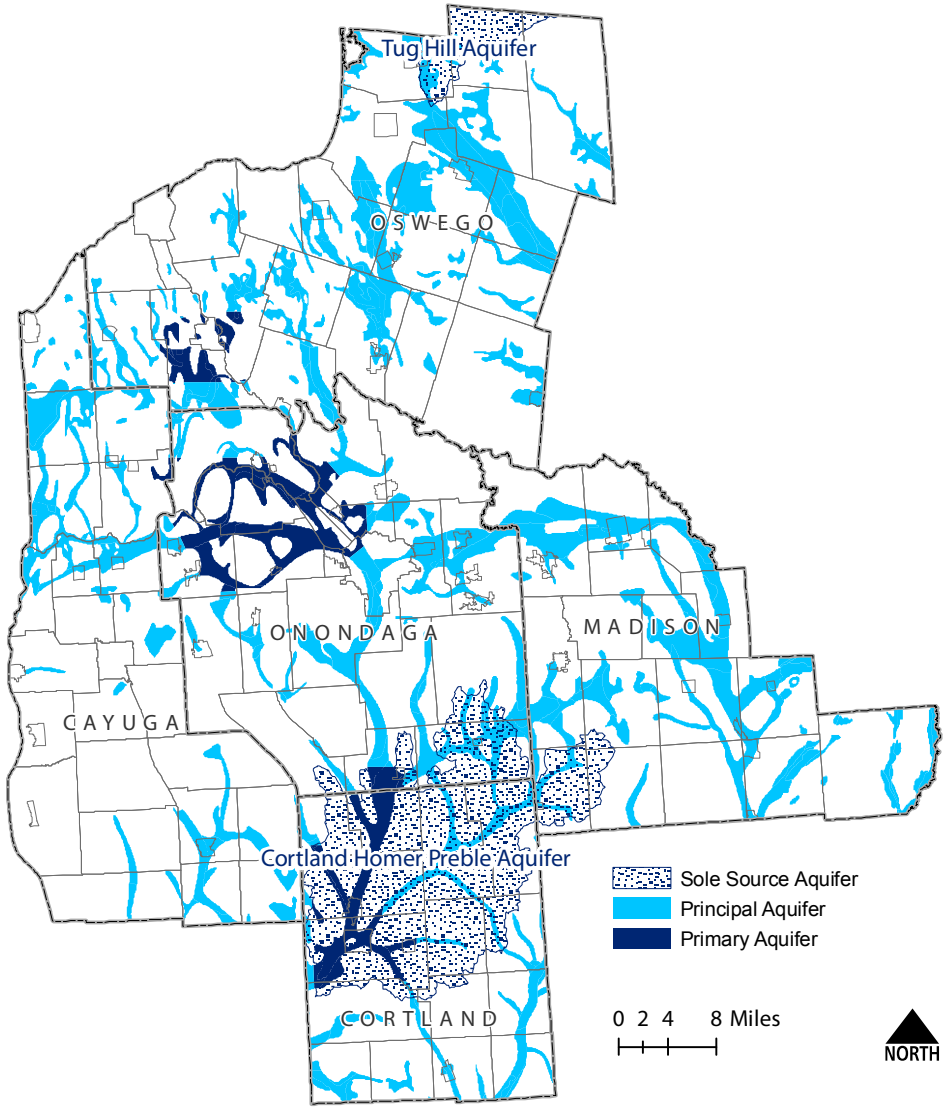
Key issues facing the Tug Hill Aquifer are impacts from withdrawal and significant development pressure especially in the northern portion due to the expansion of the Fort Drum military base. Several changes in withdrawal rates from the aquifer have occurred or are proposed,

TABLE 38–Per Capita Water Withdrawals by Sector 1995 and 2005[6]

Year	Population	Public Supply, (GPD)	Domestic, (GPD)	Industrial, (GPD)	Thermo-electric, (GPD)	Mining, (GPD)	Livestock, (GPD)	Irrigation, (GPD)	Total Per capita Water Use(GPD)
1995	799,140	227.74	21.12	21.92	1435.64	3.42	5.54	2.79	1,728.8
2005	781,839	183.30	20.16	34.66	1577.90	2.37	2.11	5.59	1,832.9
Change	-17,301	-44.44	-0.96	+12.74	+152.26	-1.05	-3.43	+2.80	+104.1

Source: USGS, 1995 and 2005

MAP 24–Groundwater Aquifers in CNY



Source: CNY RPDB

Primary Aquifers are highly productive and utilized as sources of water supply by major municipal water supply systems.

Principal Aquifers are known to be, or whose geology suggests abundant potential water supply but are not intensively used as a current source of water supply by major municipal systems.

Sole Source Aquifers are designated by the US EPA under the Federal Safe Drinking Water Act as the sole or main source of drinking water for a community.

including: the purchase of a defunct paper company's well to support expanded municipal water systems; a proposed water bottling operation plant; declining yields from an aging well field at the state fish hatchery in Altmar.

(c) Watersheds

CNY lies within three of the state's major drainage basins: Oswego River/Finger Lakes; Lake Ontario and Minor Tributaries; and the Susquehanna River (Map 25).

The Oswego River/Finger Lakes Watershed is one of the largest in the state and includes the drainages of the Oswego, Oneida, Seneca and Clyde Rivers. The watershed includes large portions of Onondaga, Cayuga, Oswego and Madison Counties, and a small part of Cortland County. Drinking water sources include Owasco, Otisco and Cayuga Lakes, as well as Skaneateles Lakes, one of the few unfiltered drinking water sources in the nation. There are 15 subwatersheds located within the CNY portion of the Oswego River/Finger Lakes Basin.

The Lake Ontario and Minor Tributaries Watershed is comprised of the smaller drainage area between the larger rivers that empty into Lake Ontario (Niagara, Genesee, Oswego and Black Rivers). Much of Oswego County and portions of Cayuga County are within the watershed which stretches along the Lake Ontario Shoreline. There are 8 subwatersheds located within the CNY portion of the Lake Ontario and Minor Tributaries watershed.

The Susquehanna River Basin is the second largest drainage basin east of the Mississippi River. The 444 mile Susquehanna River originates at Otsego Lake (Oneida County) and drains 27,500 square miles including Cortland County, portions of southern Madison County and a small portion of southern Onondaga County. There are 7 subwatersheds located within the CNY portion of the Upper Susquehanna River Basin.[7]

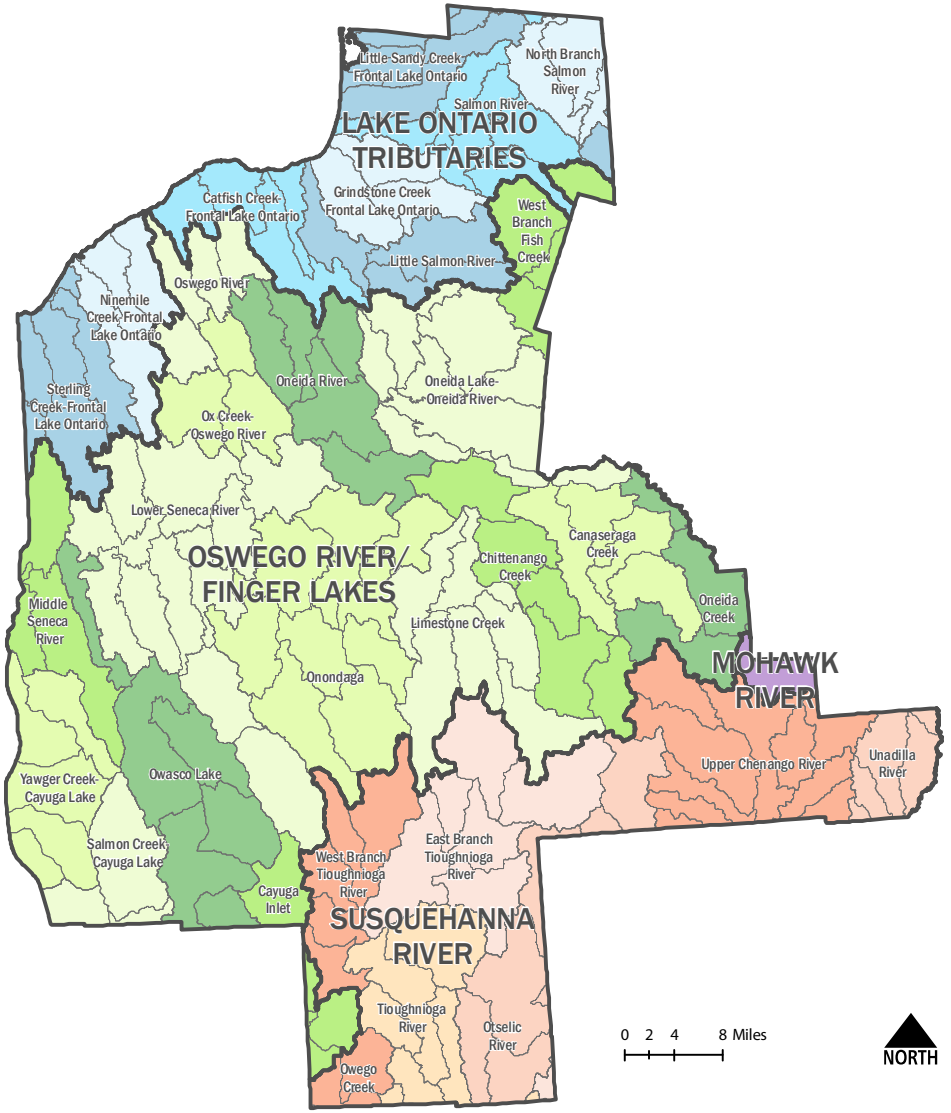
(d) Wetlands

Wetlands are transition areas between uplands and aquatic habitats that perform a number of valuable functions and provide significant ecologic and environmental benefits, including flood and stormwater control functions. While some wetlands function as groundwater discharge sites, others function as groundwater recharge areas that help to maintain base flow in streams and rivers, support ponds and lakes, and provide critical habitat for fish and wildlife, including many rare and endangered species. Wetlands comprise less than 5% of the region. Over half of the existing wetlands are concentrated in Oswego County as shown in Table 39.[8]

There are several notable wetland complexes in Central New York. Chittenango Creek runs through the 890 acre Nelson Swamp Unique Area in Madison County. Over 400 species of vascular plants (including the endangered striped coral root and threatened spreading globeflower) and 105 bird species have been cataloged in Nelson Swamp. The NYS DEC's Nelson Swamp Unit Management Plan includes specific objectives for habitat management, land conservation, public education, research and access for passive recreation.

The 8,000 acre Montezuma National Wildlife Refuge is located at the north end of Cayuga Lake in the middle of one of the busiest bird migration routes on the Atlantic Flyway. More than 240 species of birds, 43 species of mammals, 15 species of reptiles, and 16 species of amphibians have been documented on the Refuge. There is a current effort to restore and preserve expanded areas of the marsh into an area known as the Montezuma Wetlands Complex. The Complex is part of the North American Waterfowl Management Plan, an international agreement between the United States, Canada, and Mexico to restore, conserve, and enhance wetland habitats and waterfowl populations throughout North America.

MAP 25–Watersheds in CNY



Source: CNY RPDB

TABLE 39–CNY Wetland Distribution by County (acres)[9]

Classification	Cayuga	Cortland	Madison	Onondaga	Oswego	Total
Total Acres	27,117 / 6.0	2,481 / 1.0	13,479 / 3.0	47,281 / 9.0	93,911 / 51.0	184,269 / 5.0
(Acres/% of Total Land Area)						

Source: NYS DEC, 2012

Cicero Swamp Wildlife Management Area encompasses 4,747 acres in the northeastern portion of Onondaga County and is commonly used for birding, hiking, cross country skiing, and hunting. The NYS DEC manages the Cicero Swamp to provide food, cover and shelter for various wildlife species. The state regulates hunting, trapping, and fishing in the area through a permitting system in accordance with statewide regulations. Wildlife commonly found in the area includes white-tailed deer, squirrel, beaver, muskrat, raccoon, mink, fox, coyote, turkey, and the pygmy rattlesnake which is an endangered species in New York State. A diverse collection of songbirds is also found in the swamp, in addition to ruffed grouse, woodcock, and waterfowl.

The Bear Swamp State Forest is located on 3,316 acres in Cayuga County and is known for the large wetland and creek that bisect the forest. Bear Swamp is managed for multiple uses including habitat diversity, recreation, water, wildlife, and wood products. Over 13 miles of multi-use trails provide access for hiking, biking, cross country skiing, trout fishing and deer, turkey, rabbit, squirrel and ruffed grouse hunting. The state forest is the location of the highest point within Cayuga County at 1,860 feet.

The Three Mile Bay Wildlife Management Area is a 3,966 acre tract adjacent to Three Mile Bay at the north shore of Oneida Lake in Oswego County. Much of the area is lowland swamp with ridges extending across the interior. Many breeding and migratory species of waterfowl utilize Three Mile Bay during the spring and fall. Other water birds, shorebirds, white tailed deer, varying hare, ruffed grouse, squirrel, numerous songbirds, beaver, muskrat, fox and wild turkey are also present.

The Three Rivers Management Area is located on 3,607 acres in Onondaga County at the junction of the Seneca and Oneida Rivers, where the Oswego River forms. The area is managed to provide wildlife habitat and compatible public uses of the land. Since 1940, twenty-nine water units totaling over 250 acres have been constructed, including potholes and small marshes ranging in size from .5 to 5 acres, and one large marsh over 100 acres. Water levels are actively manipulated to encourage certain aquatic vegetation. Over 50,000 evergreens and shrubs have been planted to improve the diversity of habitat and to provide food and cover for wildlife. An annual system of prescribed burning is utilized to keep open fields from reverting to brush and trees. Development and management activities are funded primarily through hunting license fees and federal taxes on sporting arms and ammunition.

2. Water Resource Quality

(a) Surface Water

All waterbodies in NYS are assigned "best use" classifications based on their ability to support fish and aquatic wildlife, recreation, and, for some waters, public bathing, drinking water use or shell fishing. Water quality is considered to be Good if it fully supports its designated best use; Satisfactory if it fully supports its designated best uses, but with minor impacts; Poor (Impaired) if it does not support its designated best uses. Waterbodies for which insufficient data is available are classified as Unassessed.

Forty-one percent of the region's lakes and 57% of the stream miles have been assessed and generally found to be of good to satisfactory quality with only 8 lakes and 23 streams classified as being impaired.[10] There are 1,942 miles of high quality, oxygen rich trout classified streams in the region. The most common pollutants responsible for surface water impairments in CNY are nutrients, pathogens, silt/sediment/ and priority organics. Other known pollutants impacting lakes and streams in CNY are summarized in Table 40 and Table 41.

Agricultural and urban stormwater runoff are the primary sources of water quality impairments in CNY. High stormwater volumes and flow rates erode stream channels and banks. Introducing additional wet weather flows to combined and separate sanitary sewer systems increases the occurrences of overflows, which introduce pathogens, floatables and additional nutrients directly to surface waters in the form of raw sewage. Water quality impairments also occur as a result of failing on-site septic systems in some unsewered lakeshore communities, and toxic and contaminated sediments from past industrial and municipal point discharges.

Opportunities to reduce stormwater runoff at the source through infiltration, stormwater capture and storage exist throughout the region. Referred to as Green Infrastructure, structural and non-structural practices and wetland restoration efforts that use or mimic natural processes to infiltrate, evapotranspirate, or reuse stormwater where it falls keep rainwater out of the sewer system, thereby reducing the number of sewer overflows and the amount of untreated runoff discharged to surface waters.

Increasingly, green infrastructure techniques and technologies have been identified as best management practices at the local level, particularly in combination with traditional grey infrastructure, to achieve greater urban sustainability and resilience. For green infrastructure to be successful, it must be addressed at all scales, from the site specific and neighborhood, to the regional and watershed levels. It is important not to look at green infrastructure techniques in isolation, but to focus on their integration with grey infrastructure investments as a unified network that will deliver sustainable, cost effective benefits at scale over time.[11] The Onondaga County Save The Rain program provides excellent examples and templates for implementing simple and complex green infrastructure stormwater management practices at all scales.

Despite the numerous benefits green infrastructure can provide, many barriers continue to inhibit its wide-scale implementation, including: deficiency of data demonstrating benefits, costs, and performance; lack of codes and ordinances that facilitate the design, acceptance, and implementation of green infrastructure; insufficient data and information regarding ongoing maintenance and operation costs and economic benefits; lack of funding coupled with poor coordination or integration of programs at all levels.

Section 303(d) of the CWA requires the development of remediation plans referred to as a Total Maximum Daily Loads (TMDL) for water

OSWEGO RIVER AREA OF CONCERN

On July 21, 2006, the Oswego River, New York Area of Concern (AOC) became the first United States AOC to be formally delisted. The Oswego River is one of 43 Great Lakes "Areas of Concern" for which Remedial Action Plans (RAPs) were developed in the late 1980s to address water quality impairments. RAPs identify activities necessary to restore and protect beneficial uses by applying use impairment indicators developed by the International Joint Commission (IJC). The RAP Process identifies the sequence of necessary remedial measures needed to address goals and objectives. A Remedial Advisory/ Action Committee (RAC) consisting of a diverse group of community stakeholders and citizens assures that the process responds to local interests and concerns.

The Oswego RAP targeted impairments involving fish consumption, fish habitat and populations, and eutrophication and algae. Through public participation, investigative studies, expert involvement and assessment efforts, pollution reduction activities to address hazardous waste sites, point and nonpoint water discharges, watershed best management practices, and local agency river corridor enhancement activities have addressed the indicators and beneficial uses for the Oswego AOC.

There is a true success story behind the delisting of the Oswego River Area of Concern. Historically, the Oswego watershed was a significant source of contamination. By taking an ecosystem approach, the RAC has accomplished the community's recognition of the importance of this area as a natural resource and thereby encouraged others to act responsibly to restore and to protect the environment and the beneficial uses of the waters. The RAC stakeholders have identified, influenced, and observed the implementation of many supportive activities in the Oswego watershed. As a result, the status of each of the Use Impairment Indicators have been resolved, and significant impairments and/or threats to the AOC environment no longer exist.

TABLE 40–Impaired Lakes in Central New York[12]

Waterbody	Pollutants	Miles Impaired
Cayuga Lake (southern end)	Algae, nutrients, pathogens, silt	968.24
Lake Neatahwanta	Algae, nutrients, pathogens, dissolved oxygen, silt, salts	688
Little Sodus Bay	Nutrients, algae, dissolved oxygen, organics, pathogens, priority organics, pathogens, pesticides, silt	728
Lower Salmon River Reservoir	Pesticides, priority organics	208
Onondaga Lake (northern end)	Metals, nutrients, priority organics, pathogens, aesthetics, algae, dissolved oxygen, salts, silt	1,711
Onondaga Lake (southern end)	Metals, nutrients, priority organics, pathogens, aesthetics, algae, dissolved oxygen, salts, silt	1,277
Owasco Lake	Pathogens, nutrients, silt	6,799
Salmon River Reservoir	Silt, metals	2,572

Source: NYS Department of Environmental Conservation, Waterbody Inventory/ Priority Waterbodies List, 2012.

bodies that are too degraded to meet water quality standards (Table 42). TMDLs address all sources of the pollutant of concern and establishes maximum amounts of the pollutant each source can discharge. Waters identified on the 303(d) list are ranked in priority order.

Four CNY lakes (with a total surface area of 7,730.74 acres) and 2 rivers (totaling 150.6 stream miles) will require TMDLs.[13] (A TMDL for phosphorus is in effect for Onondaga Lake.) Although this represents a small percentage of the total surface water resource in CNY (2.4% of the total stream miles and 3% of the total lakes representing 6% of the total lake surface area), it should be noted that Owasco Lake, a pathogen listed 303(d) water, also serves as a public drinking water source for over 45,000 Cayuga County residents.

The 303(d) list also identifies waterbodies that are categorically impaired and may, due to their lower priority ranking, require a TMDL in the future. The categories of impairment are atmospheric deposition, fish consumption waters, and shell fishing (primarily restricted to waters located along Long Island). No Central New York waters are currently impaired as a result of acid deposition; however, fish consumption bans have been issued for several waterbodies representing 3.2% of the total stream miles and 2.4% of the total lake surface area in the region (Table 43). Fish consumption advisories are issued primarily as a result of PCB, mirex and or dioxin contaminated sediment as a byproduct of historic industrial and municipal discharges.

(b) Ground Water/Aquifer

There is relatively little groundwater quality data available through the NYS Groundwater Ambient Monitoring Program (Table 44). In general, groundwater quality is generally good statewide, but can vary significantly as a result of hydrology and land use. The most recent groundwater data for the 5-county region indicates that groundwater quality is generally acceptable to good for all uses; however, some constituents or bacteria exceeded at least one drinking water standard in all sampled areas. Regional threats to groundwater include pollution from inactive hazardous waste sites, pesticide application, animal feeding operations, on-site wastewater treatment systems, and chemical spills.[14]

(c) Watersheds

Water quality has been assessed for approximately 43% of river/stream miles, and 97% of lake, pond and reservoir acres in the Oswego River/Finger Lakes Basin and is generally rated satisfactory to good. There are two significant concerns in the watershed. The first is the impact of legacy pollutants from past industrial activities,

TABLE 41—Impaired Streams/Rivers in Central New York

Waterbody	Pollutants	Miles Impaired
Bloody Brook and Tribs	Pathogens, aesthetics, metals, priority organics, dissolved oxygen, thermal changes, unknown toxicity	6.0
Canastota Creek, lower and tribs	Dissolved oxygen, pathogens, aesthetics, nutrients	10.3
Chenango River, upper and minor tribs	Metals, nutrients, silt, unknown toxicity	86.4
Crane Brook and tribs	Nutrients, silt, salts	80.0
Geddes Brook and tribs	Aesthetics, metals, priority organics, nutrients, ammonia	12.4
Harbor Brook, Lower and tribs	Aesthetics, nutrients, pathogens, priority organics, dissolved oxygen, thermal changes, other pollutants, ammonia	5.0
Ley Creek and tribs	Pathogens, nutrients, aesthetics, priority organics, dissolved oxygen, unknown toxicity, thermal changes, ammonia, other inorganics	26.0
Limestone Creek, Lower and minor tribs	Silt, nutrients, dissolved oxygen, pathogens, aesthetics	49.5
Minor tribs to Onondaga lake	Dissolved oxygen, other inorganics, ammonia, nutrients, pathogens, aesthetics, metals, priority organics	7.4
Ninemile Creek, Lower and tribs	Nutrients, pathogens, aesthetics, metals, priority organics, ammonia	32.3
Onondaga Creek, Lower and tribs	Aesthetics, other pollutants, ammonia, nutrients, pathogens, unknown toxicity, metals, priority organics, silt, thermal changes	2.8
Onondaga Creek, Middle and tribs	Aesthetics, ammonia, nutrients, pathogens, un known toxicity, silt, salts, thermal changes, other pollutants	17.5
Onondaga Creek, Upper and tribs	Silt	110.5
Onondaga Lake Outlet	Nutrients, ammonia, unknown toxicity, metals, priority organics, dissolved oxygen	0.7
Oswego River, Lower, Main Stem	Metals, nutrients, silt, pathogens, priority organics	10.7
Owasco Inlet, Upper and tribs	Nutrients	25.2
Salmon River, Lower and minor tribs	Priority organics, pesticides	89.1
Salmon River, Middle and minor tribs	Priority organics, pesticides	35.7
Seneca River, Lower Main Stem (portion 1)	Dissolved oxygen, nutrients, ammonia, pathogens, priority organics	6.9
Seneca river, Lower Mani Stem (portion 2)	Dissolved oxygen, ammonia, nutrients, priority organics, pathogens, silt	23.0
Skaneateles Creek and tribs	Priority organics, nutrients	36.5
Unadilla River, Upper and minor tribs	Metals	14.2
Unadilla River, Middle and minor tribs	Metals	24.0

Source: NYS Department of Environmental Conservation, Waterbody Inventory/ Priority Waterbodies List, 2012.

TABLE 42–Individual Waterbody Segments with Impairments Requiring TMDL Development

Name	County	Municipality	Type	Class	Cause/Pollutant	Source	Year Listed
Lake Neatahwanta	Oswego	Fulton (C) Granby (T)	Lake	B	Nutrients (phosphorus)	Urban/storm runoff	1998
Pleasant Lake	Oswego	Schroeppel (T)	Lake	B	Phosphorus	Unknown	2010
Canastota Creek (lower & tribs)	Madison	Canastota (V) Lennox (T) Lincoln (T)	River	C	Oxygen demand	Municipal, CSO	2008
Owasco Lake	Cayuga	Niles (T) Scipio (T) Owasco (T) Fleming (T)	Lake	AA(T)	Pathogens	Wildlife/other sources	1998
Owasco Inlet (upper & tribs)	Cayuga	Locke (T)	River	C(T)	Nutrients	Municipal/ agriculture	2008
Duck Lake	Cayuga	Conquest (T)	Lake	C	Phosphorus	Unknown	2012
Onondaga Lake (Approved TMDL for phosphorus in effect)	Onondaga	Syracuse (C) Salina (T) Geddes (T) Liverpool (V)	Lake	B (north end) C (south end)	Phosphorus	Municipal, CSOs, urban runoff, agriculture	1996

Source: NYS Section 303(d) List, July 2012.

TABLE 43–Multiple Segment/Categorical Impaired Waterbody Segments (Fish Consumption)

Name	County	Type	Class	Cause/Pollutant	Source	Year Listed
Lake Ontario Shoreline	Oswego	Great Lake	A	PCBs, mirex dioxin	Contaminated sediment	1998
Salmon River (lower & minor tribs)	Oswego	River	C(T)	PCBs, mirex	Contaminated sediment	1998
Salmon River Reservoir	Oswego	Lake	C (T)	PCBs, mirex	Contaminated sediment	1998
Salmon River (middle & tribs)	Oswego	River	C(T)	PCBs, mirex	Contaminated sediment	1998
Oswego River	Oswego	River	B	PCBs	Contaminated sediment	1998
Onondaga Lake (north & south end)	Onondaga	Lake	C	PCBs, dioxin, mercury, other toxics	Contaminated sediment	1998

Source: NYS Section 303(d) List, July 2012.

municipal discharges and urban runoff on Onondaga Lake. Extensive remediation and water quality improvements that are underway are addressing these issues. The second concern is the protection of the Finger Lakes from various point and nonpoint sources of pollution. Although these impacts are less severe, they constitute a more widespread threat to water quality in the watershed. Other water quality concerns in the watershed are:

+ Municipal wastewater and combined sewer overflows
+ Agricultural and other nonpoint sources of nutrients
+ Contaminated urban stormwater runoff
+ Invasive aquatic plant and animal species
+ Protection of drinking water and recreational uses

Water quality has been assessed for approximately 53% of river/stream miles, 66% of lake, pond and reservoir acres, and 100% of Lake Ontario shoreline miles within the Lake Ontario and Minor Tributaries basin. Water quality is largely a reflection of water quality in Lake Ontario and the nearshore waters and embayments of the lake. The legacy of toxics discharged to the Lake and its tributaries result in fish consumption advisories for numerous species. Legacy industrial discharges are being remediated in Great Lakes Program Areas of Concern in Oswego, Rochester and Eighteen Mile Creek. While phosphorus levels in the open lake have declined over the

TABLE 44–Ambient Groundwater Quality in Central New York

Basin	Year	Results
Central New York	2007	Acceptable
Eastern Lake Ontario	2008	Good
Upper Susquehanna	2009	Acceptable

Source: USGS, 305b Groundwater Monitoring

years, nutrients and resulting aquatic plant growth continue to impact recreational uses in nearshore waters. Other water quality concerns in the watershed are:

+ Invasive aquatic plants and animals
+ Agricultural and other nonpoint sources of nutrients

Within the Susquehanna Watershed, approximately 33% of river/stream miles, and 77% of lake, pond and reservoir acres have been assessed and are generally rated as satisfactory. Most water quality impacts are the result of agricultural and other nonpoint sources which contribute nutrients and sediment to the waters. Municipal wastewater discharges (including combined sewer overflows) are concerns south of the region in and around the Binghamton-Johnson City area. Inadequate wastewater treatment in some rural areas including on-site septic and smaller community systems also contribute to water quality issues. Impacts from flooding are a concern in this area. Major water quality concerns in the watershed are:

+ Agricultural and other nonpoint sources of nutrients and various other pollutants
+ Rural community wastewater treatment and on-site septic in unsewered areas
+ Flooding impacts in the Southern Tier

(d) Wetlands

The quality of CNY's wetland resources is quite good based on the NYS DEC wetland classification system which classifies wetlands according to their ability to perform wetland functions and to provide wetland benefits. The NYS DEC wetlands Classification system establishes four separate classes that rank wetlands in descending order from Class I to Class IV. 89% of the total wetland area in the five-county region is comprised of high quality, Class I and Class II wetlands (Table 45).

3. Watershed Planning

Watershed planning (Table 46) is typically undertaken voluntarily for the purpose of restoring or protecting community resources. For example, Lake Neatahwanta in the City of Fulton suffers from nutrient enrichment resulting in toxic blue-green algae, excessive aquatic vegetation, high phosphorus levels, and poor water clarity. To address these problems, residents and community leaders of the City of Fulton and Town of Granby formed the Lake Neatahwanta Reclamation Committee in 1989. The Committee released the Lake

COOPERATIVE WATERSHED PLANNING IN THE SKANEATELES LAKE WATERSHED

Skaneateles Lake is the primary drinking water source for the City of Syracuse and several neighboring communities. The watershed of the lake contains widespread agricultural use and low-density residential development. The Skaneateles Lake Watershed Agricultural Program (SLWAP) was established in 1994, as an alternative to a costly filtration system required by the 1986 Amendments to the Safe Drinking Water Act. SLWAP is a voluntary program that encourages whole farm planning and best management practices such as nutrient management and erosion and sediment control. The program is administered by the Onondaga County Soil and Water Conservation District. In addition to SLWAP, the Skaneateles Watershed Land Protection Program arranges for preservation of lands that are critical to maintaining the lake's water purity. Cornell Cooperative Extension of Onondaga County implements a comprehensive public education and outreach program. The result of these efforts is continued use of the lake for drinking water by over 200,000 people, and a savings of $70 million in avoided cost for a filtration plant, along with another $7 million annually that would have been needed to maintain the plant.

Neatahwanta Restoration Strategy in 2001, and has been key in overseeing the design and implementation of agricultural best management practices to reduce phosphorus inputs to the lake with funding from the U.S. EPA.

Oneida Lake is a renowned recreational resource and major asset to the local and regional economy. Oneida Lake is generally of good quality, but pressure from a number of sources threaten its ecological integrity and could undermine its value as a resource. The Oneida Lake and Watershed Protection Program, initiated in 1997 by CNY RPDB, pooled the resources of citizens, local and state governments, and educational institutions from the 6-county watershed to form the Oneida Lake Advisory Council. Under their guidance, the Oneida Lake Management Plan was released in 2004. Since that time, the Advisory Council and numerous federal, state and local partners have implemented recommendations from the Plan, including invasive species control efforts, streambank stabilization projects, and public education programs. Improvement in several lake and watershed health indicators resulting from these efforts were documented in the CNY RPDB's 2011 *Oneida Lake Ecosystem Status Report.*

In some instances, watershed planning is mandated. The Onondaga Lake planning effort originated in 1988 with a consent judgment against Onondaga County for violations of the Clean Water Act and NYS Environmental Conservation Law. The consent judgment required reductions in ammonia, phosphorus, floatables, and pathogens discharged from the Metropolitan Wastewater Treatment

TABLE 45–Wetland Classifications by County in Central New York[15]

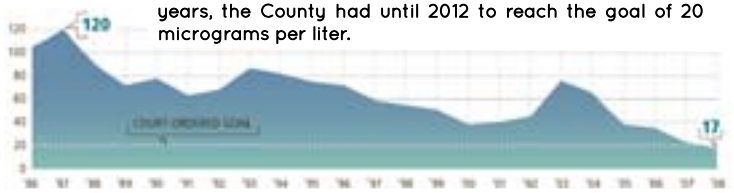
Classification	Cayuga*	Cortland*	Madison*	Onondaga*	Oswego*	Total*
Class I Acres	1,183 / 0.6	450 / 0.2	5,829 / 3.2	10,738 / 5.8	60,497 / 32.8	78,697 / 42.7
Class II Acres	19,689 / 10.7	1,956 / 1.06	7,222 / 3.9	32,047 / 17.4	24,934 / 13.5	85,848 / 46.6
Class III Acres	6,160 / 3.3	75 / 0.07	308 / 0.2	4,163 / 2.3	8,480 / 4.6	19,186 / 10.4
Class IV Acres	85 / 0.05	0 / 0.0	120 / 0.07	333 / 0.21	0 / 0.0	538 / 0.3
Total Acres	27,117 / 6.0	2,481 / 1.0	13,479 / 3.0	47,281 / 9.0	93,911 / 51.0	184,269 / 100.0
* Acres/% of CNY Total						

Source: NYS DEC, February, 2012

THE ONONDAGA LAKE CLEANUP

Phosphorous Concentrations in Micrograms per Liter

This graph shows the summer average of total phosphorus concentrations measured in the upper waters of Onondaga Lake. As part of a federal court order requiring Onondaga County to stop its sewage pollution of the lake over 15 years, the County had until 2012 to reach the goal of 20 micrograms per liter.



Source: Update Freshwater Institute, Syracuse/The Post Standard





Over $1.3 billion has been invested in the remediation of Onondaga Lake including $365 million by Onondaga County, $160 million in Federal funds and $30 Million in State funds for METRO upgrades, CSO elimination, treatment and storage facility construction and the County's Save the Rain program. Honeywell International has invested over $700 million for wetland remediation projects, the construction of an underground barrier wall and groundwater treatment plant, and the recently initiated lake bottom dredge and cap project. Phosphorus discharges to the lake from METRO have decreased by more than 80% since 2005, and ammonia discharges have been reduced by 98%.

Work is underway at Geddes Brook to transform 17 acres of land in the Onondaga Lake watershed into a diverse new habitat for wildlife. The remediated Geddes Brook will become part of a green corridor connecting habitat from Onondaga Lake to upland sites. The yearlong project will involve the removal of contaminated soil and invasive plants, and the planting of 50,000 native shrubs, flowers, and trees, which are critical to protecting and enhancing habitat for wildlife such as fish, birds, frogs, and turtles. By planting native species, re-establishing the wetlands, and improving habitat, the project will improve the ecosystem and play a significant role in creating a productive, healthy Onondaga Lake watershed.

Plant (METRO), combined sewer overflows, and other sources. In 1993, "Onondaga Lake: A Plan for Management was released by the Onondaga Lake Management Conference, later known as the Onondaga Lake Partnership. The plan outlined a strategy for addressing the issues affecting Onondaga Lake.

Two decades later, Onondaga Lake has made a remarkable recovery resulting from major improvements at METRO and numerous projects to retrofit the County's sewage collection system, including elimination of 22 combined sewer overflows, agricultural best management practices in the upper reaches of the watershed, and ongoing efforts of Honeywell International and others to remediate the industrial contamination in and around the Lake.[16]

Implementation of many management plans is overseen by watershed stewards who act as an interface between the public and jurisdictional entities. Watershed steward programs have been established through the City of Auburn to serve the Owasco Lake Watershed and through the Cayuga Lake Network to serve the Cayuga Lake Watershed. An Independent Environmental Monitor works under the direction of NYS DEC Region 7 to oversee Onondaga Lake remediation projects.

Public interest groups are also instrumental in advancing management plan objectives. The Oneida Lake Association (OLA), for example, actively addresses environmental issues impacting Oneida Lake including lake water levels, conservation legislation, public access, and water quality monitoring. The OLA was instrumental in securing funding for cormorant control programs and continues to seek long term cormorant control funding.

4. Air Resources in Central New York

Air is an inexhaustible natural resource. It is essential for the survival of all living organisms on earth. The quality of air varies as the result of pollutants emitted in association with human activities such as energy generation, manufacturing, and transportation. Air pollution can harm human health, the environment and the economy in a variety of ways including increased incidents of respiratory and nerve damage, reduced agricultural and forest yields, and increased number of lost work days due to illness.

TABLE 46–CNY Watershed, Lake, and Stream Corridor Management Plans

Name	Date
Lake Como Watershed Management Plan	2007
Duck Lake Watershed Management Plan	2005
Oneida Lake Watershed Management Plan	2004
Cayuga Lake Watershed Restoration and Protection Plan	2001
Owasco Lake Watershed Management Plan	2001
Skaneateles Lake Watershed Management Plan	1998
Cazenovia Lake Management Plan	2009
Lake Moraine Management Plan	2002
Onondaga Lake: A Plan for Action	1993
Lake Neatahwanta Diagnostic Feasibility Study and Management Plan	1991
Otisco Lake Management Plan	In development due 2013
Onondaga Creek Conceptual Revitalization Plan	2009 (draft)
Sucker Brook Streambank Management Plan	2003

Source: CNY RPDB, 2013

When air pollutants are deposited on the surface of the earth through acid deposition, they can result in acidification of lakes and streams, damage to sensitive forest soils and trees at high elevations, and accelerated decay of building materials and paints. While the natural environment of the CNY region is not particularly sensitive to acidity because of limestone deposits and soils which neutralize the acid, many areas of the state including the Adirondacks, the Catskills, Hudson Highlands, Rensselaer Plateau and parts of Long Island are sensitive to acid deposition where soil and bedrock are not able to counteract the acid.

The primary emissions responsible for acid deposition are sulfur dioxide (SO_2) and oxides of nitrogen (NO_X) from the combustion of coal, oil, and natural gas. SO_2 and NO_X interact in the atmosphere to form fine sulfate and nitrate particles that can be transported long

distances by winds or penetrate indoor environments. Studies have identified a relationship between elevated levels of fine particles and increased illness and premature death from heart and lung disorders, such as asthma and bronchitis.

State-wide air quality has improved significantly for all parameters. The NYS DEC attributes the improvements to a number of statewide, regional, and national initiatives that have reduced emissions from mobile and stationary sources. Air quality in Central New York is generally good as documented under the NYS Ambient Air Monitoring program at four CNY monitoring stations: western Oswego County (Fulton); Central Onondaga County (Syracuse and East Syracuse); and southern Madison County (Camp Georgetown). Monitored parameters are ozone, sulfur dioxide, inhalable particulates and carbon monoxide. Measured values indicate that Central New York meets all the National Ambient Air Quality Standards established for these parameters.

Ozone maximum one-hour, 8-hour average, and annual averages measured at the Camp Georgetown, Fulton/Granby, and East Syracuse stations are in compliance. Sulfur dioxide levels measured at Camp Georgetown and East Syracuse averaged over one-hour, three-hour, 24-hour and annual periods were well below standard limits. The maximum, 98th percentile, quarterly and annual average inhalable particulate levels measured in East Syracuse remained within the compliance range throughout the period. Carbon monoxide maximum hourly, 8-hour average and annual average measurements in Syracuse remained also were less than the standard limits.

Although all the parameters in CNY presently show attainment, ozone levels are currently near the limits of the existing standards. Ozone levels are affected not only by local sources of precursor emissions but also transport of precursors from upwind sources, including coal-fired power plants out of state, as well as by weather conditions such as the number of days with temperatures exceeding 80° F and number of days with stagnant winds. As a result, if the weather is unfavorable it is possible to again exceed the limits. Furthermore, the U.S. Environmental protection Agency has indicated its intent to lower federal attainment levels. Therefore, ozone warrants continued and increased attention.

TABLE 47–Major manufacturing facilities in CNY that are monitored by NYS DEC and the US EPA

- Anheuser Busch Baldwinsville Brewery
- Bristol-Myers Squibb Company
- General Chemical LLC
- Interface Solutions, Inc
- L & JG Stickley, Inc
- New Process Gear, Inc
- Novelis Corporation
- Nucor Steel Auburn, Inc
- Owens-Brockway Glass Container, Inc (plant #35)
- Spear USA
- Sunoco Fulton Ethanol Plant
- TGP Station 241 LaFayette

Source: US EPA Air Markets Data Program, http://ampd.epa.gov/ampd/QueryToolie.html, 2013

Sulfur dioxide levels were below threshold compliance levels throughout 2011 and have not exceeded the maximum allowed 30 ppb within the last 10 years. Inhalable particulate levels measured in East Syracuse remained within the compliance range throughout the previous three years (2009, 2010, 2011). Carbon monoxide levels monitored in Syracuse remained below the exceedance threshold throughout 2011. Annual arithmetic means values for CO at Syracuse have remained below 1 ppm for the past 10 years.

By reducing the amount of impervious surfaces through the use of tree plantings and green roofs, it is possible to reduce local air pol-



Electric car charging station

TABLE 48–Ozone Data 2001 to 2011[17]

Station	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Avg 2009-2011
Camp Georgetown (Madison Co) (Site 2655-01)	0.082	0.085	0.08	0.067	0.074	0.069	0.077	0.072	0.066	0.071	0.064	0.067
E. Syracuse (Onondaga Co) (Site 3353-09)	0.085	0.091	0.081	0.066	0.077	0.071	0.081	0.07	0.061	0.073	0.069	0.067
Fulton/Granby (Oswego Co) (Site 3754-01)	not avail	not avail	0.093	0.076	0.079	0.073	0.078	0.071	0.065	0.071	0.067	0.067
4th Highest Daily Maximum 8-Hour Average: Not to exceed an average of 0.075 ppm during the last 3 years												

Source: NYS DEC, Air Quality Monitoring Report, 2011

TABLE 49–Sulfur Dioxide Data 2001 -2011[18]

Station	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Camp Georgetown (Site No. 2655-01)	2.46	2.18	248	2.3	2.39	2.06	1.85	1.79	1.17	1.09	0.52
East Syracuse (Site No. 3353-09)	2.97	2.82	3.32	2.62	2.35	2.23	2.11	2.06	1.23	0.92	0.88
Annual averages 2001 to 2011 annual arithmetic mean (ppb) - Primary Standard (12-month average not to exceed 30 ppb)											

Source: NYS DEC, Air Quality Monitoring Report, 2011

TABLE 50–Inhalable Particulate Data 2001 to 2011[19]

Station	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
East Syracuse (Site No. 3353-09) Annual Mean (g/m3)	10.7	10.9	9.8	9.8	11.5	8	9.8	8.2	7.6	7.6	8.1
East Syracuse (Site No. 3353-09) 98th Percentile (g/m3)	35.3	38.5	22.7	24.6	34.8	19.2	31.5	22	21.2	22.5	24.1
Comparison Between NYS Ambient Air Quality and Ambient Air Quality Standards (Average of last 3 years= annual means not to exceed 15 g/m3 *; and average of 98th percentile.											

Source: NYS DEC, Air Quality Monitoring Report, 2011

TABLE 51–Carbon Monoxide Data 2001 to 2011[20]

Station	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Syracuse (Site No. 3301-22) highest 1-hr avg.	4.3	3.6	4.5	3	3.2	3.1	2.3	1.3	3.3	2.1	2.2
Syracuse (Site No. 3301-22) highest running 8-hr avg	2.5	2.4	2	1.6	2.3	2.1	1.3	1.1	1.3	1.5	1.4

Source: NYS DEC, Air Quality Monitoring Report, 2011

lution levels while simultaneously achieving other environmental and sustainability goals. Green roofs can filter air pollutants "including particulate matter (PM) and gaseous pollutants such as nitrogen oxide, sulfur dioxide, carbon monoxide, and ground level ozone. Researchers estimate that at 1,000 square foot green roof can remove 40 pounds of PM from the air annually, while also producing oxygen and removing carbon dioxide. Forty pounds of PM is roughly equivalent to the annual emissions of 15 passenger cars. The temperature benefits of green roofs extend to climate change mitigation as well. Vegetation and the growing medium on green roofs also can store carbon. Modeling has determined that green roofs may reduce building energy use for electricity consumption by 2% to 6% over conventional roofs, particularly for summer cooking. Carbon sequestration is estimated at 375 grams per square meter for green roofs.[21] The 60,000 square foot green roof at the OnCenter in Syracuse is one of the largest in the Northeast region. This self-sustaining system relies upon natural processes to retain and evapotranspirate stormwater runoff and require little maintenance.

5. Natural Resources in Central New York

(a) Forests

Although not evenly distributed, the combined urban and rural forest canopy of CNY covers approximately 44% of the region. The largest stands of unbroken forest lands exist primarily in the Tug Hill region to the north and in the Appalachian Uplands in the south. The top forest species are sugar maple, red maple, white ash, black cherry, hemlock, oaks, pines and other hardwoods. As these are not climax communities, the tree species will change and will affect the wildlife population over time.

In the deciduous forests, two major species of trees have virtually disappeared during the 20th century due to disease. The American chestnut and American elm both succumbed to fungal diseases. Other non-indigenous species, such as black locust and Norway maple, were introduced and rapidly colonized the voids left in the deciduous forests. The recent arrival in NYS of the Emerald Ash Borer, an invasive insect from Asia, virtually guarantees that ash trees, estimated to comprise between 8% and 20% of the regional forest canopy, will follow the same fate as the American chestnut and elm.

Eighty-nine percent of the forested land in Central New York is in private ownership, which presents a number of challenges to resource managers that are concerned with maintaining cohesive, well-functioning forest ecosystems. Stewardship efforts must be of sufficient scale to target large numbers of independent landowners responsible for managing small woodlots. Compared to owners of large tracts, owners of small forest parcels are less likely to manage their forests or allow access to their land by others for activities such as hiking, hunting, and fishing, and are less likely to seek professional assistance regarding all aspects of forest management.[22] Numerous studies have linked forest health to carbon absorption and recovery rates. Healthy, actively managed forests absorb carbon more quickly and efficiently than mature trees. It is estimated that through intelligent forest management principles and practices that emphasize thinning, restoration and replanting, nationally, our forests could offset 1.6 billion tons of CO_2 per year.

Currently it is estimated that fewer than 24,000 jobs rely on raw wood material from New York State's forests.[30] Within the 5-county region, there are only 10 primary wood products companies in operation including Baldwin Lumber in Cayuga County, Dutchess Lumber in Cortland County, Johnson Brothers Lumber in Madison County, Paradise Milling in Onondaga County, and Shutts Lumber in Oswego County.[31]

There are 34 secondary wood products companies in the 5-county region producing products that include cabinets, trusses, flooring, moulding, wood stove fuel pellets, pallets and toys. Secondary wood products companies include Universal Forest Products- Auburn in Cayuga County, McGraw Box Co. in Cortland County, Madison County Woodwork in Madison County, L.&J.G Stickley in Onondaga County and Harden Furniture in Oswego County.[32]

(b) Soils

Central New York soils are among the most productive and diverse in the state owing to the topological dichotomy between the Appalachian Plateau, the Lake Ontario Plain and the Tug Hill Plateau. Soil conditions range from alluvial bottomland soils and rich, saturated organic "muck" soils, to rich upland loams, and the rocky, nutrient-poor soils of Tug Hill. Soil fertility is generally the result of inheri-

tance from the parent material. Sandy soils are derived from geologic material composed primarily of quartz, which has no nutrient value. Silty and clayey soils may be derived from limestone or calcareous shales, which are comprised of nutrient-containing minerals. Some of the most fertile soils are derived from limestone which produce phosphorus rich soils, such as those found throughout Central New York. The level of naturally occurring phosphorus in most CNY soils is sufficient to support turf growth without additional supplements.

Central New York's soil resources support a strong agricultural industry. In 2007, 30% of the region's total land area was classified as agricultural.[23] Major farms in the region include dairy, livestock, fruit and vegetable. Major crops grown in the region include feed corn, oats, hay, onions, sweet corn and potatoes. The Madison and Oswego County mucklands are utilized for growing onions, sweet corn, and potatoes.

Soil quality is at risk from a number of threats driven by a range of man-made and natural pressures including climate change, land use change and land management practices. Once soil is damaged or contaminated it can be extremely difficult or impossible to restore. Construction development and agricultural activities that disturb soil surfaces can lead to compaction and expose soils to the erosive effects of wind and rain. Soil loss from agricultural operations is cited as a primary contributor to regional water impairments including nutrient enrichment, sedimentation, aquatic habitat loss and turbidity.

(c) Minerals

The Marcellus Shale is a natural gas-bearing black shale formation underlying approximately 18,700 square miles in New York State (Map 26). The Marcellus Shale is exposed in outcrops to the north and east and reaches depths of more than 5,000 feet in the Southern Tier. In CNY, Marcellus Shale is present from Cortland County through the southern portions of Cayuga, Madison and Onondaga Counties. The maximum depth of the Marcellus shale across most of CNY is between 1,000 and 2,000 feet, although depths increase to more than 2,000 feet below the surface in southern Cortland County. Marcellus Shale thicknesses range from 100 feet at the northernmost extent of the region, to as much as 200 feet in southeastern Cortland County. The formation is believed to contain nearly 84 billion cubic feet of

The Agricultural Environmental Management (AEM) program is funded by NYS DEC through the NYS Soil and Water Conservation Committee. AEM is a voluntary, incentive-based program that helps farmers make cost-effective, science-based decisions that meet business objectives while protecting and conserving the State's natural resources. Farmers work with local AEM resource professionals to develop comprehensive whole farm plans using a tiered process:

Tier 1 **Inventory** current activities, future plans and potential environmental concerns.
Tier 2 **Document** current land stewardship; assess and prioritize areas of concern.
Tier 3 **Develop** conservation plans addressing concerns and opportunities tailored to farm goals.
Tier 4 **Implement** plans utilizing available financial, educational and technical assistance.
Tier 5 **Evaluate** to ensure the protection of the environment and farm viability.

Regionally, participation in the AEM program is strong as summarized in Table 52; however, because AEM maintains a strong focus on dairy farms, participation in Oswego County is relatively low due to the high concentration of fruit and vegetable farms.

TABLE 52–CNY AEM Participation 2011

County	Number of Farms	Farms Enrolled in AEM (number)	Farms Enrolled in AEM (percent of county total)
Cayuga	936	397	42.4
Cortland	587	367	62.5
Madison	744	300	42.9
Onondaga	692	252	36.4
Oswego	639	106	16.5

Source: CNY RPDB, 2012

natural gas within the Appalachian Basin.[24] Most of the natural gas that can be extracted is at depths of 2000 feet or more.

The Utica Shale (Map 27) is located a few thousand feet below the Marcellus Shale. The Utica Shale is thicker than the Marcellus, and it is more geographically extensive underlying approximately 28,500 square miles in New York from the Adirondack Mountains to the Southern Tier and east to the Catskill front. Utica Shale ranges from less than 50 feet thick in north-central New York and increases eastward to more than 700 feet thick. The Utica Shale is exposed in outcrops along the southern and western Adirondack Mountains, and it dips gently south to depths of more than 9,000 feet in the Southern Tier of New York. Utica shale underlies the entire five-county region.

The Utica Shale contains approximately 38 trillion cubic feet of undiscovered, technically recoverable natural gas (at the mean estimate). Undiscovered oil estimates range from 590 million barrels to 1.39 billion barrels (mean of 940 million barrels). The estimate of NGLs ranges from 4 to 16 million barrels (mean of 208 million barrels). The Utica Shale assessment covered areas in Maryland, New York, Ohio, Pennsylvania, Virginia, and West Virginia.[26]

TABLE 53–Central New York Agricultural Resources 2007[25]

County	Number of Farms	Number of Acres in Farms
Cayuga County	936	249,476
Cortland County	587	124,824
Madison County	744	188,320
Onondaga County	692	150,499
Oswego County	639	100.195
CNY Total	3,598	813,314

Source: 2007 Census of Agriculture

The gas potential in the Marcellus and Utica shale formations was evaluated based on analysis of geochemical data from rock core and outcrop samples using methods applied to other shale gas plays, such as the Barnett Shale in Texas. As a result of the evaluation process, the gas productive "fairway" for each of the formations was identified. The fairway represents the portion of the shale formation most likely to produce gas based on specific geologic and geochemical criteria; however, other factors, such as formation depth, make only portions of the fairway favorable for drilling. Operators consider a variety of these factors, besides the extent of the fairway, when making a decision on where to drill for natural gas.[27]

(d) Fish and Wildlife

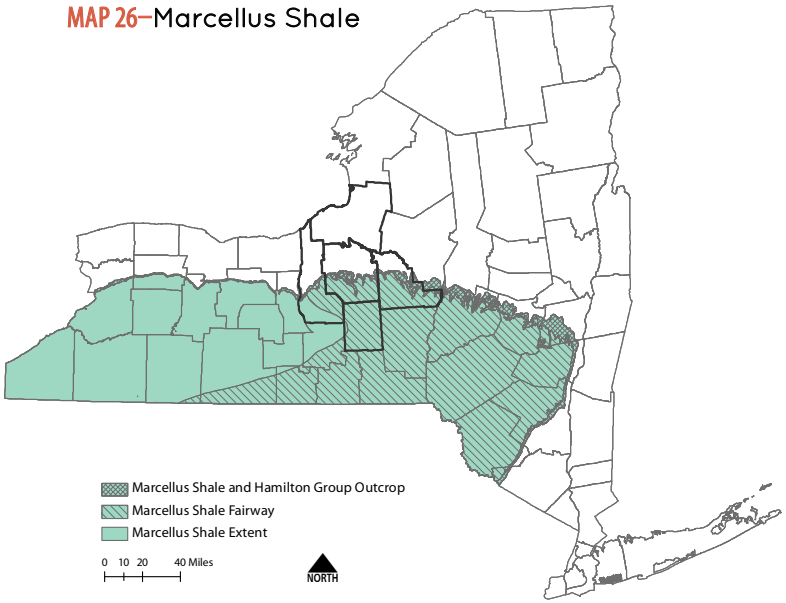
Central New York offers a diverse and productive fishery from the Finger Lakes in the east, to Lake Ontario in the north, to the Susquehanna River in the south. The deep, cold waters of Lake Ontario produce record breaking Chinook and Coho salmon, brown trout, walleye and a broad range of panfish. The relatively shallow waters of Cazenovia Lake are renowned as a productive largemouth bass, crappy and bluegill fishery. Otisco Lake's productive warm water fishery supports a healthy population of tiger muskies. Other notable natural fisheries located within the region include:

Cayuga Lake is particularly known for brown trout, lake trout and rainbow trout. Pickerel, large and small mouth bass and northern pike can be found in the warm and shallower areas of the lake. Pike, bass, bullhead and perch are plentiful in the southern end of the lake.

The Salmon River in Oswego County offers some of the finest sport fishing in the country. Two major fish records have been set in the Salmon River: the Great Lakes record Chinook salmon (47 lbs. 13 oz.) and the world record Coho salmon (33 lbs 4 oz).

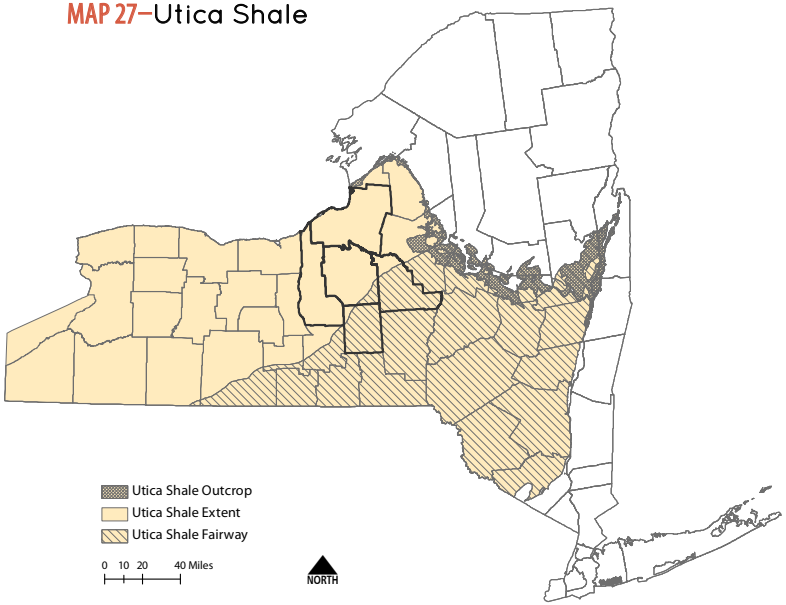
Oneida Lake boasts one of the most productive fisheries in the northeast including the largest walleye population in NYS. Additional species include yellow perch, small and largemouth bass, catfish and bullhead. According to the Oswego County Office of Tourism, the lake provides anglers with more fish per acre than any other lake in the Northeast.

MAP 26–Marcellus Shale



Source: NYS DEC, Revised SGEIS, 2011

MAP 27–Utica Shale



Source: NYS DEC, Revised SGEIS, 2011

The natural productivity of the region's waterbodies is supplemented through stocking programs run by the State and Onondaga County. There are three active fish hatcheries in the region:

Oneida Hatchery is located in the Village of Constantia in Oswego County, on the north shore of Oneida Lake. The rearing program is focused on walleye, and includes egg collection from Oneida Lake, and stocking of millions of walleye fry and fingerlings. Experimental culture of rare or threatened fishes, such as round whitefish, lake sturgeon and paddlefish, also occurs here. Annual fish production is about 6,000 pounds.

Salmon River Hatchery, located in the Village of Altmar in Oswego County, is the mainstay of NYS DEC's stocking program for Lake Ontario and Lake Erie. The hatchery attracts up to 500,000 visitors annually, many of whom come to watch egg collections from steelhead, Coho salmon and Chinook salmon returning to the hatchery. Annual fish production totals 120,000 pounds.

Carpenter's Brook Fish Hatchery located in the Town of Elbridge in Onondaga County, is one of only four county run hatcheries in the state. Carpenter's Brook has been in continuous operation since its inception in 1938 and produces over 80,000 Brook, Brown and Rainbow Trout annually.

The fisheries of Central New York support a thriving tourism and sport fishing industry that is critical to local economies. In 2006, New York resident anglers alone spent $1.8 billion and the fishing industry supported 16,500 fishing related jobs statewide.[28]

The topography, land cover and climate of Central New York provides a diverse range of habitats utilized by a wide variety of wildlife species. The region has healthy white tail deer and turkey populations, as well as a number of black bears, primarily in the Southern Tier. Fox, beaver, muskrat and an occasional bobcat can be found throughout the region. The Federally endangered Indiana Bat is known to winter in Onondaga County. A pair of peregrine falcons nest in Syracuse and have produced more than 20 young over the past several years. The region is the only known location of the endangered Chittenango Ovate Amber Snail. There are several bald eagle nests throughout

the region, and in recent years many eagles have been seen wintering along the shores of Onondaga Lake.

6. Conservation Resources

(a) State Forests

Much of the CNY region was cleared for farming during the 18th and 19th centuries and has since reverted back to forest land naturally or through state reforestation efforts. Turn of the century reforestation efforts were undertaken to combat the effect of aggressive commercial timber harvesting operations that threatened to deplete the state's timber stock within 50 years. These efforts were later expanded to include a massive tree planting program to restore abandoned farm lands for watershed protection, flood prevention and future timber production. Many of the early reforestation areas were established on some of the least productive land in the State. Today, these areas are covered with healthy forests. Currently, there are 156,297 acres of conserved land in the region, including 48 State Forests and 11 wildlife management areas. State Forests are multi-use areas that are actively managed to improve ecosystem health and enhance habitat, biodiversity, landscape ecology, and carbon sequestration.[29] Biomass energy, harvested from the region's forests, has the potential to provide an important source of renewable energy.

(b) Wildlife Management Areas

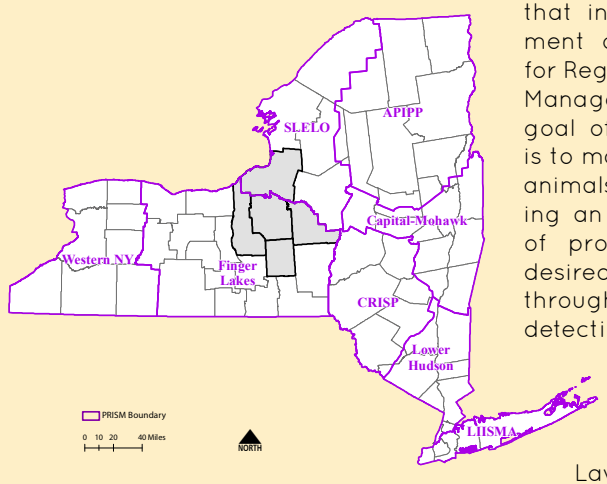
There are 11 NYS Wildlife Management Areas (WMAs) located in the region.[33] The WMA program is part of a long term effort to establish permanent access to public lands in NYS for the protection and promotion of its fish and wildlife resources with an emphasis on game species. WMAs are also utilized for logging following NYS DEC forest management objectives.

Although municipal governments do not have direct control of these state owned lands, they may be able to use them in their planning efforts to create greenways, biological corridors and recreational trails. Refer to Table 54 for the names and locations of WMAs in Central New York.

PARTNERSHIPS FOR REGIONAL INVASIVE SPECIES MANAGEMENT

The rate of invasive species infestation is increasing at an alarming rate in response to the increase in international trade that accompanies globalization. Invasive species cause harm to the environment and/or human health and put at risk economically important industries including farming, forestry, tourism, and commercial and recreational fishing. Invasive species are expensive to manage or eradicate and cost taxpayers millions of dollars each year. Nationally, the impact of invasive species is estimated at $167 billion annually.

MAP 28–PRISM Boundaries



Source: CNY RPDB

Central New York has seen the economic and environmental impacts that invasive species can have.26 It is estimated that in Cayuga Lake alone, the cost to manage hydrilla, an aggressive and fast spreading aquatic invasive plant, will be approximately $5 to $8 million.

Prevention is the first line of defense against invasive species. Prevention efforts must have the coordinated support of federal, state and local agencies, industry and other interested parties. The 2011 NYS Invasive Species Management Strategy calls for the development of an adaptive, statewide invasive species management plan that includes the establishment of eight Partnerships for Regional Invasive Species Management (PRISMs). The goal of the PRISM program is to manage invasive plants, animals and pathogens using an integrated approach of protecting or restoring desired native communities through education, early detection and eradication, and management. The CNY region lies within both the Finger Lakes and St. Lawrence Eastern Lake Ontario PRISM regions.

B. SUSTAINABLE FUTURE IN CENTRAL NEW YORK

1. Goal and Targets

A review of the information presented in this chapter shows that the preparation of the environmental management strategy must carefully consider the broad array of past and current natural resource development and protection efforts that have collectively contributed to, and presently support the natural environment of CNY. It should be noted that while many successful national level environmental initiatives, and subsequently state and local initiatives, have been reactionary, the growing "global" environment no longer allows us to enjoy that luxury. Technological advancements are changing the way natural resources are viewed and used. New opportunities to capitalize on the elements of a healthy natural environment are limited to the extent that society is willing to protect and improve the existing natural resource base.

In developing this plan, CNY sought to establish a clear picture of the region's natural resource base and the associated environmental services that currently support the regional economy and quality of life. Through this process, challenges to the long term health of the regional environment were identified and opportunities to implement corrective and protective measures were laid out.

CNY has significant natural resources to meet the collective socioeconomic needs of the region well into the future. Surface and groundwater resources exceed current municipal, residential, commercial and industrial water needs, while supporting the local economy through recreational opportunities such as fishing and boating on four Finger Lakes, one Great Lake, and the single largest inland lake entirely within New York State. CNY's rivers provide a natural system of navigable channels that link the region to Lakes Erie and Ontario as well as the Hudson River and the Atlantic Ocean. Wetlands and unique ecological communities located within the region provide habitat for a broad diversity of plants and animals. The region is home to an extensive network of parks and open spaces and contains thousands of acres of productive agricultural land supporting a wide diversity of agricultural products, from dairy to fruit and vegetable farming to meat production. The region's extensive forest resource includes 48 State Forests and 11 wildlife management areas that improve overall ecosystem health, enhance regional biodiversity, landscape ecology and carbon sequestration. The full potential of these collective resources has yet to be realized.

At the same time, the CNY environment is facing challenges that could threaten the long term sustainability of the natural resource base and associated ecosystem services. Exacerbated by high concentrations of impervious surfaces in urbanized areas, untreated stormwater and sewage overflows introduce bacteria and nutrients to many local waters during heavy rains. Eroding streambanks and sedimentation result from destabilization of stream channels, a consequence of past urbanization and current land use activities. Fragmented forest ownership and inconsistent forest management planning threaten to undermine the intrinsic value of wooded lands. Terrestrial and aquatic invasive species threaten to compromise the ecological and aesthetic quality of many lakes, wetlands, and protected lands. Unchecked development in some areas encroaches on, and impacts the function of wetlands and floodplains. Soil erosion and nutrient depletion threaten the long-term viability of agricultural lands. Aging water infrastructure is responsible for significant potable water loss and the discharge of improperly treated wastewater to surface waters. The continued reliance on fossil fuels in conjunction with increasing temperatures threatens the health of the public and the environment.

Based upon public input and the information presented above, the planning team has established the following environmental management goal for Central New York:

GOAL: Conserve and protect the quality of the region's water, air, land and wildlife resources without compromising the ability to meet current and future resource dependent needs.

To achieve this goal, the following targets have been established for Central New York:

TABLE 54–CNY Wildlife Management Areas[34]

Name	Location	Size
Cross Lake Islands	Cayuga County	27 Acres
Northern Montezuma	Cayuga County	7,500 Acres
Tioghnioga	Madison County	3,803 Acres
Cicero Swamp	Onondaga County	4,947 Acres
Hamlin Marsh	Onondaga County	1,689 Acres
Three Rivers	Onondaga County	3,586 Acres
Curtiss Gale	Oswego County	47 Acres
Dale Creek Marsh	Oswego County	1,770 Acres
Happy Valley	Oswego County	8,895 Acres
Little John	Oswego County	7,912 Acres
Three Mile Bay/Big Bay	Oswego County	3,966 Acres

Source: NYS DEC Wildlife Management Areas, http://www.dec.ny.gov/outdoor/8297.html

TABLE 55–Central New York Unique Natural Areas

UNA	Location	Unique Features
Camillus Unique Area	Camillus Town, Onondaga County	145 acres of open fields, 135 acres of early successional trees and shrubs, 38 acres of old forest, and 18 acres of mature mixed tree species
Labrador Hollow Unique Area	Towns of Fabius and Truxton on the borders of Onondaga and Cortland County	Rare plant life, scarce animal habitats, unique topography, 100 acre pond
Nelson Swamp Unique Area	Towns of Cazenovia, Fenner and Nelson in Madison County	400 species of vascular plants including the endangered striped coral root and threatened spreading globeflower, 105 species of breeding birds
Salmon River Falls Unique Area	Orwell Town, Oswego County	110 foot waterfalls and 3,000 foot long gorge, 4 distinct plant communities

Source: NYS DEC, List of State Forests by Region, http://www.dec.ny.gov/lands/34531.html

TABLE 56–Central New York Critical Environmental Areas

Critical Environmental Area	Location	Reason for Designation
Homer Public Water Supply Source	Town of Homer, Cortland County	Aquifer protection/public water supply source protection
City Water Works	Cortland City, Cortland County	Sole source aquifer protection
Groundwater Protection Overlay District	McGraw Village, Cortland County	Provide groundwater protection
Portions of Nine Mile Creek	Camillus Town, Onondaga County	Not available
Onondaga Escarpment Nature Corridor	Manlius Village, Onondaga County	Karst topography
Sandy Ponds	Sandy Creek Town, Oswego County	Barrier dunes, wetlands protection

Source: NYS DEC Critical Environmental Areas by County, http://www.dec.ny.gov/permits/6184.html

1) **Ensure no net increase in consumptive water withdrawals through 2030.**

CNY has vast surface and ground water resources that adequately meet its collective municipal, residential, business, and commercial needs. The majority of the region's water supply is drawn from Lake Ontario and three Finger Lakes (Owasco, Skaneateles, and Otisco Lakes) and there is currently a greater than 100% surplus in available water supply. As of 2005, about 1,502.08 million gallons per day of fresh water is withdrawn in CNY.

2) **Reduce the number of impaired water bodies in CNY by 50% by 2030.**

There are a total of 6,229 miles of streams and 104 lakes in CNY, of which 23 streams and 8 lakes are classified by NYS DEC as impaired. The most common pollutants responsible for surface water impairments in CNY are nutrients, pathogens, silt/sediment and priority organics, with agriculture and urban stormwater runoff being the primary sources.

3) **Reduce the number of combined sewer overflows (CSOs) in CNY by 65% by 2030.**

Combined sewer overflows negatively impact water quality in some older, urbanized areas of CNY including the Cities of Syracuse, Oswego, Oneida, and Auburn and the Village of Canastota. There are currently 80 CSO outfalls in the region. Onondaga County is under a consent order to close many of the CSO outfalls which will improve the water quality of Onondaga Lake, as well as recreational opportunities and the quality of life in CNY.

4) **Reduce the percentage of impervious surfaces in the Syracuse Urbanized Area from 21% to 18% by 2030.**

Urban stormwater runoff is a leading contributor to water quality problems in CNY. When rainwater falls on impervious surfaces such as parking lots and buildings, it cannot soak into the ground and instead flows across these surfaces, picking up pollutants along the way and draining directly into surface water bodies Excess stormwater volume entering combined and sanitary sewer systems contributes to CSO and SSO events. The average percentage of impervious of the land in the Syracuse Urbanized Area (SUA) is 21% as of 2006.

5) **Reduce air pollutant emissions by 25% for ozone, sulfur, particulates, and carbon monoxide by 2030.**

Air quality in New York is generally good as documented under the NYS Ambient Air Monitoring program at four CNY monitoring stations. Air quality is a direct result of pollutants emitted in association with human activities such as energy generation, manufacturing, and transportation. Air pollution can harm human health, the environment, and the economy in a variety of ways.

2. Strategies

Through group discussions with stakeholders, the planning team identified areas of key opportunities and challenges to achieving sustainable environmental management in the region. After reviewing the goal, indicators and targets, and the key opportunities and challenges, a set of environmental management strategies were identified for future implementation. Strategies were selected based on the contribution of each to advance the plan's overall environmental management goal and targets. In addition, strategies were evaluated for their overall benefits to the region, as well as the costs and feasibility for implementation.

In establishing an action plan for the region, these strategies were prioritized according to their readiness for implementation in the short-term opportunities or long-term initiatives, with short-term defined as 1-5 years and long-term defined as 5-10 years, as these opportunities may require additional time and effort to develop and implement.

Key strategies that have been identified to achieve the sustainable management of environmental resources include:

Short-Term Opportunities

a) Provide tools, resources and training for local officials to encourage resource conservation.

b) Promote a comprehensive regional green infrastructure program to improve air and water quality.

c) Develop a regional urban-rural forestry restoration program.

Long-Term Initiatives

d) Implement a coordinated regional invasive aquatic weed-harvesting management program.

e) Utilize and replicate natural systems in support of critical infrastructure services to protect and improve water quality.

f) Develop a regional program to reduce the amount of impervious parking areas.

g) Implement targeted infrastructure improvement for pollution sources known to impact impaired water bodies.

h) Develop a regional public education and water conservation program.

i) Support a regional agriculture cover-crop and no-till program in priority watersheds.

j) Develop a coordinated stream restoration program for high priority water-bodies.

a) Provide tools, resources and training for local officials to encourage resource conservation.

The success and effectiveness of public officials and natural resource managers is frequently made more difficult as the result of procedural, regulatory and financial issues beyond their ability to change. Rather than protect and enhance our natural resource base, outdated local codes and ordinances, misguided or absent state legislation, and competing regulatory priorities can and do create unintended obstacles that work against sustainable natural resource protection efforts.

In order to protect the quality of CNY's natural resources while fully utilizing their potential to provide a wide range of ecosystem and socioeconomic services into the future, public officials must have the tools they need to support sound natural resource policy decision making and program implementation. Enhanced technical assistance in support of modifying local planning codes and zoning ordinances that prohibit or impede green infrastructure implementation and grey water recycling, as well as tools for inventory and planning such as Geographic Information Systems (GIS), computer models, and other analytical methods should be readily available to municipal officials and staff, accompanied by training where necessary to ensure proficiency in use of these tools.

There is a network of organizations available to help implement this strategy including the NYS DOS, CNY RPDB, and county planning departments. In addition, assistance is available from the New York Water Environment Association and the SU Environmental Finance Center.

b) Promote a comprehensive regional green infrastructure program to improve air and water quality.

Green infrastructure is the term used for structural or non-structural practices that use or mimic natural processes to infiltrate, evapotranspire, or re-use stormwater where it falls, and act as a carbon sink by removing carbon dioxide from the atmosphere. Because green infrastructure methodologies keep rainwater out of the sewer system, they play a major role in reducing the number and frequency of sewer overflows and discharges of untreated runoff that carry pollutants to bodies of water. Green infrastructure practices such as green roofs absorb and filter harmful particulate matter and remove nitrogen oxides, sulfur dioxide, carbon monoxide, and ground-level ozone from the air.

The successful "Save the Rain" program in Onondaga County represents a starting point and model to be expanded upon at a region-wide level. While "Save the Rain" is focused predominantly on CSOs, the practices can be applied to sanitary sewer inflow and infiltration problems as well as stormwater management for separate storm sewer systems. Examples of projects that can be completed to build the momentum of this program include expansion of the use of green infrastructure to prevent sanitary sewer overflows in

ONONDAGA COUNTY SAVE THE RAIN PROGRAM

The Save the Rain program, launched in 2010 by County Executive Joanie Mahoney, is a comprehensive plan to cleanup and restore Onondaga Lake. The program includes construction of traditional gray infrastructure projects and the development of an innovative green infrastructure plan to reduce the effects of stormwater pollution to the lake and its tributaries by capturing 95% of existing stormwater runoff.

The Save the Rain program is a multi-faceted program that incorporates several components:

Rain Barrel Program provides free rain barrels to homeowners in the City of Syracuse. The County has distributed over 600 rain barrels that will capture an estimated 2.1 million gallons of stormwater annually.

Green Improvement Fund provides financial incentives to encourage the installation of Green Infrastructure in new and redevelopment projects on private property in CSO sewersheds within the City of Syracuse. In 2011, the County exceeded its goal by implementing 60 projects. Combined, those projects are expected to capture 43.6 million gallons of stormwater annually.

Suburban Green Infrastructure Program provides grants to suburban communities in the County sanitary sewer district to implement projects to reduce inflow and infiltration into the sanitary sewer system. In 2012, the County awarded $3 million in grants to 12 suburban communities that will capture 38.2 million gallons of stormwater.

The Urban Forestry Program aims to develop a robust strategy for planting 8,500 trees over the life of the program in neighborhoods throughout the City of Syracuse. In 2011, 407 trees were planted that will capture 814,000 gallons of stormwater annually.

Because Save the Rain has been so successful, the County anticipates meeting its stormwater capture requirements ahead of schedule. Additional benefits of the program include an projected energy cost savings of $20 million by avoiding pumping and treating stormwater like sewage and an increased in landscaped green space within the urban environment of the City of Syracuse.

Tully Street Rain Garden, Syracuse



the Bayberry neighborhood in the Town of Clay, completion of the City of Oswego's "Green Gateway" street improvements to reduce CSOs, implementation of green infrastructure improvements at Colgate University in the Village of Hamilton, and the rooftop disconnect program to increase stormwater infiltration in the Town of Sullivan.

Many communities are actively engaged in the development of green infrastructure projects in CNY. To help with the effort assistance is available from the NYS DEC and EFC, the Finger Lakes-Lake Ontario Watershed Association, Onondaga Environmental Institute, NYWEA, the Environmental Finance Center at Syracuse University, and the CNY Stormwater Management Coalition.

c) Develop a regional urban-rural forestry restoration program.

Eighty nine percent of forested land in CNY exists on small, privately owned parcels. As a result, maintaining a cohesive and functioning forested ecosystem is challenging. A forest restoration program that stresses professional forest management planning and active silvicultural management would improve forest health resulting in improved carbon sequestration and other ecosystem services such as watershed protection and biofuel production.

An effective urban-rural forestry restoration program will include a forest landowner outreach component, supplemented by low cost woodlot management assistance programs. These components are critical in overcoming multiple ownership issues and improving private forest management planning for multiple benefits, including recreational and habitat value, timber productivity, and carbon sequestration. The program should stress the use of resilient native species in original plantings as well as mortality replacement plantings in urban and rural areas that are in accordance with species diversity standards. The program must also include development of a regional response plan for invasive species infestations such as the Emerald Ash Borer.

Leading this effort across the state is the NYS DEC and SUNY College of Environmental Science and Forestry. Locally, Cornell Cooperative Extension and county parks departments have become active in this issue.

d) Implement a coordinated regional invasive aquatic weed-harvesting program.

Invasive species harm the environment, the economy and human health. The rate of invasive species infestation is rapidly accelerating as a result of international trade and climatic factors. Invasive species threaten nearly every aspect of the natural environment and are one of the greatest threats to biodiversity. They cause or contribute to habitat degradation and loss, the loss of native fish, wildlife and plant species, the loss of recreational opportunities and income, crop damage and diseases in humans and livestock. In Central New York, non-native aquatic invasive plants have been a perennial problem on many lakes with recreational and natural habitat significance. In addition to established regional problem species such as Eurasian milfoil and water chestnut, new invaders such as Hydrilla are being discovered at an alarming rate.

To help address this issue, the NYS DEC established in 2011 the NYS Invasive Species Task Force and has implemented a regional program called Partnerships for Regional Invasive Species Management (PRISMs). Other organizations addressing this issue in CNY include the FL-LOWA, county-based soil and water conservation districts, and the CNY RPDB. Together, these groups must implement a coordinated regional harvesting program that includes pooled financial, technical, and human resources and equipment sharing across county across county boundaries must be established to provide regional solutions in place of piecemeal control efforts.

e) Utilize and replicate natural systems in support of critical infrastructure services to protect and improve water quality.

Wetlands exist naturally in the environment but can also be constructed to simulate beneficial processes and functions including filtration, sedimentation and nutrient removal. Both natural and constructed wetlands have the potential to supplement or replace traditional constructed facilities for stormwater, wastewater, and landfill leachate treatment and control. Constructed wetlands can be used with onsite systems to improve the quality of the effluent before it is returned to the environment. Central New York should take full advantage of this potential, particularly in instances where water quality impairments exist and/or existing facilities are inadequate.

Constructed wetland technology locally developed and successfully used to treat wastewater in Minoa and municipal landfill leachate at Bristol Hill Landfill in Oswego County should be replicated as a low cost, low energy water quality treatment option at unsewered lakefront communities and municipal landfills throughout the region. Following feasibility assessments, completion of the Duck Lake and Tully Kettle Lakes constructed wetlands projects would serve as significant demonstration projects for other small lake communities facing nutrient related water quality problems, while the Camillus Belle Isle Landfill Constructed Wetlands project would advance the ongoing remediation of Onondaga Lake/ Solvay wastebeds.

As previously noted, there are several organizations the can help communities in CNY develop these natural resource systems. Noteworthy examples include Honeywell Corporation, the Village of Minoa, NYWEA, and local soil and water conservation districts.

f) Develop a regional program to reduce the amount of impervious surface parking areas.

Excess stormwater runoff volume due to high levels of impervious surfaces in urban and suburban areas is a leading contributor to water quality impairments. High volume, high velocity stormwater runoff erodes stream channels and banks, increases the occurrence of combined sewer overflows, introduces a variety of pollutants directly to surface waters and contributes to localized flooding. The use of porous materials in developed areas creates opportunities to infiltrate stormwater where it falls, thereby reducing the volume of stormwater runoff and improving surface water quality. When implemented at the neighborhood, watershed or regional scale, impervious surface area reduction can significantly reduce stormwater volume runoff.

A regional program to reduce the amount of existing impervious surface parking area through technical support and financial incentives for incorporating porous pavement materials on large commercial and residential developments would provide an effective mechanism for reducing stormwater runoff from private develop-

ment. Onondaga County's Suburban Green Infrastructure Program and Green Improvement Fund provide successful models in support of establishing and implementing incentive based stormwater retrofit programs that include project evaluation criteria and long term maintenance considerations. Municipalities should establish payment in lieu of tax incentive programs to encourage porous retrofits on redevelopment project sites. An example of an appropriate project that would benefit from this type of a program is the redevelopment of a 100 acre commercial parcel located at the intersection of NYS Route 11 and Interstate Route 81 in the Town of Salina.

g) Implement targeted infrastructure improvements for pollution sources known to impact impaired water bodies.

Improving the region's water quality is a critical component of environmental sustainability. In 2012, 722 miles of streams in CNY were classified as impaired by NYS DEC. Impaired waters do not fully support the designated best uses as established by the state's water quality standards. The primary sources of water quality impairments in CNY are agriculture and urban stormwater runoff, failing septic systems, contaminated sediments from past discharges and municipal point discharges. In CNY municipal point discharges include 18 wastewater treatment plants that discharge directly into impaired water bodies. Seventeen of those plants have exceeded their useful life expectancies and are in need of updates and replacement.

Significant improvement in local water quality can be achieved by implementing an infrastructure improvement program that prioritizes projects known to have a direct cause and effect relationship with the water quality impairments. Greater recognition of the local implications implemented projects have on a watershed, rather than a statewide scale, will help to advance projects that otherwise would have been stalled by the finance gap frequently encountered under the NYS CWSRF, such as inflow and infiltration projects needed to eliminate overflows from the East Sullivan Sewer District.

Federal, state and local units of government have a major role to play with the implementation of this strategy. Supplementing their efforts are resources available from NYWEA, SU Environmental Finance Center, the professional civil engineering community, and local development agencies across the region.

h) Develop a regional public education and water conservation program.

Water conservation is most commonly associated with the need to protect limited fresh water supplies. When water supply is not the immediate concern, as in CNY, water conservation programs can be implemented to achieve other benefits. Conserving water within a municipal water system will reduce household expenses, increase treatment plant efficiency, and reduce the amount of electricity and chemicals needed to treat wastewater. By reducing the volume of water that enters the waste stream, water conservation programs reduce combined and sanitary sewer overflows during wet weather events and increase the life of municipal treatment plants and septic systems in rural areas.

Virtually all water conservation efforts depend on public awareness and understanding of the need for conservation. A regional education program designed to communicate an understanding of basic water conservation issues and needs, including short and long term economic and environmental benefits relative to the public at large, municipal officials and water suppliers will lay the groundwork for implementing conservation practices and build political and public support for projects such as the Syracuse water leak detection and slip line technology repair program. Organizations that can help assist with this effort include Cornell Cooperative Extension, Onondaga County Water Authority, and the CNY RPDB.

i) Support a regional agriculture cover-crop and no-till program in priority watersheds.

The 2000 National Water Quality Inventory reports that agricultural nonpoint source (NPS) pollution is the leading source of water quality impacts on surveyed rivers and lakes, the second largest source of impairments to wetlands, and a major contributor to contamination of surveyed estuaries and ground water. Cover crops are widely touted as one of the most important ways that farmers can help protect water resources from nonpoint source nutrient runoff while protecting and improving soil resources.



No-till Cover Crop

Development of a regional cover-crop and no-till program in agriculturally dominated watersheds having water bodies that are currently impacted or impaired by nutrients and sediment, such as Owasco, Skaneateles, Otisco and Oneida Lakes and the Tioghnioga and Seneca Rivers, will expand opportunities and improve access to on-farm planning and technical assistance needed to support long term water quality improvements. Implementation of this program is being carried out across the region by soil and water conservation districts, Cornell Cooperative Extension, and local farm bureaus.

j) Develop a coordinated stream restoration program for high priority water-bodies.

There are 6,229 miles of streams throughout CNY. In their natural and healthy state, streams perform many functions including purifying water, moderating floods and droughts and maintaining habitat for fisheries, birds and wildlife. 30% of CNY's stream miles are currently impaired or impacted by land based activities, and in-stream erosion is one of the primary sources of non-point source pollution in CNY. Streambank erosion can lead to tree loss, road and bridge failure, and destroy critical fish spawning habitat.

Because watersheds influence the behavior of streams, some solutions to stream problems are located outside of the stream channel and may not be easily or accurately identified. A coordinated stream restoration program led by local soil and water conservation districts and the NYS DEC provides a forum for evaluating problems, identifying opportunities, prioritizing restoration recommendations and implementing appropriately targeted and designed restoration projects that will provide a cost effective and efficient mechanism for restoring stream health throughout CNY. The Oneida Creek streambank restoration and aspects of the Onondaga Lake watershed restoration programs exemplify areas that would benefit as part of a coordinated program. Additional assistance is available from local environmental groups, county planning agencies, and the CNY RPDB.

3. Alignment of Strategies and Targets

The following table illustrates the alignment of environmental strategies and targets.

TABLE 57–Alignment of Environmental Strategies and Targets.

Strategies	TARGETS				
	1	2	3	4	5
	ENSURE NO NET INCREASE IN CONSUMPTIVE WATER WITHDRAWALS THROUGH 2030	REDUCE THE NUMBER OF IMPAIRED WATERBODIES IN CNY BY 50% BY 2030	REDUCE THE NUMBER OF COMBINED SEWER OVERFLOWS (CSOS) IN CNY BY 65% BY 2030	REDUCE THE PERCENT OF IMPERVIOUS SURFACES IN THE SYRACUSE URBANIZED AREA FROM 21% TO 18% BY 2030	REDUCE AIR POLLUTANT EMISSIONS BY 25% FOR OZONE, SULFUR, PARTICULATES, AND CARBON MONOXIDE BY 2030
Short-Term Opportunities					
a. Provide tools, resources and training for local officials to encourage resource conservation.	●	●			●
b. Promote a comprehensive regional green infrastructure program to improve air and water quality.			●	●	
c. Develop a regional urban-rural forestry restoration program.		●			
Long-Term Initiatives					
d. Implement a coordinated regional invasive aquatic weed-harvesting management program.		●			
e. Support a regional agriculture cover-crop and no-till program in priority watersheds.		●			
f. Utilize and replicate natural systems in support of critical infrastructure services to protect and improve water quality.		●	●	●	
g. Develop a regional program to reduce the amount of impervious parking areas.		●	●	●	
h. Implement targeted infrastructure improvement for pollution sources known to impact impaired water bodies.		●			
i. Develop a regional public education and water conservation program.	●				●
j. Develop a coordinated stream restoration program for high priority water-bodies.		●			

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COR Development Company, Syracuse Inner Harbor Master Plan

Chapter 6: Economic Development

***An economic development strategy** provides a community with a clear understanding of their current economic situation, identifies potential opportunities as well as challenges for economic growth, and defines the efforts required to achieve specific goals.*

A strategy is typically established for a ten to twenty year horizon and addresses the multiple facets of economic development at the local level including organizational structure, resource development and allocation (provision of basic public services, supply of qualified labor, capacity and accessibility of reliable utilities, availability of land and buildings, capital resources, favorable tax and regulatory policy, etc.), and the growth of specific target industries that will produce jobs and new wealth for the community.

An important part of the strategy is to promote a broad range of economic initiatives that not only help strengthen existing businesses, but also help to diversify the employment base through the start-up of new companies and the attraction of businesses to the area. Since the employment levels of any given company never stay constant, it is important to continually support expansion of the local economy with new opportunities. This approach helps insure jobs for the next generation seeking employment in a community.

To carry out this economic development mission, considerable attention must be paid to forces in the marketplace that will affect the likely success of any particular economic development initiative. In today's global economy, these forces operate on the international, national, regional, and local levels. Compounding the challenge is the need to pay close attention to the broad range of employers in a community, from the traditional large scale manufacturing firm to the entrepreneurial start-up with plans to introduce a new niche product or service into the marketplace. Attention must also be focused on key industry sectors in a community such as advanced manufacturing, professional and business services, agriculture, and tourism. In addition, the large institutional employers in a community such as colleges and universities, hospitals, and utility providers must be recognized. These institutions serve as major economic engines with their own set of resource needs and associated economic development opportunities.

When preparing an economic development strategy for a region, it is important to start with a common understanding that the public sector has traditionally provided services to support business and commerce at the local level. These services cover a broad range of activities including governance, public safety, roads, sewer and water, educa-

tion, recreation, solid waste management, environmental and public health protection, and the overall advancement of the common welfare. Maintaining the delivery of these vital public services in an affordable and efficient manner must be the starting point for any concerted effort to support the growth of a local economy. Building on these resources, attention can then be focused on the tools available in the public and private sector that can support job retention and creation in a market system based upon the concept of free enterprise. In today's competitive world, the application and use of these tools often requires an entrepreneurial and proactive approach in the business community and at all government levels.

A review of the information presented in this chapter shows that the preparation of an economic development strategy must be carefully calibrated to account for developments which are occurring on an international, national, and regional level. As noted in a World Economic Outlook Update issued by the International Monetary Fund in January 2013, global growth is projected to increase during 2013, as the factors underlying soft global activity are expected to subside. Policy actions have lowered acute crisis risks in the euro area and the United States. The IMF noted that economic conditions improved modestly in the third quarter of 2012, with global growth increasing to 3%. The main sources of acceleration were emerging market economies, where activity picked up broadly as expected, and the United States, where growth was higher than expected. With financial conditions stabilizing, bond prices in the euro area periphery declined, while prices for many risky assets, notably equities, rose globally and capital flows to emerging markets remained strong.

The IMF projects that growth in the United States will average 2% in 2013. These forecasts are broadly unchanged from the October 2012 WEO, as underlying economic conditions remain on track, in particular, a supportive financial market environment and the turnaround in the housing market have helped improve household balance sheets which should underpin firmer consumption growth in 2013. The IMF projections are predicated on the assumption that the federal spending sequester will be replaced by back-loaded measures and the pace of fiscal withdrawal at the general government level in 2013 will remain at 1.25% of GDP.

Supplementing this information is an overview of the current condition of the NYS economy as provided by the NYS Comptroller's office in May 2012. This report noted that New York's Gross State Product (GSP) rebounded strongly after the recession, with the rate of growth exceeding the nationwide increase and ranking second among the 50 states in both 2010 and 2011. However, New York's rate of growth eased from 5.1% in 2010 to an estimated 3.8% in 2011, and IHS Global Insight forecasts that the State's GSP will slow to 2.6% in 2012. The report also noted that between December 2009 and April 2012, NYS has regained 312,700 jobs, nearly 95% of the jobs lost during the recession, and that New York has added more private sector jobs (335,900) during the recovery than it lost during the recession, but these gains have been offset by 23,200 jobs lost in the government

TABLE 58–Employment Changes by Metropolitan Area, April 2012, in Thousands

	Recession (Jobs Lost)	Recovery (Jobs Gained)	Net Change	Share Recovered
Glens Falls	-2.7	3.7	1.0	137.0%
New York City	-140.1	180.8	40.7	129.1%
New York State	-330.4	312.7	-17.7	94.6%
Rochester	-19.0	15.9	-3.1	83.7%
Utica/Rome	-4.3	2.9	-1.4	67.4%
Kingston	-3.1	2.0	-1.1	64.5%
Buffalo	-21.0	11.9	-9.1	56.7%
Mid-Hudson Valley	-9.7	5.4	-4.3	55.7%
Lower Hudson Valley	-32.2	16.7	-15.5	51.9%
Syracuse	-13.7	6.9	-6.8	50.4%
Long Island	-53.7	25.4	-28.3	47.3%
Albany	-15.5	3.9	-11.6	25.2%
Binghamton	-6.3	1.3	-5.0	20.6%
Elmira	-2.7	-0.1	-2.8	NA
Ithaca	-1.2	-1.9	-3.1	NA

Notes: Recessionary and recovery periods are determined by peak and trough levels of employment, which vary by region. For the State, employment peaked in July 2008 and reached its low in December 2009. Data have been seasonally adjusted.

Source: NYSDOL

sector. Regarding employment, it was noted that job growth has been uneven across that State and the unemployment rate exceeded the Statewide rate of 8.5% in more than half of New York's counties (33 of 62), including eight counties in which the rate was 10% or greater. In a previous report issued by the Comptroller in October 2010, it was noted that the State's population is projected to increase from 18.5 million in 2010 to 20.5 million over the next ten years, with most of the State's population growth occurring in the NYC metropolitan area.

Looking more closely at national level data, it is instructive for purposes of this plan to consider a report issued by the Brooking Institution in 2011 titled, *Sizing the Clean Economy: A National and Regional Green Jobs Assessment*. In this report, Brookings takes a look at a specific sector in the nation's economy called the "green" or "clean" or low carbon economy, defined by Brookings as the sector of the economy that produces goods and services with an environmental benefit, and notes that as a matter of aspiration no swath of the economy has been more widely celebrated in recent years as a source of economic renewal and potential job creation by communities across the nation. Covering the years 2003 to 2010 for every county in the United States, the report (available for download at www.brookings.edu/meto/clean_economy.aspx) represents the first study of the U.S. clean economy to provide timely information that is both comprehensive enough in its scope and detailed enough in its categorization to inform national, state, and regional leaders on the dynamics of the U.S. environmental goods and services "supersector" as they are operating in regions and metropolitan areas. Issues and data highlighted in the report include:

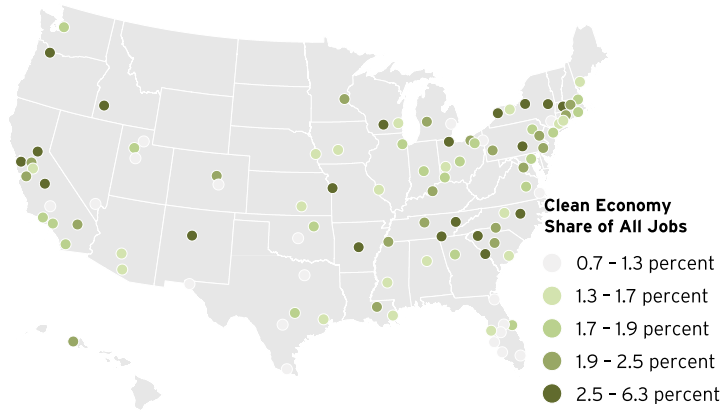
+ The clean economy, which employed some 2.7 million workers in 2010, encompasses a significant number of jobs in establishments spread across a diverse group of industries. These jobs were spread over 57,501 different establishments in 41,185 companies and existed in almost every industry. Encompassing 2% of all positions, the clean economy represents a modest slice of the U.S. economy. By contrast, the healthcare sector—the nation's largest source of private employment—employs 13.8 million workers, and accounts for 10.2% of all jobs.

TABLE 59–Segments of the Clean Economy in the U.S.

Category	Segment	Jobs, 2010
Agricultural and Natural Resources Conservation	Conservation	314,983
	Organic Food and Farming	129,956
	Sustainable Forestry Products	61,054
Education and Compliance	Regulation and Compliance	141,890
	Training	266
Energy and Resource Efficiency Public Mass Transit	350,547	
	Energy-saving Building Materials	161,896
	HVAC and Building Control Systems	73,600
	Green Architecture and Construction Services	56,190
	Professional Energy Services	49,863
	Appliances	36,608
	Energy-saving Consumer Products	19,210
	Battery Technologies	16,129
	Smart Grid	15,987
	Electric Vehicle Technologies	15,711
	Lighting	14,298
	Water Efficient Products	13,066
	Fuel Cells	7,041
Greenhouse Gas Reduction, Environmental Management, and Recycling	Waste Management and Treatment	386,116
	Professional Environmental Services	141,046
	Recycling and Reuse	129,252
	Green Consumer Products	77,264
	Green Building Materials	76,577
	Nuclear Energy	74,749
	Recycled-Content Products	59,712
	Remediation	56,241
	Air and Water Purification Technologies	24,930
	Green Chemical Products	22,622
	Pollution Reduction	9,986
	Carbon Storage and Management	391
Renewable Energy	Hydropower	55,467
	Wind	24,294
	Solar Photovoltaic	24,152
	Biofuels/Biomass	20,680
	Solar Thermal	5,379
	Waste-to-Energy	3,320
	Geothermal	2,720
	Renewable Energy Services	1,981
	Wave/Ocean Power	371

Source: Brookings-Battelle Clean Economy Database

MAP 29–Clean Economy Intensity in the 100 Largest Metro Areas



Source Brookings-Battelle Clean Economy Database and Moody's Analytics

+ The clean economy grew more slowly in aggregate than the national economy between 2003 and 2010, but newer "cleantech" segments produced explosive job gains

+ The clean economy is manufacturing and export intensive

+ The clean economy offers opportunities for low-and middle-skilled workers

+ Among regions, the South has the largest number of clean economy jobs though the West has the largest share relative to population

+ Most of the country's clean economy jobs concentrate within the nation's 100 largest metro areas (the Syracuse Metropolitan Area is ranked 80 out of 366, by population).

+ The clean economy permeates all of the nation's metro areas

+ Strong industry cluster boost metros' growth performance in the clean economy

The measurements and trends presented in the report offer a mixed picture of a diverse array of environmentally-oriented industry segments growing modestly even as a sub-set of clean energy, energy efficiency, and related segments grow much faster than the nation and in ways that are producing a desirable array of jobs, including in manufacturing and export-oriented fields.

As to what policymakers should do to catalyze faster and broader growth across the U.S. clean economy, Brookings notes that the private sector needs to play the lead role, but governments have a role too. In this connection, the fact that significant policy uncertainties are weakening market demand for clean economy goods and services, chilling finance, and raising questions about the clean innovation pipeline reinforces the need for engagement and reform. Not only are other nations bidding to secure global production and the jobs that come with it but the United States currently risks failing to exploit growing world demand.

This report concludes that private sector-led growth needs to be promoted through complementary engagements by all levels of the nation's federal system to ensure the existence of well-structured markets, a favorable investment climate, and a rich stock of cutting-edge technology. The report recommends that governments at different and appropriate levels can help by:

+ Scaling up the market by taking steps to catalyze vibrant domestic demand for low-carbon and environmentally-oriented goods and services

+ Ensure adequate finance by moving to address the shortage of affordable, risk-tolerant, and larger-scale capital that now impedes the scale-up of numerous clean economy industry segments

+ Drive innovation by investing both more and differently in the clean economy innovation system

+ Focus on regions, meaning that all parties need to place detailed knowledge of local industry dynamics and regional growth strategies near the center of efforts to advance the clean economy.



A. EXISTING CONDITIONS

1. Regional Economy

Central New York is geographically centered in Upstate New York and includes the counties of Cayuga, Cortland, Madison, Onondaga, and Oswego. The region covers an area of 3,622 square miles, comprising a balance of an urban center the City of Syracuse, suburban areas, small cities and towns, and rural farming communities. The region is located in close proximity to the cities of Rochester, Ithaca, Utica, Buffalo, Albany, and Binghamton and is within a 4–5 hour drive to several major metropolitan areas in the northeast including New York, Toronto, Boston, Montreal, and Philadelphia. Over 136 million people live within a 750 radius of Syracuse including over 50% of the population of Canada and the United States. Central New York has a population base of approximately 790,000 residents. Historical population statistics show that the region's population has remained relatively stable over the past 20 years since reaching a peak in 1990. Per capita income for the Syracuse Metropolitan Statistical Area to-

TABLE 60–Employment by Industry, Syracuse MSA 1990–2010, in Thousands

	1990	1995	2000	2005	Dec 2010
Total Non-Farm	317.8	307.8	325.4	320.8	320.1
Total Private	264.2	252.9	269.0	263.5	262.7
Goods Producing	61.2	53.0	57.3	45.5	40.0
Service Producing	256.6	254.8	268.1	275.4	280.1
Nat. Resources, Mining, Construction	15.6	11.7	12.9	12.3	12.0
Manufacturing	45.6	41.3	44.5	33.2	28.0
Wholesale Trade	20.1	15.8	15.8	15.6	14.1
Retail Trade	38.3	37.3	38.1	36.9	36.1
Utilities	6.4	4.8	4.8	4.0	3.4
Transportation/ Warehousing	9.5	9.4	9.2	9.4	9.2
Information	7.7	6.3	7.7	6.6	4.8
Financial Activities	20.6	18.0	17.7	17.6	17.0
Professional/Business Services	27.8	29.0	30.2	34.3	34.6
Educational Services	11.8	13.7	15.2	16.7	21.4
Health Care and Social Assistance	26.9	31.9	34.4	38.0	42.2
Hospitals	8.9	9.3	9.1	8.9	9.4
Leisure/Hospitality	24.1	22.8	25.2	26.6	27.5
Accommodation and Food Services	21.6	20.1	22.0	22.6	22.7
Other Services	9.8	11.1	13.3	12.5	12.4
Government	53.7	54.9	56.4	57.4	57.4
Federal	4.6	4.6	5.1	4.4	4.4
State	13.0	13.5	13.8	13.9	13.7
Education	6.0	6.6	7.4	8.2	8.3
Local	36.1	36.8	37.5	39.1	39.3
Education	20.3	21.9	23.0	23.6	25.8

Source: NYSDOL and BLS

tals $36,980 which compares favorably with other metropolitan areas across Upstate New York and with the nation.

The region's labor force currently numbers more than 394,600 workers and has remained stable over the past ten years. The average annual wage cost in the five-county area is estimated to equal $40,286 which is competitive with national levels and significantly below major metropolitan areas in the northeast. Over 38.9% of the region's population has attained a college associate's degree or higher. The skills of the Central New York labor force support a wide range of economic sectors including agriculture, manufacturing, health care, education, professional business services, warehouse and distribution, wholesale and retail trade, construction trades, utilities, and public employment.

Current statistics for the region show a total of 330,000 jobs, including 262,000 in the private sector, with an annual payroll in excess of $13.6 billion. Over 28,500 jobs are based in the manufacturing sector with a total payroll of approximately $1.8 billion. The total value of agricultural products sold in the region is estimated at more than $532 million. Annual tourism spending in Central New York exceeds $4 billion. A metropolitan statistical area's economic strength ranking provided by the Policom Corporation shows that the Syracuse MSA ranks 162 out of 366 metropolitan areas in the nation.

Businesses in Central New York are served by an extensive transportation network, which includes Syracuse Hancock International Airport, the deep water Port of Oswego, several rail freight carriers, a CSX intermodal rail center, Amtrak passenger rail service, Interstate Routes 81 and 90, and a public transportation bus service maintained by the CNY Regional Transportation Authority. Companies are also served by an extensive network of public sewer and water facilities, which includes a major water supply transmission line from Lake Ontario that is provided by the Metropolitan Water Board and the Onondaga County Water Authority. Ample supplies of electric and gas service are provided by the New York Power Authority and several private utility companies including National Grid, New York State Electric and Gas, and Rochester Gas and Electric. The region is also served by an advanced telecommunications system that is provided by such major service providers as Verizon, Time Warner, and AT&T.

In evaluating the region's resources, it is important to note that businesses have access to a wide range of real estate opportunities that are very affordable and diverse—from sophisticated urban space and high-tech research centers, to office and industrial parks, and efficient warehouse and distribution facilities. This real estate inventory is well distributed throughout the five-county region and includes several major business parks and Build Now-NY "shovel ready" sites: the Aurelius Business Park in Cayuga County; the Finger Lakes East Business Park in Cortland County; the Canastota and Lakeport Business Parks in Madison County; the Clay Business Park, Syracuse University Research Park, Hancock Airpark, Collamer Crossing Business Park, and the Radisson Industrial Park in Onondaga County; and the Oswego County Industrial Park, Lake Ontario Industrial Park, and the Riverview Business Park in Oswego County. Together these real estate holdings represent over 1,000 acres of land that are ready for development at very affordable prices that range from $10,000–$100,000 per acre.

When seeking to build an educated workforce, companies across the region are well served by 44 institutions of higher education located in Upstate New York, with a combined enrollment in excess of 215,000 students, and several for-profit education centers. Top area schools include Cazenovia College, Clarkson University, Colgate University, Cornell University, LeMoyne College, Rensselaer Polytechnic Institute, Rochester Institute of Technology, Syracuse University, University of Rochester, Wells College and members of the SUNY system including Albany, Binghamton, Buffalo, Cortland, Morrisville, Oswego, the College of Environmental Science and Forestry, the Institute of Technology, Cayuga Community College, Onondaga Community College, and Tompkins-Cortland Community College. Many of these colleges and universities have made the U.S. News and World Reports annual survey of the nation's best institutions of higher learning.

Advanced education and research facilities in the region include the Syracuse Center of Excellence and the Computer Applications and Software Engineering Center, the Human Performance Center at SUNY Upstate Medical University, Onondaga Community College's Applied Technology Center, Rome's U.S. Air Force Research Laboratory, and four national research centers at Cornell University.

Residents in Central New York enjoy very affordable housing, excellent health care, a strong K-12 public education system, several vibrant entertainment and shopping districts, cultural amenities that include a professional theatre, professional and college level sports, and numerous outdoor recreation opportunities. Quality of life rankings for the region are consistently very high—Forbes.com has ranked Syracuse #4 in the American Best Places to Raise a Family List and the ACCRA cost of living index maintained by the Council for Community and Economic Research shows the region is very competitive with other metropolitan areas across the nation.

Businesses in Central New York are supported by a strong professional business service community and a network of county and regionally based economic development organizations. These organizations offer a range of services that include financial assistance, tax abatement programs, workforce training, entrepreneurial development, marketing, and site location assistance. Building upon these resources, companies and various development organizations across the region are engaged in efforts to capitalize on developments in the marketplace that could prove beneficial to CNY such as initiatives in biotechnology, alternative energy, information management, health care, national defense, and deployment of advanced infrastructure systems and smart grid technology.

In addition to the information that can be gleaned from the data are the opportunities presented by trying to capitalize on the business operations of major employers in CNY which include such prominent names as Cornell University, Syracuse University, SUNY Upstate Medical University, Wegmans, Lockheed Martin, Constellation Energy Group, the Hartford Financial Group, Welch Allyn, Verizon, Syracuse Research Corporation, Bank of America, Excellus BC/BS, Anheuser Bush, Air Force Research Lab, Cooper Crouse Hinds, Nucor Steel, Bristol-Myers Squibb, Novelis, Pall Trinity Micro, MONY Group, Marietta Industries.

In addition to the efforts noted above, support is being given to innovative initiatives being led by major area companies and those associated with the Syracuse Technology Garden, the Syracuse Center of Excellence, and the Central New York Biotechnology Center. Attention is also being directed to work done by the NYS Energy Research and Development Authority and by the NYS Foundation



Upstate Golisano Children's Hospital

for Science, Technology and Innovation, and to the economic opportunities associated with several major developments in Upstate New York. These developments include the ongoing growth of the U.S. Army Fort Drum military installation in the north country, the AMD/Global Foundries semiconductor manufacturing center at the Luther Forest Technology Park in Saratoga County, the activities associated with the SEMATECH industry research consortium and the College of Nanoscale Science & Engineering at the University of Albany. Also noteworthy for its potential impact in CNY are the GE Global Research Center in Schenectady, the Cornell Agriculture and Food Technology Park in Geneva, the NYS Yogurt Summit, the NYS Beer, Wine and Spirits Summit, the Roswell Park Cancer Institute in Buffalo, the New York Power Authority's off-shore wind power and solar initiative, Destiny USA and Turning Stone Resort, and high speed rail. These initiatives, when combined with the region's strong economic foundation, are expected to help generate the growth of a significant number of new jobs in the years ahead.

2. Employment Clusters

Industries can group within an area as a result of several factors including geography, availability of natural resources, presence of intellectual assets, presence of a workforce with a high concentration of a particular skill, and the unique historical development of a region. Areas with such concentrations tend to attract similar industries or supporting industries; this provides a competitive advantage from the local pooling of talent and expertise.

Information presented in the following tables represents data assembled by the NYSDOL regarding industry concentrations in Central New York (Cayuga, Cortland, Madison, Onondaga and Oswego Counties). The table lists the industry concentration within the region, the jobs and wages produced by each, their regional ranking and their Location Quotient (LQ), which are measures of employment concentration in a regional economy. More specifically, they compare the concentration of industry employment locally to that of the U.S. If an industry's LQ is greater than 1.0, the region's labor market contains a higher concentration of jobs in that industry relative to the U.S. In the next table, information is presented regarding the region's economic clusters by industry sector.

TABLE 61–Central New York Employment Clusters, 2009

Industry Cluster	Jobs	Rank	Total Wages ($ MM)	Rank	Average Wage	Rank	Employment Location Quotient	Clusters Ranked by LQ within Region
Central NY								
Back Office & Outsourcing	6,900	6	$210.9	9	$30,500	15	0.84	9
Biomedical	3,100	11	$215.6	8	$68,900	1	1.48	2
Communications, Software & Media Services	5,900	7	$290.5	6	$49,600	9	0.84	9
Distribution	14,200	3	$669.7	4	$47,200	10	1.07	6
Electronics & Imaging	2,100	14	$114.3	14	$55,300	6	1.09	5
Fashion, Apparel & Textiles	400	16	$13.7	16	$36,500	14	0.24	16
Financial Services	14,300	2	$761.7	3	$53,300	7	.97	7
Food Processing	3,900	9	$163.6	10	$42,400	12	0.79	11
Forest Products	3,500	10	$148.4	12	$42,900	11	1.26	3
Front Office & Producer Services	15,900	1	$986.0	1	$62,000	5	0.89	8
Industrial Machinery & Services	12,400	5	$781.2	2	$62,800	4	1.61	1
Information Technology Services	2,300	12	$150.3	11	$64,200	2	0.46	15
Materials Processing	5,700	8	$292.8	5	$51,100	8	1.12	4
Miscellaneous Manufacturing	600	15	$23.1	15	$41,200	13	0.57	14
Transportation Equipment	2,200	13	$140.8	13	$63,500	3	0.79	11
Travel & Tourism	12,600	4	$246.1	7	$19,600	16	0.79	11
Total, All Clusters								
Central NY	105,900		$5,208.7		$49,200			

Source: NYSDOL

TABLE 62–Number of Companies by Select Industry Sectors, Syracuse MSA, 2009

	Syracuse MSA			United States			
	A	B	C	D	E	F	
Industry	Number of Companies	% of companies in an Industry Segment as a % of Total Companies in MSA	Paid Employees	Number of Companies	% of companies in an Industry Segment as a % of Total Companies in USA	Paid Employees	Ratio (B/E)
Estimated Total Number of Companies in MSA (includes Market Segments not shown below)	13,568	100.00%		6,417,035	100.00%		
Manufacturing	787	5.8%	28,202	363,753	5.7%	16,888,016	1.02
Food	67	0.5%	2,240	26,361	0.4%	1,471,050	1.19
Apparel	4	0.0%	500	17,065	0.3%	719,269	0.11
Wood & Paper	62	0.5%	2,848	23,307	0.4%	1,151,346	1.25
Chemical	28	0.2%	1,278	13,513	0.2%	884,321	0.97
Plastics/Rubber	38	0.3%	2,414	16,876	0.3%	1,029,976	1.06
Fabricated Metals	150	1.1%	4,467	62,501	1.0%	1,774,874	1.13
Machinery	74	0.5%	4,403	30,665	0.5%	1,421,820	1.13
Computer & electronic products	53	0.4%	5,771	17,465	0.3%	1,698,529	1.43
Electrical equipment & appliances	26	0.2%	3,030	6,946	0.1%	594,914	1.76
Furniture	21	0.2%	1,255	20,758	0.3%	604,845	0.48
Misc	67	0.2%	1	31,554	0.5%	735,337	1
Wholesale Trade	1,206	8.8%	15,611	453,470	7.1%	5,796,557	1.25
Retail Trade	2,895	21.2%	40,997	1,118,447	17.7%	13,991,103	1.22
Transportation & Warehousing	353	2.6%	10,954	178,025	2.8%	2,920,777	0.93
Truck Transportation	200	1.5%	3,967	103,978	1.6%	1,293,790	0.9
Warehousing & Storage	22	0.2%	394	6,497	0.1%	109,760	1.59
Finance & Insurance	941	6.9%	15,679	395,203	6.2%	5,835,214	1.12
Credit Intermediation & Related Services	334	2.4%	5,007	166,882	2.6%	2,744,910	0.94
Securities Intermediation & Related Services	88	0.6%	764	54,491	0.8%	706,053	0.76
Insurance Carriers & Related Activities	519	3.8%	9,908	172,299	2.7%	2,327,306	1.42
Professional, Scientific & Technical Services	1,362	10.0%	13,000	621,129	9.7%	5,361,210	1.03
Administrative & Support Services	528	3.9%	16,548	260,025	4.1%	7,066,658	0.95
Art, Entertainment and Recreation	289	2.1%	1,964	99,099	1.5%	1,587,660	1.37

Source: Bureau of Labor Statistics and DeLoitte & Touche

In reviewing the data, it is important to note that Central New York has several industries with a positive location quotient including biomedical, distribution, electronics and imaging, forest products, industrial machinery, and services and materials processing. Several other industries have high employment concentrations that suggest the area has a critical mass of skills that could be leveraged to expand activity in that sector through local growth or outside investment.

Regarding the "clean economy" the Brookings report underscores the importance of this cluster in the region's economy by noting that the Syracuse metropolitan are ranks 55th among the 100 largest metro areas with 9,648 clean economy jobs or 3.0% of all jobs in the region. On this measure of concentration, Brookings indicates that the region ranks 11th in the nation and that between 2003 and 2010 the Syracuse metro added 1,376 clean economy jobs for a 2.2% growth annually during this period, placing the region 64th and 80th respectively for those categories. It was also noted in the report, that on average each clean economy job in Central New York generated $10,317 in exports per job.

3. Regional Benchmarks

To assess the relative strengths and weaknesses of the economy in CNY, the region can be benchmarked against data from other parts of the country. The most efficient vehicle for comparison is federally Census designated Metropolitan Statistical Areas (MSAs). An MSA is defined as a geographical region with a relatively high population density at its core and close economic ties throughout the area. There are currently 366 MSAs in the United States; the Syracuse MSA consist of Madison, Onondaga, and Oswego Counties.

To evaluate the relative state of the region's economy, two ranking services were found to be particularly informative: the Policom Corporation's Economic Strength Rankings and the Milken Institute's Best Performing Cities. The Policom approach emphasizes the condition of local economies. Weight in its rankings is given to areas that have demonstrated rapid and consistent growth for an extended period of time. Areas with volatile growth typically rank lower. Three groups of data are considered:

+ Earnings, jobs, and wages for the whole area and on a per capita basis reflect overall growth in the size and quality of a local economy;

+ The same data, but specifically for small businesses (proprietors), the construction industry, and the retail industry, are measured because it is highly reactive to changes in the flow of money into or out of an area;

+ Welfare and Medicare income are tracked as negative indicators of local economic performance.

The most recent release of Policom's rankings (2011) provides 8 years of rankings dating to 2004. The Syracuse MSA has shown significant improvement over this period and in 2011 ranked 162 out of 366 MSAs. Since 2004, the Syracuse MSA has improved its ranking position by nearly 100 places. Among other Upstate NY MSAs, Albany and Rochester had higher ranking although neither showed the type of improvement over time as the Syracuse MSA did.

The Milken ranking system focuses on job and wage growth to pinpoint areas that are thriving. Additionally, the system incorporates a measurement of high technology GDP growth and high technology location quotients to weight for a metro area's participation in the knowledge economy. The Syracuse MSA saw an improvement in its 2008 overall ranking of 127, rising to 80 in 2010. The Syracuse MSA did especially well in the one-year job growth category (31), high-tech sector output growth relative to the U.S. average (42) and in the number of high-technology industries with a location quotient (LQ) above the U.S. average of 1.0 in 2009 (18).

4. Regional Economic Development Plans

The Central New York community has a very diverse economy that is supported by a growing workforce, a well-developed infrastructure base, and strong academic resources. To capitalize on these assets, the region has completed studies and developed a number of strategic economic development plans in recent years which together represent a short-term economic development strategy and a long-term comprehensive approach to economic growth. These documents include a report issued in 2007 by Battelle regarding the opportu-

TABLE 63–Policom Economic Strength Rankings

Metropolitan Area	2011	2010	2009	2008	2007	2006	2005	2004
Washington-Arlington-Alexandria, DC-VA-MD-WV (MSA)	1	2	2	2	1	3	1	3
Salt Lake City, UT (MSA)	2	6	10	9	28	18	6	17
Seattle-Tacoma-Bellevue, WA (MSA)	3	1	12	11	23	51	34	11
Austin-Round Rock-San Marcos, TX (MSA)	4	12	19	39	37	45	22	15
Houston-Sugar Land-Baytown, TX (MSA)	5	4	1	8	26	29	32	24
Madison, WI (MSA)	12	9	6	15	8	20	7	13
Omaha-Council Bluffs, NE-IA (MSA)	13	23	22	23	32	38	57	48
San Diego-Carlsbad-San Marcos, CA (MSA)	14	8	8	3	6	21	21	5
Phoenix-Mesa-Glendale, AZ (MSA)	20	16	18	6	7	8	11	14
Raleigh-Cary, NC (MSA)	22	15	15	24	30	25	19	9
Colorado Springs, CO (MSA)	24	40	73	77	83	67	39	29
New Haven-Milford, CT (MSA)	65	55	52	57	41	35	69	83
Cincinnati-Middletown, OH-KY-IN (MSA)	66	50	38	31	38	34	33	38
Albany-Schenectady-Troy, NY (MSA)	68	92	68	75	65	54	82	110
Louisville/Jefferson County, KY-IN (MSA)	76	102	59	66	67	41	28	30
Milwaukee-Waukesha-West Allis, WI (MSA)	94	66	45	35	40	37	58	57
Albuquerque, NM (MSA)	95	111	129	111	100	88	74	61
Knoxville, TN (MSA)	98	81	74	60	74	58	77	71
Oklahoma City, OK (MSA)	99	75	97	148	180	153	157	183
Chattanooga, TN-GA (MSA)	118	99	108	93	75	71	105	145
Rochester, NY (MSA)	121	135	110	106	115	147	175	214
Worcester, MA (MSA)	151	160	172	160	122	98	109	118
Scranton–Wilkes-Barre, PA (MSA)	152	198	159	180	196	168	133	163
Ann Arbor, MI (MSA)	160	165	130	114	110	97	84	106
Syracuse, NY (MSA)	162	195	149	166	179	201	222	258
Palm Bay-Melbourne-Titusville, FL (MSA)	188	169	167	145	174	199	209	177
Buffalo-Niagara Falls, NY (MSA)	190	219	161	167	167	179	201	235
Akron, OH (MSA)	191	150	99	95	108	90	104	120
Toledo, OH (MSA)	276	249	195	190	203	214	220	233
Utica-Rome, NY (MSA)	287	308	289	306	326	321	308	282
Dayton, OH (MSA)	295	265	199	175	168	136	152	162

Source: Policom Corporation

TABLE 64–Milken Best Performing Cities Rankings

2010	2009	Population 2009 (thousands)	Metropolitan area	2009 Value*	Rank 5-yr job growth 2004–2009	2009	Value* Rank 1-yr job growth, 2008–2009	2008	Value* Rank 5-yr wages/ salaries growth, 2003–2008	2008	Value* Rank 1-yr wages/ salaries growth , 2007–2008	Growth	RankJob growth (Apr 09–Apr 10)	2009	Value* Rank 5-yr relative HT GDP growth, 2004–2009	2009
1	2	379	Killeen-Temple-Fort Hood, TX MSA	110.75	7	103.84	4	122.72	1	106.18	1	1.52%	3	148.17	4	104.96
2	1	1,705	Austin-Round Rock, TX MSA	114.09	2	102.17	19	110.06	15	101.89	34	-0.09%	24	103.68	53	101.68
3	8	406	Huntsville, AL MSA	108.72	12	101.98	22	106.22	33	103.35	17	0.14%	18	104.54	48	103.67
4	4	741	McAllen-Edinburg-Mission, TX MSA	117.75	1	103.54	5	115.15	5	103.57	14	1.61%	2	110.69	32	105.53
5	6	246	Kennewick-Richland-Pasco, WA MSA	111.75	4	105.84	1	102.75	60	104.84	5	4.55%	1	87.19	157	105.19
7	10	1,126	Raleigh-Cary, NC MSA	111.85	3	100.13	84	109.82	16	101.15	51	-0.90%	56	109.14	34	101.48
9	14	751	El Paso, TX MSA	106.26	26	102.26	17	104.47	45	102.59	29	-0.04%	23	113.53	23	100.93
21	26	1,227	Oklahoma City, OK MSA	104.44	42	101.62	37	106.43	32	104.56	8	-1.22%	78	96.38	105	105.26
41	72	858	Albany-Schenectady-Troy, NY MSA	100.24	95	102.34	15	94.23	168	102.86	22	-0.83%	52	99.35	84	101.10
43	27	465	Fayetteville-Springdale-Rogers, AR-MO MSA	106.63	22	100.82	62	109.60	17	101.71	37	-1.35%	84	96.89	100	99.73
46	66	850	Omaha-Council Bluffs, NE-IA MSA	104.34	43	102.16	20	99.60	95	100.98	66	-1.21%	76	100.62	76	97.57
69	86	1,124	Buffalo-Niagara Falls, NY MSA	98.63	125	101.89	24	92.15	180	100.68	80	-0.22%	27	92.08	130	100.00
78	87	1,674	Virginia Beach-Norfolk-Newport News, VA-NC MSA	98.99	118	100.79	63	98.30	115	99.64	128	-1.01%	62	99.32	85	103.64
79	118	1,238	Richmond, VA MSA	100.58	86	100.19	82	101.64	66	99.48	136	-1.84%	119	103.47	54	101.54
80	74	646	Syracuse, NY MSA	99.31	113	101.77	31	93.29	176	100.38	97	-0.44%	34	88.98	151	97.05
82	73	677	Poughkeepsie-Newburgh-Middletown, NY MSA	99.27	114	101.82	26	95.86	146	101.09	55	-1.48%	91	89.02	150	98.09
119	92	485	Winston-Salem, NC MSA	101.98	66	99.98	89	94.43	166	99.78	124	-1.38%	85	162.64	1	92.13
120	141	1,328	Jacksonville, FL MSA	101.70	74	98.53	153	100.71	80	96.91	180	-1.65%	105	96.66	102	106.47
121	132	549	Scranton–Wilkes-Barre, PA MSA	99.50	107	101.35	45	93.99	171	99.98	116	-0.78%	49	72.36	189	91.27
132	50	1,840	San Jose-Sunnyvale-Santa Clara, CA MSA	99.69	104	97.76	173	102.14	63	96.69	185	-2.24%	142	97.24	97	96.01
133	172	524	Chattanooga, TN-GA MSA	95.97	168	97.00	184	95.35	153	99.31	143	-0.18%	25	137.94	8	103.25
138	43	407	Santa Barbara-Santa Maria-Goleta, CA MSA	97.51	146	99.48	120	98.39	112	100.00	115	-2.37%	152	97.39	95	93.91
139	151	1,560	Milwaukee-Waukesha-West Allis, WI MSA	97.70	141	99.21	129	94.53	165	100.49	90	-2.18%	137	114.49	21	95.74
140	170	352	Evansville, IN-KY MSA	96.23	166	100.34	75	91.34	184	100.69	79	-0.76%	47	72.12	191	84.86
194	190	408	Canton-Massillon, OH MSA	91.91	191	98.26	164	88.02	191	99.38	140	-2.93%	177	140.89	6	97.44
195	198	672	Toledo, OH MSA	90.57	193	97.67	175	86.43	193	96.93	178	-1.76%	113	96.02	108	99.94
196	143	419	Reno-Sparks, NV MSA	93.74	184	94.67	199	97.79	123	95.32	192	-3.05%	181	85.56	162	95.37

Source: Milken Institute

nities and prospects for Upstate New York's "green" industry sector. Other important reports include the CNY Comprehensive Economic Development Strategy (CNY CEDS), Vision 2010: A Regional Economic Development Strategy for Syracuse and Central New York, and the Essential New York Initiative. The CNY CEDS is a document updated each year by the CNY Regional Planning and Development Board and focuses on a short term project priority list of public capital improvement projects for the region. Vision 2010 is a document that was prepared in 1996 by the Stanford Research Institute under contract with the Metropolitan Development Association of Syracuse and Central New York. The revisions to Vision 2010, now titled the Essential New York Initiative, were prepared in 2004 by the Battelle Institute and Catalytix (a Richard Florida Company), two nationally-recognized consultants retained by MDA.

In 2011, these planning efforts received additional support by Governor Andrew Cuomo's administration through the implementation of a regional economic development council program initiative. As part of this initiative, each regional council was tasked with the challenge of preparing a regional economic development plan for their respective region. The Central New York Regional Economic Development Council (CNY REDC) completed work on their Five-Year Strategic Plan: 2012–2016 in November 201. This plan was chosen by the Governor's office in December 2011 as the "Best Plan Awardee" in NYS and received $103.7 million in capital grants and tax credit financing to support a range of economic and community development projects in the five-county Central New York region.

The CNY REDC's strategic plan is built around three priority goals to guide the region's collective actions:

A. Strengthen Targeted Industry Concentrations that Leverage Unique Economic Assets

B. Improve Competitiveness in, and Connections to, the Regional, National, and Global Economies

C. Revitalize the Region's Urban Cores, Main Streets, and Neighborhoods

A. Strengthen Targeted Industry Concentrations that Leverage Unique Economic Assets - In planning for future prosperity, the CNY REDC identified several critical industry concentrations that are at the heart of its economic strategy. These sectors represent a cross-section of both traditional and new economy industries and share five common criteria: (1) they have critical mass of existing firms and a large base of existing employment in the region; (2) employment in these sectors is highly concentrated in Central New York; (3) there is significant growth in regional, national, and global demand for the products and services they generate; (4) Central New York possesses resources to support these clusters and, therefore, this region has a competitive advantage to attract similar firms; and (5) they are deeply connected to our anchor institutions. Priority industry concentrations identified in the plan include:

a. Clean Energy and Environmental Systems—Central New York has the eighth highest concentration of private sector "green jobs" of any region in the country and is home to New York State's Syracuse Center of Excellence in Environmental and Energy Systems (SyracuseCoE), a consortium of more than 200 research institutions and private sector companies.

b. Health, Biomedical Services, and Biosciences— The region's hospitals directly employ more than 23,000 people and another 3,500 are



Syracuse Inner Harbor COR Development Model

employed in private, high-tech biomedical companies with average wages approaching $70,000, nearly double the region's median wage. The region's extensive research and development (R&D) in the biosciences cluster not only fuels health and biomedical, but also drives the area's clean technology, agribusiness, and other core industries.

c. Financial Services—This industry employs more than 24,000 in the region. Recent research demonstrates that Central New York offers significant advantages to firms in this sector, such as a lower cost of operation and a highly skilled and experienced labor force that provides opportunities for employment growth.

d. Agribusiness and Food Processing—New York State is the nation's third-largest producer of fluid milk and commodity crops representing more than $1 billion in sales alone. Central New York is a significant contributor and increasingly focused on value-added opportunities for agribusiness, including food processing.

e. Advanced Manufacturing—Manufacturing represents 10% of the region's total employment and subsectors, such as digital electronics and radar and sensor systems, serve expanding global markets in security, information technology, and defense.

f. Tourism—Tourism is a $1 billion industry in Central New York, and current global economic conditions, including the weak dollar, create opportunities for the region to draw additional international visitors across our shared boundary with Canada and from entry points downstate.

B. Improve Competitiveness in, and Connections to, the Regional, National, and Global Economies -The CNY REDC's economic development strategy acknowledges and embraces the global nature of today's economy and encourages businesses, large and small, to compete in an increasingly competitive marketplace. As noted in the plan, Central New York's highly educated workforce forms the foundation for those investments, as does its unique concentration of leading higher-education and research and development institutions. In order to improve global competitiveness, the plan recommends making significant investments in several critical mechanisms that fuel economic growth:

a. Encourage New Venture and Product Development—The region has a strong foundation in entrepreneurship with collaborative programs between higher education and business. Further investments in this area are recommended to support successful venture development, including student venture development, as part of a transformational strategy to re-energize the regional economy.



Syracuse Center of Excellence

b. Prioritize Investments in Innovation, Commercialization, and Process Improvement—Continuous improvement and the development of new products and services is critical to the success of businesses in a rapidly evolving global economy. The CNY REDC recommends private investment in research and development; improve technology commercialization among its educational and research institutions; and the creation of a complete ecosystem of mentors, business services, and risk-capital to enable innovation.

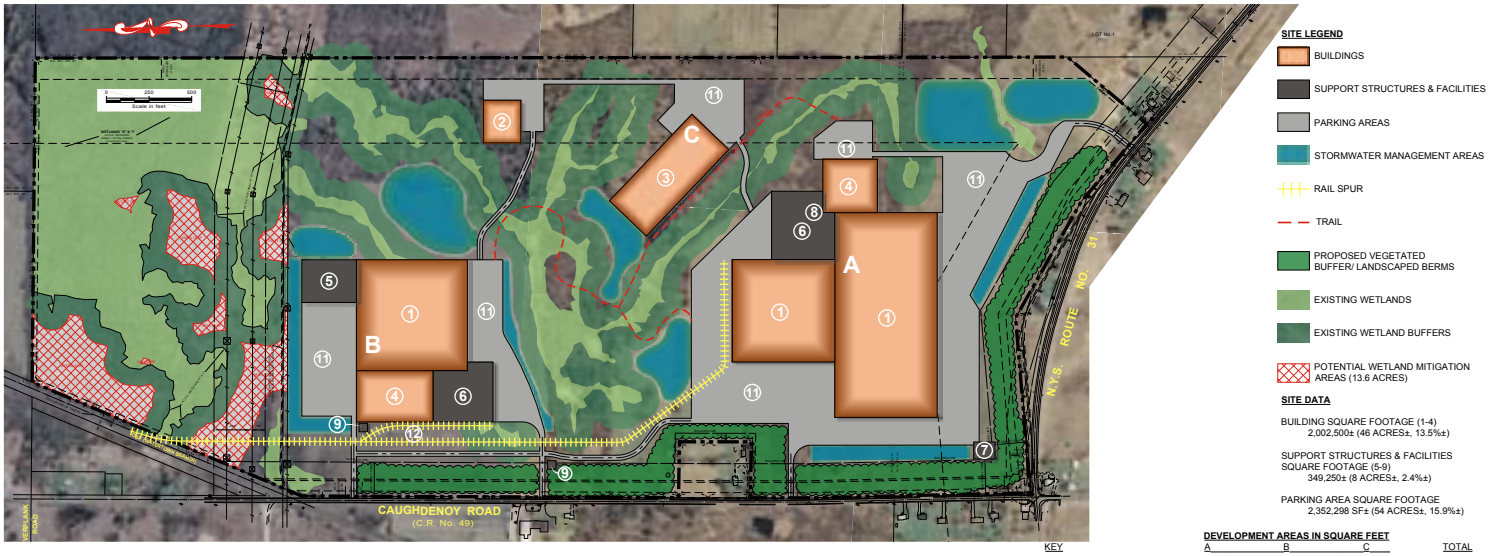
c. Capture a Greater Share of the Global Marketplace—Ninety-five percent of the world's consumers currently reside outside of the United States. Improving export performance is critical to the long-term competitiveness of the region. Export-driven jobs also provide higher wages for the region's residents. In addition to promoting

Central New York's products and services across the world, the region is well positioned to attract new foreign investment from global companies looking to serve domestic markets.

d. Build a 21st Century Infrastructure—Global competitiveness requires global connectivity. The region must improve its physical infrastructure, including its air service, port access, road and rail infrastructure, and broadband connectivity, in order to get regional goods and services to national and global markets.

e. Maximize Human Capital—While the region possesses a highly skilled and well-educated workforce, the region must expand the participation of the workforce in the new economy, particularly in key industry sectors, such as advanced manufacturing and health care.

C. Revitalize the Region's Urban Cores, Main Streets, and Neighborhoods - As part of the plan, the CNY REDC recognized that strong regions are built around strong municipal cores and neighborhoods that develop, attract, and retain the human and social capital



CONCEPTUAL SITE PLAN & PREFERRED DEVELOPMENT SCENARIO

CLAY WHITE PINES COMMERCE PARK

SCALE: 1"=250'

	KEY	DEVELOPMENT AREAS IN SQUARE FEET A	B	C	TOTAL
BUILDINGS	①MANUFACTURING / ASSEMBLY	360,000 720,000	422,500		1,502,500
	②OFFICE / ADMINISTRATION			55,000	55,000
	③LAB / R&D			210,000	210,000
	④WAREHOUSE / S&R	100,000	135,000		235,000
SUPPORT STRUCTURES & FACILITIES	⑤ELECTRICAL / SUBSTATION		80,000		80,000
	⑥UTILITY / SERVICE YARDS	139,250	112,500		251,750
	⑦WASTEWATER PLANT (PUMP STATION)		12,500		12,500
	⑧WATER TANK (100' HT.)	1 MG			1 MG
	⑨GUARD / SECURITY	2,500	2,500		5,000
	⑩STORMWATER				
	⑪PARKING* (# OF SPACES 1-4)	2,160 @ 2/1000 50 @ 0.5/1000	845 @ 2/1000 68 @ 0.5/1000	110 @ 2/1000 420 @ 2/1000	3,653
	⑫RAIL SPUR		2,150 LF 800 LF		2,950 LF

required for industry to grow and remain competitive—the convergence of ideas and people. Many leading businesses and key industry sector hubs are located within these city and town centers, and the region's anchor institutions—educational, health care, and cultural—have been at the forefront of the national movement to leverage their assets for community revitalization. Building upon the strengths of these existing opportunities, the CNY REDC recommends that efforts be directed to recreate the social, physical, and cultural fabric of its neighborhoods, urban cores, and main streets. In pursuing the goal to invest in and strengthen the region's cores, the CNY REDC recommended:

a. Rethink—Reinvigorate the region's neighborhoods and main streets through mutually beneficial partnerships with diverse businesses and the region's anchor institutions, and invest resources that leverage the national movement of anchor institutions to restore neighborhoods, train new workers, retain young talent, and create small business and social enterprises.

b. Repurpose—Municipal centers represent significant investments in physical infrastructure that must be preserved and enhanced for future growth. Pursue a strategy that repurposes existing physical assets through adaptive re-use and brownfield remediation, links planned transportation investment with surrounding private development through transit-oriented strategies, uses green technologies to improve the efficiency of existing assets from individual buildings to entire neighborhoods, promotes density in development, and encourages quality communities.

Oswego Harbor



c. Retrain—Human and social capital is the most important asset for a globally competitive economy, and the region must rise to the challenge to improve Pre-K-12 educational attainment; provide greater access to education; prepare students for high-demand careers; retrain workers for new careers; support minority, women, and veteran owned businesses; and create quality employment opportunities that will allow individuals and families to prosper.

D. Next Steps in Building the Foundation for Transformative Prosperity - Although the strategic plan is largely developed to address immediate funding opportunities in partnership with New York State, it also identified "transformational" projects, programs, and other opportunities that are critical for the region's future. Transformational initiatives identified include:

a. Regional Industrial Clusters: New York Energy Regional Innovation Cluster—(NYE-RIC) NYE-RIC is a statewide alliance focused on accelerating the development and deployment of innovations to dramatically improve energy efficiency in buildings, addressing a global demand in a market that is expected to grow dramatically over the coming decades. The proposed investment of $225 million includes $150 million from private and federal sources, which can be used to leverage $75 million from various state and federal sources.

Food-to-Market and Agricultural Programming—Central New York is uniquely poised to be the agribusiness "hub" of New York if it can coordinate its use of agricultural and natural resources to create more robust systems for local food to market initiatives and regional energy production.

Tourism in the Arts and Culture—The region has an abundance of arts and cultural opportunities, with world-class offerings by individual artist studios to large-scale performance venues. Access must be provided to broader audiences while finding ways to leverage community support and funding for the arts to reach national and international markets.

Project "Top Hat" A Fortune 1,000 financial back office services firm is considering an expansion in multiple regions in upstate New York, with the potential to generate more than 1,000 jobs. In order to accommodate the anticipated growth, the region must engage institutions of higher learning in terms of internships, curriculum development, and employment training to meet the company's anticipated workforce demand.

b. Connecting People, Jobs, and Housing: Municipal Core Mixed-Use Investment Program— The Restore New York program successfully provided needed gap financing to mixed-use projects of all sizes throughout the State. The program proved critical to getting new commercial and residential construction moving in Central New York's municipal cores and the State must consider the creation of similar mixed-use investment programs in the future.

Broadband/Connectivity Infrastructure—In an increasingly interconnected marketplace, ubiquitous high-speed, affordable broadband Internet access is a key component to thriving economies in both urban and rural communities. Rural areas need a strategy to support investment in broadband to connect its citizens with each other and the broader economy.

Region-Wide Waterfront Revitalization Strategy— To unlock the full economic potential of the region's abundant waterfronts, New York State must help create focused waterfront programs that leverage local investments in municipal revitalization, marketing, business recruitment, and shipping.

c. Workforce Alignment: Say Yes to Education—The nation's first-ever, district-wide implementation of Say Yes in the City of Syracuse is poised to be a visionary, turnaround model for education and economic development in urban centers across the United States. New York State must help expand the Say Yes Summer Academies throughout the five-county region, and further advance scholarship opportunities for aspiring youth.

d. Innovation Infrastructure: Innovate Upstate Fund—Central New York has a robust innovation ecosystem through R&D at major area employers and its academic institutions, and at strong early-stage companies; however, the State does not have a complete continuum of funding programs and tax breaks to assist in various emerging technology sectors. The region's private and institutional partners must work to capitalize a regional venture fund to provide critical risk capital to accelerate the launch and growth of more startup companies.



SUNY ESF Willow Crop Initiative

B. SUSTAINABLE FUTURE IN CENTRAL NEW YORK

A review of the information presented in this chapter shows that the preparation of the economic development strategy must be carefully calibrated to account for developments which are occurring on an international, national, and regional level. As noted in recent years by the International Monetary Fund, the world economic recovery is proceeding broadly with most advanced and emerging economies still facing major adjustments, including the need to strengthen household balance sheets, stabilize and subsequently reduce high public debt, and repair and reform their financial sectors. Supplementing this information is a comprehensive overview on the current condition of the NYS economy as provided by the NYS Comptroller's office. These reports underscore the fact that New York is slowly recovering from the worst recession since the Great Depression but still faces significant challenges and risk with unemployment rates high and many upstate regions struggling.

On a regional level, data was presented which documented that the population base in Central New York has stabilized in recent years following a sharp decline estimated to have taken place from 1985–1995. In looking at these figures, it is important to note that the area's population is now at the highest level it has ever been in the history of this region. Other demographic factors show that the region's per capita income is comparable with similar sized metropolitan areas and has increased in recent years in a manner that is consistent with general trends across the State and nation. Education data clearly suggests the region is in a strong position to provide the educated workforce needed by employers today.

On the economic front information was presented that documents the diversity of the region's economy, which has proven to be a real benefit to the area as residents struggle with the nation's current economic recession. In reviewing this data, it is important to note that this economic diversity is consistent with similar patterns taking place in many parts of the country and is a reflection of a natural shift in the nation's economy and not the result of some major public policy initiatives which have been implemented at the federal, state, or local level. With regard to the CNY labor force, the region's labor force has remained very stable in recent years. Data shows that wage rates in the region are very competitive with labor cost across the country.

In addition to the economic development opportunities that can be gleaned from the data are the possibilities presented to communities who can capitalize on the presence of several major employers in CNY. Complementing these companies are the opportunities presented by the fact that there are several major employment clusters in Central New York. These clusters include biomedical, logistics and distribution, electronics, industrial machinery, materials processing, food processing, education, and health care service.

Supporting the economic base of the area is a large network of transportation assets, public water and sanitary sewer systems, electric and natural gas supplies, telecommunication systems, public safety services, public education, and various recreational assets. Complementing these resources is an extensive professional business service and banking network that exists in Central New York. This network provides a very robust and competitive array of services and financial resources to support economic growth in the region. Regarding governance, it is important to note the challenges facing government today to provide vitally needed public services and infrastructure while at the same time controlling costs.

Putting all the data in perspective, regional benchmarking analysis shows that Central New York is in a fairly competitive position ranking 162 out of 366 metropolitan areas in the nation in one study and 80 out of 366 in another study. Each of these rankings demonstrates that the regions' economy has improved fairly dramatically in recent years when compared to other communities across the nation. In addition, information presented in the CNY Regional Economic Development Council's Strategic Economic Development Council Plan: 2012–2016 noted the opportunities associated with efforts focused on three priority goals including strengthening target industries, improved competitiveness in the world marketplace, and revitalizing the region's urban cores and main streets.

1. Goal and Targets

Based upon public input and the information presented above, the planning team has established the following economic development goal for Central New York:

GOAL: Support the growth of a diverse economic base that will provide employment opportunities for a broad cross section of citizens across the five-county region.
To achieve this goal, the following targets have been established for Central New York:

1) **Increase the region's current population of 791,500 to 1 million residents by 2050.**

   The population of CNY has remained relatively steady over the past twenty year and currently equals approximately 791,500 residents; a little over half of the region's population (412,317) lives in the Syracuse Urbanized Area. Given the aging base of the region's population, additional population growth is needed in Central New York to support the existing economic base and to serve as a resource to attract new employers to the five-county area. To meet this anticipated demand, it is projected that the target population for Central New York needs to increase to one million people over the next 35 years. This represents a population increase of 208,500 or 5,957 people per year, which is less than a 1% change in population each year.

2) **Increase the regions' current number of jobs from 320,000 to 405,000 by 2030.**

   There are currently 320,000 jobs in CNY including 280,000 in the private service sector and 40,000 jobs in the private goods producing sector. This number has remained fairly steady over the past thirty years. Major industry sectors in the region include health care, education, professional business services, trade, and manufacturing. In order to sustain the region's population base, additional jobs are needed across a broad cross-section of the economy. The target is to increase the number of jobs in CNY to 405,000 by 2030.

3) **Increase the region's per capita income to equal or exceed the national average by 2030.**

   The average per capita income in CNY is currently $25,419, while the national average is $26,059. Per capita income is measured in the American Community Survey, and has been increasing in each county in Central New York since 2009. To ensure that residents in CNY have sufficient income to meet their daily needs, the number of good paying jobs must be increased so the per capital income in CNY is equal to or exceeds the national average by 2030.

4) **Improve the region's national economic strength index rating to a "Top 50" score.**

   One method of evaluating the strength and growth of the CNY economy is looking at economic indexes that rank Metropolitan Statistical Areas (MSA). The Policom Corporation publishes the Economic Strength Rankings, which emphasizes the condition of local economies, and the Milken Institute publishes the Best Performing Cities, which focuses on job and wage growth. Currently, the Syracuse MSA ranks 162 (out of 366) on the Economic Strength Rankings, and 80th on the Best Performing Cities. The target is to improve the Syracuse MSA ranking to top 50 standing in both indexes by 2030.

5) **Increase the number of clean-energy jobs in Central New York as measured by the Brookings Institute by 25% over the next 20 years.**

   According to the Brookings Institute, there are 9,648 clean economy jobs in the Syracuse MSA, making up 3% of total jobs. Clean economy jobs are defined as those that produce goods and services with an environmental benefit. This concentration of clean jobs ranks the Syracuse MSA 11th in the nation. The target is to increase the number of clean-economy jobs by 25% to 12,060 jobs by 2030.

2. Strategies

Through group discussions with stakeholders, the planning team identified areas of key opportunities and challenges to achieving sustain-

able economic development in the region. After reviewing the goal, indicators and targets, and the key opportunities and challenges, a set of economic development strategies were identified for future implementation. Strategies were selected based on the contribution of each to advance the plan's overall economic development goal and targets. In addition, strategies were evaluated for their overall benefits to the region, as well as the costs and feasibility for implementation.

In establishing an action plan for the region, these strategies were prioritized according to their readiness for implementation in the short-term opportunities or long-term initiatives, with short-term defined as 1-5 years and long-term defined as 5-10 years, as these opportunities may require additional time and effort to develop and implement.

Key strategies that have been identified to achieve sustainable economic development include:

Short-Term Opportunities

a) Maintain a strong foundation for the management and efficient delivery of government services at the federal, state, and local level.

b) Support the development and maintenance of a modern infrastructure network in Central New York that is focused on roads, sewer and water facilities, transit services, telecommunication resources, air and rail services, shovel ready development sites, and port facilities.

Long-Term Initiatives

c) Develop a coordinated regional program that will improve the quality of life in Central New York through targeted investments in the region's recreation, cultural, arts, and historic resources.

d) Maintain a strong network of county and regionally-based organizations with the capacity to coordinate the delivery of a range of economic development services, tax abatement, and financial assistance in Central New York.

e) Support the operation of a coordinated and robust business retention and expansion program in Central New York

f) Maximize the region's human capital by improving the alignment of workforce supply and employment demand in the region.

g) Encourage the growth of a strong entrepreneurial culture in Central New York that will strengthen the region's economy through new venture formation and product development activities.

h) Support the region's industry concentrations through investment of resources in targeted research initiatives, capital funding, and workforce training programs.

i) Coordinate implementation of a comprehensive regional marketing and business recruitment program.

j) Implement a comprehensive regional export marketing campaign and technical assistance program.

a) Maintain a strong foundation for the management and efficient delivery of government services at the federal, state, and local level.

In developing an economic development strategy, it is important to acknowledge that the region is competing for jobs on a regional, national, and international level. This competition underscores the importance of providing traditional public services to business and residents in an efficient, cost effective, and professional manner. In Central New York these services are provided through a formal legislative structure and public administrative offices. Through these offices, communities have been able to maintain a complex infrastructure network, a strong public school system, an effective public safety system and emergency communication service, a comprehensive solid waste system, records management, a range of public health and social welfare services, and an efficient tax collection system. In most cases these services are delivered efficiently with per capita tax expenditure being among the lowest in the State.

To build on this record of accomplishment in CNY, communities are continuing efforts to further consolidate the delivery of services in the region. Examples of this actions include work by the CNY

Regional Transportation Authority, the Metropolitan Water Board and the Onondaga County Water Authority, and an integrated county-based 911 Emergency Communication System being implemented in the region. Other steps being taken include efforts to reduce the cost of mandated services and public pensions for local communities. Beyond these macro-level initiatives, consideration must be given to actions that can facilitate sustainable development in the region. These actions include efforts to implement a comprehensive storm water management program in the region along with efforts to broaden the reach of green infrastructure and smart growth policies in Central New York. Complementing these activities is work that can be done on an inter-municipal basis to standardize municipal forms and application for permitting, zoning, and building code applications in the region. In addition, work can be done to better inventory the region's public infrastructure and use this information to development a coordinated asset management and capital improvement program for major resources in CNY. Complementing these activities is the ongoing work which must be continued through various leadership organizations in CNY that provide a forum to coordinate public policy and community development initiatives in the five-county area.

b) Support the development and maintenance of a modern infrastructure network that is focused on roads, transit services, sewer and water facilities, telecommunication resources, commercial air service, a navigable water harbor port facility, rail services, and shovel ready development sites.

The provision of public infrastructure is one of the most vital services that can be provided to the business community in Central New York. The principal issues of concern to businesses in this field are reliability and cost of service, convenient access and proximity to markets and supplies, speed of communication, capacity and redundancy of vital services, and affordable real estate assets. In reviewing these issues it is important to note that CNY has a very robust infrastructure network and real estate market that is capable of meeting most of the present day demands in the marketplace and future needs as the economic base of the region grows. To capitalize on these resources, communities need to consider the merits of developing a coordinated asset management and capital improvement program for the major infrastructure resources in the region. As part of this effort, attention must be focused on actions which can be taken to properly address the I-81 Challenge regarding the replacement of the highway viaduct in downtown Syracuse. Consideration should also be directed toward improvements to the waste-water treatment plants in Auburn and Cortland to support pending business expansion projects in these communities.

Opportunities are also available to capitalize on plans to improve rail freight service in the region through the implementation of projects such as the intermodal rail freight-inland port initiative in the Towns of DeWitt and Manlius. Ideas have also been advanced to the planning and conceptual design stage for expansion of the Port of Oswego and to complete a major water transmission and distribution line across the north shore of Oneida Lake which will bring vitally needed service to this part of the region and areas in northern Madison County, while at the same time significantly improving the overall redundant capacity of the region's major water distribution network. Other high priority initiatives include the provision of public sewer and water service to the Clay White Pines Commerce Park, the Madison County Agriculture and Renewable Energy Park, and the Syracuse Inner Harbor in support of a large urban waterfront revitalization commercial mixed-use development that has been proposed for the area.

c) Develop a coordinated regional program that will improve the quality of life in Central New York through targeted investments in the region's anchor institutions, recreation assets, cultural and historic resources, and gateway centers.

One of the primary goals of the CNY Regional Economic Development Council Strategic Plan is to support the revitalization of the region's urban cores, main streets, and neighborhoods. In advancing this goal, it is recognized that strong regions are built around vibrant communities with the capacity to attract, retain, and nurture the human and social capital needed to compete in the world marketplace for ideas and talent. To help facilitate an improvement in the quality of life experienced by local residents communities across Central New York are strongly encouraged to pursue opportunities associated with key resources that are located in their community centers. In many instances these

STRATEGIC PLAN FOR ST. JOSEPH'S HOSPITAL AND A PROSPECT HILL MEDICAL DISTRICT

The Central New York Regional Planning and Development Board commissioned a strategic planning study in July 2008 at the request of the St. Joseph's Hospital Health Center. Funding was provided by the U.S. Department of Commerce – Economic Development Administration, the St. Joseph's Hospital Foundation, the Syracuse Industrial Development Agency, and the CNY RPDB.

The study was undertaken by a multi-disciplinary consultant team retained by the CNY RPDB that was led by the architecture and urban design firm of Chan Krieger Sieniewicz (Cambridge, MA). Other members of the consultant team included Ashley McGraw Architects (Syracuse, NY), Tripp Umbach, a national healthcare market research consulting firm (Pittsburgh, PA) and Economic Research Associates, a national real estate market research firm.

This report presents a strategic plan that has been developed for the creation of a medical district in conjunction with the St. Joseph's Hospital Health Center, in an area known as the Prospect Hill neighborhood in the City of Syracuse, New York. The study area, equivalent to 32 blocks and roughly half the size of the Syracuse downtown core, is bounded by North Salina Street, Butternut Street, Lodi Street, and James Street.

Plans for the completion of this study were driven, in part, by the community's recognition that medical institutions, such as the St. Joseph's Hospital Health Center, play an important part in the region's economic development and community revitalization efforts and that steps must be taken to help strengthen these institutions and the neighborhoods in which they reside.



As the dominant employer in the community, St. Joseph's Hospital impacts the Prospect Hill neighborhood in the City of Syracuse more than any other driver in the area. Certain investments can best be made by the institution itself such as the clinical, educational, and research growth that is stemming from transformations in the health care industry and driving St. Joseph's Hospital current expansion plans. Other projects are best advanced by the public sector. City departments (such as engineering, transportation, and planning) help set the stage for redevelopment through community revitalization and infrastructure investments that can make an area more attractive for investment. Private sector developments arise – and are most successful – when the risks to the developer are reduced by carefully planned and coordinated institutional investments and public sector commitment of resources in the surrounding area.

In preparing this strategic plan, information was taken from the study advisory team and combined with the urban design, health care, and real estate market expertise of the full consultant team. This information and analysis is organized in the following pages of this report, which is divided into five sections:

I. Introduction
II. Existing Conditions Report
III. Conceptual Planning Alternatives
IV. Final Strategic Plan
V. Appendix

In reviewing this plan, it is important to understand that while many of the recommendations are targeted geographically to certain building parcels and sites, the overall concept of developing a coordinated medical district in the Prospect Hill neighborhood is visionary. This vision will require careful consideration by the hospital, its neighbors, and community leaders before it can be fully embraced and implemented.

assets include certain location advantages, education institutions, recreation centers, along with various cultural, arts and historic resources. By capitalizing on these assets, communities can help make the region more attractive to the existing workforce and new employers that are considering locating in the area.

To realize the potential of the region's community assets, a strong recommendation is made to focus resources on reinvigorating the region's community centers and main streets through mutually beneficial partnerships with key institutions, repurposing existing physical assets through adaptive reuse and investing in historic buildings, brownfield redevelopment, carefully planned transportation improvements, and targeted infrastructure investments. As part of the effort to develop and retain the workforce of tomorrow, federal, state, and local officials across Central New York must also recognize the importance of improving the region's physical appearance and immediately implement a comprehensive beautification campaign focused on certain gateways into the region, key interstate highways locations and road intersections, waterfront areas, and public parks. Furthermore, a commitment must be made to providing an ongoing financial base that is needed to maintain and grow a robust cultural arts and entertainment community in Central New York.

d) Maintain a strong network of county and regionally-based organizations with the capacity to coordinate the delivery of a range of economic development services, tax abatement, and financial assistance in Central New York.

It is important to note in today's economic climate that many regions across the nation have formed dedicated economic development functions with full-time professional staff with responsibility for providing a range of services to support economic growth. In NYS, a cornerstone of this economic development structure are county and city based public benefit corporations established under the provisions of State law with the authority to issue taxable and tax-exempt bond financing, elimination of sales tax on materials and equipment used for manufacturing, and the establishment of payment-in-lieu-of-tax agreements for the management of real property taxes and the elimination of mortgage recording taxes. In addition to these statutory powers, these organizations and related legal partners provide a range of other economic development services including performing liaison functions with the local business community, providing access to financial incentives and job training resources at the federal, state, and local level, and assisting businesses with the identification and development of real estate assets.

In Central New York, these organizations include the Auburn Industrial Development Agency, Cayuga County Industrial Development Agency, Cortland County Industrial Development Agency, Madison County Industrial Development Agency, the City of Syracuse and the Onondaga County Industrial Development Agencies, and the County of Oswego Industrial Development Agency. Complimenting these county-based organizations is a network of organizations that operate on a regional basis in Central New York. These organizations include the NYS Department of Economic Development/Empire State Development, NYS Department of Labor, U.S. Small Business Administration, National Grid, CenterState Corporation for Economic Opportunity, Manufacturers Association of Central New York, CNY Technology Development Organization, and the CNY Regional Planning and Development Board.

As noted above, Central New York is well-served by the current economic development structure in the region. To further capitalize on these assets, resources should be directed toward using the Central New York Regional Economic Development Council as a forum to help coordinate local development efforts and inform municipal officials across the region. In addition, the CNY REDC can serve as the vehicle for coordinating efforts to maintain a comprehensive economic development strategy. As part of this effort, consideration should be given to periodically convening meetings of industry representatives and a local "economic expert" roundtable to review economic data, resources, and opportunities for economic development in CNY. In addition, current state and local regulatory policy must be maintained to ensure that local development agencies have a sufficient revenue stream to maintain existing staff resources to perform the level of business outreach needed to properly inform and assist the local business community with support job creation and retention and general economic growth. Furthermore, additional federal, state, and local financial resources

must be provided to local and regional development organizations so that certain discretionary programs can be implemented across the region. These programs include entrepreneurial development, export marketing, venture capital assistance, workforce training, business recruitment, and real estate development. Attention should also be directed to regularly evaluating utility rate structures and local incentive programs to ensure they align with evolving economic development objectives, community needs, and competition in the marketplace.

Major organizations with a capacity to implement this strategy include the NYS Empire State Development, CenterState CEO, and county- and city-based industrial development agencies.

e) Support the operation of a coordinated and robust business retention and expansion program in Central New York.

Beyond organizational initiatives, a great deal of attention is paid today to work that can be done at the federal, state, regional, and local level to support economic growth through an organized business retention and expansion program. While often undervalued as a strategy for economic development, business retention and expansion (BR&E) is nevertheless among the most common elements of a comprehensive economic development program. According to the International Economic Development Council (IEDC), two-thirds of all economic development organizations in the nation have BR&E programs, while less than half have business attraction programs.

There is a common adage in economic development that it is far easier to retain an existing employer than to recruit a new one. In fact, research has shown that most new jobs are created by existing businesses in a community rather than those relocating from elsewhere. In today's global marketplace, with industries rapidly consolidating and economic developers competing to lure new companies to their communities, business retention is even more important as part of an economic development strategy. Business retention and expansion programs typically include a wide variety of activities undertaken to retain and facilitate the growth of local businesses. The "tools" used in BR&E are many of the same items found in the recruitment toolbox: financial assistance, workforce training, information on available sites or buildings, assistance with permitting and licensing, export/procurement assistance, and so on. In some cases, the economic development organization (EDO) can provide services directly; in other instances, the EDO serves as a broker between the company and the source(s) of the assistance.

Because the services provided are based on the needs of the customer, BR&E depends heavily on a customer service orientation. Successful BR&E must begin with an effective outreach program to assess the needs, priorities, and concerns of individual businesses in cooperation with company owners and managers. Based upon an analysis of numerous BR&E programs across the country and a review of the available resources and work that is being done in Central New York, specific attention must be given to the following actions:

+ Convene workshops of local "economic experts" to review issues, resources, and opportunities for economic development in the region

+ Establish a formal business outreach program at the county level that coordinates the delivery of services provided by various agencies to the small business community

+ Conduct formal outreach to various business service providers such as bankers, lawyers, and accountants to identify business development opportunities and needs in the region

+ Complete a detailed inventory and contact list for major development projects/business opportunities in Upstate New York—Fort Drum, Albany Nanotech, Global Foundries, Turning Stone that may represent business development opportunities for local companies

+ Support entrepreneurial initiatives and business networking forums at area colleges

+ Support regional and statewide efforts to foster formal relationships with venture capital providers and angel investors to support entrepreneurial development in the region

+ Maintain a competitive business incentive and small business loan program across the five-county region

f) Maximize the region's human capital by improving the alignment of workforce supply and employment demand in the region.

The availability of a trained or trainable workforce may be one of the most crucial ingredients in any decision by today's business community to expand or relocate. The development of specialized skills is an expensive undertaking for any company and the availability of a pool of workers ready to be productive is a major attraction for local and relocating firms alike. Having such a workforce is a key to the region's ability to participate in the dynamic and highly competitive regional, national, and international economies of today. There are two essential challenges in this area including keeping a viable local labor pool available as the population ages, and providing the right type of training at the right time for this workforce.

In evaluating its workforce training resources, it is important to note that Central New York is well-served by a strong K-12 public school system, three community colleges, and several four-year colleges and universities. These institutions include Syracuse University, SUNY Upstate Medical University, the SUNY College of Environmental Science and Forestry, Colgate University, Cazenovia College, Wells College, LeMoyne College, and SUNY Colleges at Cortland, Morrisville, and Oswego. Complementing these resources is a network of county-based job training and local workforce investment agencies formed across the region under the provisions of the federal Workforce Investment Act (WIA). These organizations provide a single point of entry for bringing together businesses, job seekers, and training providers with the goal of providing skilled workers for every business and employment for every job seeker in the community.

In accordance with the WIA, counties are required to form local Workforce Investment Boards to facilitate a partnership approach to meeting the needs of business, providing career opportunities for workers, and assuring meaningful education and employment experiences for youth. Board composition must align with the structure of the region's economy and include representation from business, education, organized labor, government, employment & training, economic development and community-based organizations. Workforce Investment Boards are required to develop plans that evaluate their community's economic conditions, workforce needs, and systems for the delivery of employment and training services. These plans are designed to help direct resources to key career counseling programs, workforce training needs, and job placement services in a community. Utilizing the information that is drawn from these plans, it is apparent that several ideas should be advanced in Central New York to help ensure that the region has sufficient labor resources to support economic growth across a range of industrial sectors. These recommendations include:

+ The development of a web-based information portal that has a comprehensive inventory of the vocation and technology education programs currently being offered by the education institutions in Central New York. As part of this outreach effort, as series of case studies can be prepared to demonstrate how certain training programs in CNY have been used by area employers to meet their workforce needs.

+ One of the greatest challenges confronting companies today is to generate the capital resources needed to train existing and new employees on new equipment and advances in production processes which must be brought into the workplace to meet the competition in the marketplace. In most cases, these training costs cannot be financed through traditional lending institutions and must be addressed through internal cash flow resources. However, in today's economic environment, many companies are unable to generate these resources and, therefore, a regional training grant program must be capitalized in Central New York. Such a program should be targeted to small businesses that are net wealth generators for their community with the capacity for employment growth.

+ In addition to addressing current employment needs, local academic institutions should be challenged to help finance a study that would focus on identifying local training needs based on anticipated changes in the marketplace and future employment opportunities. Such initiatives have been successfully un-

dertaken in communities to address workforce needs such as those related to semi-conductor manufacturing and nanotechnology, operation of nuclear power facilities, health care, and developments related to alternative energy supplies such as the installation of solar photovoltaic systems and wind towers. To be useful, this study would need to evaluate marketplace activities and identify business opportunities and training needs that might be applicable in CNY

+ According to local business representatives, one of the greatest challenges they are confronted with in recruiting new employees is a general lack of knowledge of existing career opportunities and current business practices in the workplace. This issue is often highlighted by local manufacturing companies where public perception has not kept abreast of the job opportunities and modern working conditions which exists at many facilities in CNY. To address this issue, a public education and outreach program needs to be implemented in CNY. This program could include public service announcements, a formal career-awareness campaign in area K-12 schools and colleges and universities, and a coordinated internship program for high school graduates and college level students.

To assist with this effort communities must look to their major economic development organizations based at the regional and county level. In addition resources are available from the NYS Department of Labor, local workforce investment boards and job training agencies, and career training centers at area colleges and universities.

g) Encourage the growth of a strong entrepreneurial culture in Central New York that will strengthen the region's economy through new venture formation and product development activities.

In recent years, many communities across the country have undertaken efforts to expand their traditional economic development programs beyond business retention and recruitment to include initiatives that support the development of an entrepreneurial culture in their communities.

Entrepreneurship is the act and art of bringing new products and services things into the marketplace. This action may lead to the formation new companies or may be part of revitalizing mature organizations in response to a perceived opportunity. According to Paul Reynolds, entrepreneurship scholar and creator of the Global Entrepreneurship Monitor, by the time they reach their retirement years, half of all working men in the United States probably have a period of self-employment of one or more years; one in four may have engaged in self-employment for six or more years. Participating in a new business creation is a common activity among U.S. workers over the course of their careers. And in recent years it has been documented by scholars to be a major driver of economic growth in both the United States and Western Europe. Entrepreneurial activities are substantially different depending on the type of organization and creativity involved. Entrepreneurship ranges in scale from solo projects (even involving the entrepreneur only part-time) to major undertakings creating many job opportunities. Many kinds of organizations now exist to support would-be entrepreneurs including specialized government agencies, business incubators, science parks, and some NGOs. Many "high value" entrepreneurial ventures seek venture capital or angel funding (seed money) in order to raise capital to build the business.

In Central New York, communities have come to recognize that small business growth, entrepreneurship, and innovation are key elements to transitioning the local economy to a sustainable future. To encourage this transition, organizations have been working to develop certain community-based assets to support entrepreneurship in the region. These initiatives include the establishment of a network of business incubator facilities and small business financing programs across the region. In addition, funding has been secured from the Kauffman Foundation to establish a formal entrepreneurship program at Syracuse University resulting in 165 campus-community projects that infuse entrepreneurship at the grass roots level throughout CNY. The program includes partnerships with Cayuga Community College, Le Moyne College, Morrisville State College, Onondaga Community College, and the SUNY College of Environmental Science and Forestry. Other initiatives being advanced in Central New York include formation of the Clean Tech Center and the Innovation and Disruptive Entrepreneurship Accelerator Student Sandbox program at the

Syracuse Technology Garden, streamlining small business services through the NYS Small Business Development Center, and construction of the Syracuse Center of Excellence, and the Central New York Biotechnology Accelerator Center, a partnership between Upstate Medical University and the SUNY ESF.

The region is also home to SU Falcone Center for Entrepreneurship, the Southside Innovation Center, and the Entrepreneurship Bootcamp for Veterans with Disabilities. The region has also gained national recognition for programs like Start-Up NY, a partnership between the Whitman School of Management and the Burton Blatt Institute at SU, pioneering work through SU's acclaimed Near Westside Initiative, the Stardust Entrepreneurial Institute in Auburn, SUNY Morrisville's Nelson Farms food incubator, the CNY Technology Development Organization's Small Business Innovation Research Outreach Program, and the U.S. Small Business Administration's comprehensive training programs.

Building a robust innovation ecosystem is a key component to driving ideas, new technologies, products, and services to the marketplace. To capitalize on these opportunities for job creation, the region must build on its current work and ensure that all of the necessary resources are in place to help ensure that new ventures grow into viable enterprises in CNY. To build a truly world-class entrepreneurial ecosystem existing programs must be supplemented by several actions including:

+ Building a pipeline of new and emerging ventures through aggressive business attraction efforts and by facilitating the transition of research activities into product development and commercialization

+ Foster student entrepreneurship through ongoing mentorship programs at area academic institutions and the Syracuse Student Sandbox program

+ Develop additional physical and virtual incubation space that fosters the interaction of ideas and new partnerships in a setting that is supportive and affordable to new venture companies

+ Develop formal programs and networks that improve local access to early stage seed capital and venture capital resources

+ Expand new product commercialization assistance through specialized funding programs such as the NYS supported Grants-for-Growth program administered by CenterState CEO and the SU COE Commercialization Assistance Program

+ Build mentor networks consisting of subject matter experts and entrepreneurs-in- residence that can provide guidance regarding business plan development, venture formation, path-to-market, technology roadmap, business modeling and funding strategies, procurement, contracting, and market access assistance

+ Connect entrepreneurs with market leaders to beta-test new products and technologies through programs like Tech Meet-Up, special events, and workshops and conferences

+ Establish a Bridge NY program to build a pipeline of deal-ready companies that can be introduced to investors in financial centers in NYC and Boston

Resources are available to assist with the implementation of this strategy through CenterState CEO, the CNY Technology Development Organization, Syracuse Center of Excellence, and the Syracuse Technology Garden.

h) Support the region's industry concentrations through investment of resources in targeted research initiatives, capital funding, and workforce training programs.

In planning for a sustainable future, development representatives in Central New York have identified several critical industry concentrations that can help form the basis for economic growth in the region. These sectors represent a cross-section of traditional and new economy companies and share five common criteria including (1) these industries have a critical mass of companies and a large employment base in the region, (2) employment in these sectors is highly concentrated in CNY, (3) there is significant growth in the demand for the products and services provided by these compa-

nies on a regional, national, and global basis, (4) the region has the necessary infrastructure and human capital to support these industry clusters, and (5) certain companies in these industry clusters are closely aligned with the region's major anchor institutions. Major industrial cluster in Central New York include advanced manufacturing, the clean energy and environmental systems, education and health care, biomedical services and biosciences, financial services, agribusiness and food processing, and tourism.

To capitalize on these industry concentrations, recommendations have been advanced to target resources in certain industry clusters with significant growth potential in CNY. In addition, proposals have been made to encourage cross industry collaborations through joint research and training initiatives. Suggestions have also been for business recruitment efforts that are focused on companies that can benefit from the industry concentration resources that currently exist in CNY. As part of this recruitment effort, it is recommended that attention be focused on the opportunities associated with plans by the Federal Aviation Administration to develop an unmanned vehicle training center. Detailed ideas have also been advanced for specific industry clusters by utilizing the Syracuse Center of Excellence to showcase new products that are being brought to the marketplace by area companies. As part of this effort, new research and development labs are needed at the COE to demonstrate fuel-cell, combined heat and power systems, smart grid applications, photovoltaic and wind power generation equipment, and battery and energy power storage systems. In health care, proposals have been made to advance research initiatives at the new CNY Biotechnology

Accelerator and the proposed St. Joseph's Hospital –Welch Allyn Floor of the Future project. It is also recommended that the region ensure a better alignment of medical and bioscience services through several initiatives including programs such as a replication of iSciWNY program and the National Science Center, along with a formal health care education credentialing process.

In the area of financial services, data processing, and back-office operations, the region is well positioned to capitalize on a critical mass of companies, a competitive labor supply, and affordable real estate and operating cost. To realize these opportunities, it is recommended that the region continue a focused business outreach and marketing program in major metropolitan areas in the northeast. In addition, efforts should also be directed to ensure the proper alignment of education programming to keep pace with the latest developments in the industry. Also, it is recommended that investments be made in cyber-security research through cross-industry and university collaborations.

Regarding advanced manufacturing it is strongly recommended that efforts be continued to complete development in Syracuse of a Nanotechnology Innovation and Commercialization Center to support the region's defense, radar, and sensor industries. In addition, it is recommended that efforts be directed to an industry sector supply chain usage and integration program along with an infrastructure investment initiative targeted to enhancing certain business parks and manufacturing sites in the region. Proposals have also been made for focused learning and training through new manufacturing certification programs and career ladder initiatives that address science, technology, engineering, and math education and training. In the area of agribusiness, targeted investments are recommended for food processors and the production of certain value-added agriculture products.

To advance the business development opportunities in the tourism sector, focused ideas have been made for the development of a convention center hotel in downtown Syracuse along with the develop of facilities to support the Finger Lakes Musical Festival in Auburn. More broadly, ideas include implementation of a comprehensive tourism marketing plan, coordinated packaging, signage, event planning, and gateway beautification program. Recommendations were also made for engaging local businesses and business groups in a regional convention center attraction campaign and in efforts to promote a regional brand identity for Central New York.

i) Coordinate implementation of a comprehensive regional marketing and business recruitment program.

While a comprehensive business retention and expansion program must be a cornerstone to a region's economic development program, data provided by various site location experts suggest

that resources should also be directed to a targeted business recruitment program. In trying to recruit a company to a community, officials must have some understanding of the global stress factors that are impacting companies today and how these factors may influence a company's decision to expand or relocate their operations to a new community. In reviewing these factors, considerable attention must be focused on high-growth industries and the potential to capitalize on certain industry clusters which exist in Central New York. In addition, communities must recognize that the site selection process typically begins on an international or national level today, transitions into a regional and state search, before finally focusing on a set of recommendations regarding potential host communities. While surprising to many, the site selection process is often characterized as a process of elimination that places a premium on communities being "ready-for-development" long before prospect interest is ever known to a community.

Given its strategic location, strong population and labor force base, and the availability of a well developed infrastructure system, site location consultants and corporate real estate executives have indicated that the region could benefit from a business recruitment program that is carefully targeted to certain industry sectors including advanced manufacturing, food processing, information and financial back office services, data processing centers, pharmaceuticals, and warehouse and distribution centers. In making this recommendation, emphasis was placed on the number of major food processing companies with corporate headquarters in New York City and existing processing facilities in the State. Also noted were the opportunities associated with recruiting business from companies looking to move back office operations out of high cost metropolitan areas in the northeast. An example of this opportunity is the Bank of New York Mellon Corporation operations that are currently located in the Syracuse and Utica areas. Another example is the 184,000 sf Yahoo data center that was recently established in the Buffalo region. Recommendations have also been provided which suggest the region has an opportunity to capitalize on the growth of the semiconductor technology industry that is taking root in the Albany region with the location of a major GlobalFoundries center in Saratoga County that consists of 1.7 million square feet of manufacturing and research space.



Luther Forest Technology Campus, Saratoga County

It is suggested that such a business recruitment program consist of several elements including direction coordination and consultation with the NYS Empire State Development – Strategic Business Division and CenterState CEO. In addition, the region should maintain a close working relationship with selected site location consultants across the nation, particularly those individuals and companies that have a focus area that is related to industry cluster strengths in CNY. To complement this outreach effort, staff operating on a regional basis should afford themselves of the opportunity to participate in selected national forums and trade association meeting sponsored by the site location consultant community and selected industry sectors. As part of this effort, an accurate data base must be maintained for the region so that information can be made available to business prospects in a timely manner. This effort should include the preparation of a comprehensive real estate site profile database.

j) Implement a comprehensive regional export marketing campaign and technical assistance program.

One of the key goals outlined in the CNY Regional Economic Development Council's *Five Year Strategic Plan: 2012-2016* is to improve competitiveness and connections to global economies.

In making this recommendation, the Council noted data showing that domestic consumption in the United States has slowed down considerably in the past 30 years while today 95% of the world's consumers reside outside of the United States and that improving export performance to these markets is critical to the long-term competitiveness and growth potential of the region. In addition, reference is made to a National Exporting Initiative that has been established at the federal level, through the U.S. Department of Commerce – International Trade Administration and the U.S. Small Business Administration, to align and streamline the resources of federal agencies to reduce barriers to exporting and assist domestic companies in making international sales contacts. Complementing these federal efforts, is a new initiative announced this past year by the Brookings Institution called the Metropolitan Export Initiative. Recognizing that a majority of existing exports come directly from metropolitan areas throughout the country, Brookings selected four regions from across the nation to participate in a comprehensive effort to develop a region-wide export development strategy. Central New York was selected to participate in this program in early 2011, joining a select group of peers that include Minneapolis, Los Angeles, and Portland, Oregon.

In choosing Central New York to participate the Brookings program, it was noted that the Syracuse MSA produces $3.6 billion in total exports each year, which is the equivalent of 10% of the region's total production annually and supports approximately 30,000 jobs. Major export industries in Central New York include machinery manufacturing, chemical manufacturing, computer and electronic product manufacturing, primary metals manufacturing, and transportation equipment manufacturing.

To capitalize on the region's export opportunities, it is recommended that businesses be assisted in their efforts to compete in the global economy by encouraging companies to produce products and services that are marketable around the world. In addition, opportunities were noted for the region's service-oriented sectors to capitalize on new business opportunities in the world. Specific "tactics" recommended for implementation in Central New York include:

+ Broadly promoting and improving access to existing federal and state export assistance program by establishing a "one-stop" export assistance center in Central New York
+ Utilize public relations efforts, partner networks, and events to build a greater awareness in of export opportunities, and "export-centric" programming and services available in the region
+ Develop detailed market information or country specific reports to assist in easing the entry to market for targeted high growth companies
+ Create an export mentoring network using existing high export companies to support the export growth of small and medium sized enterprises
+ Establish a global business leadership program to support the salary and training of designated export experts in companies targeted for export growth
+ Streamline target country entry for the region's goods and services with the greatest export potential through industry collaborations, partnerships, and new enterprise development
+ Capitalize on existing federal export finance incentives by developing a regional "soft-costs" assistance program for market entry – i.e. legal, licensing, and regulatory

Resources available to support this effort include those available at the federal level through the U.S. Department of Commerce, the International Trade Administration, U.S. Small Business Administration, and CenterState CEO.

3. Alignment of Strategies and Targets

The following table illustrates the alignment of economic development strategies and targets.

TABLE 65—Alignment of Economic Development Strategies and Targets.

Strategies	TARGETS				
	1	2	3	4	5
	INCREASE THE REGION'S CURRENT POPULATION OF 791,500 TO 1 MILLION RESIDENTS BY 2050	INCREASE THE REGION'S CURRENT NUMBER OF JOBS FROM 320,000 TO 405,000 BY 2050	INCREASE THE REGION'S PER CAPITA INCOME BY 10% OVER THE NEXT 40 YEARS TO EQUAL OR EXCEED THE NATIONAL AVERAGE BY 2050	IMPROVE THE REGION'S NATIONAL ECONOMIC INDEX RATING TO A "TOP 50" SCORE	INCREASE THE NUMBER OF CLEAN-ECONOMY JOBS IN CENTRAL NEW YORK BY 25% BY 2030
Short-Term Opportunities					
a. Maintain a strong foundation for the management and efficient delivery of government services at the federal, state, and local level.	●	●			
b. Support the development and maintenance of a modern infrastructure network in Central New York	●	●	●		●
Long-Term Initiatives					
c. Develop a coordinated regional program that will improve the quality of life in Central New York through targeted investments in the region's recreation, cultural, arts, and historic resources.	●	●			
d. Maintain a strong network of economic development organizations to deliver financial and technical assistance to the business community		●	●	●	●
e. Support the operation of a coordinated and robust business retention and expansion program in Central New York		●	●	●	●
f. Maximize the region's human capital by improving the alignment of workforce supply and employment demand in the region.		●	●	●	●
g. Encourage the growth of a strong entrepreneurial culture in Central New York that will strengthen the region's economy through new venture formation and product development activities.		●	●	●	●
h. Support the region's industry concentrations through investment of resources in targeted research initiatives, capital funding, and workforce training programs.		●	●	●	●
i. Coordinate implementation of a comprehensive regional marketing and business recruitment program.		●	●	●	●
j. Implement a comprehensive regional export marketing campaign and technical assistance program.		●	●	●	●



Chapter 7: Materials Management

***Waste** is society's ultimate externality. It is no longer affordable—both in terms of direct and indirect costs—to simply discard used items without considering the value those items may contain or the impact on the environment which could result.*

Much of the material that ends up in landfills contains a value—usually as an input resource into another process. Landfills generate methane, a gas that is 21 times more intense than carbon dioxide in its global warming impact. Also, carbon-based fuels are used to collect and transport materials to their destination and waste to landfill locations. Finally, greater percentages of materials are coming from chemicals and other potentially hazardous components.

A new materials management paradigm would lead to the recognition that waste shouldn't and doesn't have to be a part of the consumption cycle, and to actions that ensure that no waste is created in the first place. As in nature, all by-products of production processes would be used for something else; any scraps or materials not going into the final product would be rebuilt or reused in another product. The concepts of "cradle-to-cradle" and "zero waste" embody this perspective, rethinking all aspects of a product – from its design to reuse and recycling.

Achieving this shift will require significant transformation of the current waste management systems prevalent in the United States, which generated 243 million tons of municipal solid waste (MSW) from residential, commercial and institutional sources in 2009. This figure amounts to 4.3 pounds per person per day of consumer discards, such as durable and non-durable goods, packaging, food scraps, yard trimmings and miscellaneous organic and non-organic items. From 1960 to 2009, per capita total waste increased by 62%, while the annual amount of MSW increased by 275%. With the constant challenge of finding appropriate landfill sites, striving towards zero waste is more important now than it has ever been. Mobilizing the community to protect natural resources will require changes to cultural practices and economic incentives.

Change, however, is possible and is happening. Total waste and MSW per capita stopped climbing in 2007 and diversion rates are steadily on the increase, growing significantly since the early 1990s.

New York State recognized the need for change when it developed and updated its *Beyond Waste* Plan in 2010. The Executive Summary of the plan states that the state must "shift from focusing on 'end-of-the-pipe' waste management techniques to looking 'upstream' and more com-

prehensively at how materials that would otherwise become waste can be more sustainably managed through the state's economy."[2] Central to this shift and the state's plan is recognition that the state must "reduce demand for energy, reduce dependence on disposal, minimize emission of greenhouse gases and create green jobs."[3]

It is with these same objectives that CNY undertook an examination of regional waste management practices to identify opportunities to move from a contextual paradigm of "waste" to one that is focused on materials management where waste streams are treated as resources and assets. This chapter identifies strategies to reduce the production of waste, reuse and recycle materials wherever possible, and recover the embedded energy in materials with the goal of creating a sustainable materials management system in Central New York.

A. EXISTING CONDITIONS

1. Material Definitions and Flows

The U.S. Environmental Protection Agency (EPA) defines municipal solid waste as the materials traditionally managed by municipalities, whether by burning, burying, recycling, or composting. This material is actually a small fraction of the far larger universe of waste created "upstream" of the consumer in the course of extracting raw materials, processing and manufacturing products, and packaging. These industrial-process wastes are called industrial hazardous waste and industrial nonhazardous waste. There are three major components of municipal solid waste:

+ Inorganics (inert material such as ashes, rocks, bricks, etc.).
+ Food scraps and yard trimmings and other biodegradable wastes.
+ Manufactured products and their associated packaging.

The widely accepted "waste hierarchy" (Figure 12) not only outlines the most to least desirable waste management strategies but also can be viewed as the historical evolution of waste management, beginning with disposal. In the past, waste was "managed" by simply being disposed of in a landfill located on the fringe of a community. In the late 1960s, higher regulatory standards and public resistance to facility siting began to limit access to affordable landfill space. Waste



FIGURE 12–The waste management hierarchy

managers responded to these issues with solutions – mega landfills and waste export – that didn't address any of the root causes of the waste. These types of solutions are referred to as end-of-the-pipe, as they don't consider where the waste came from or how the product that produced it was used.

Recognition that landfill sites were finite led to the addition of the "first R," recovery, which refers to the recovery of energy from waste, commonly through incineration. Technologies such as waste-to-energy (WTE) plants were conceived to recover the energy released when waste is burned. Moving up the hierarchy, managers conceived of another "R option" for waste diversion efforts: recycling. But it has become increasingly clear that, while recycling solves the problem of finite landfill space, it moves the problem while doing little to prevent it in the first place. The next two "Rs" in the hierarchy, reduce and reuse, were heavily promoted beginning in the 1990s through education campaigns and encourage behaviors which address the root causes of the problem. The top and most evolved strategy, and the one that should be used most frequently, is "avoid", which demands frameworks for not creating waste in the first place.

2. Materials Management Roles and Responsibilities

As a result of the Solid Waste Management Act of 1988 (Chapter 70, Laws of 1988), the development of a statewide network of local solid waste management (SWM) plans helped New York State move from an "out-of-sight, out-of-mind" approach to a planned system of integrated solid waste management that considers waste as a resource with value to be recovered. Consequently, each of Central New York's five counties developed their own local SWM plans under their own Planning Unit designation. It was acknowledged that up-to-date solid waste management planning at the local level was a necessary and essential element in maintaining an environmentally-sound integrated solid waste management program in New York State.

The following are the solid waste management priorities set forth by NYS in the Solid Waste Management Act, in order of priority:

+ to reduce the amount of solid waste generated;
+ to reuse material for the purpose for which it was originally intended or to recycle material that cannot be reused;
+ to recover, in an environmentally acceptable manner, energy from solid waste that cannot be economically and technically reused or recycled; and
+ to dispose of solid waste that is not being reused, recycled or from which energy is not being recovered, by land burial or other methods approved by the Department of Environmental Conservation (per Law 27-0106.1).[1]

A decade after the last biennial update of the 1987 Solid Waste Management Plan, NYSDEC issued a statewide solid waste management plan (SWMP), *Beyond Waste: A Sustainable Materials Management Strategy for New York* in December 2010 that maintains the essence of the 1988 priorities while acknowledging the need for greater progress in reducing the amount of waste New Yorkers dispose of every year. It defines broad statewide objectives for waste reduction, reuse and recycling, waste-to-energy, landfilling, and special issues.

THE QUALITATIVE GOALS OF BEYOND WASTE ARE TO:

+ Minimize Waste Generation
+ Maximize Reuse
+ Maximize Recycling
+ Maximize Composting and organics Recycling
+ Advance Product and Packaging Stewardship
+ Create Green Jobs
+ Maximize the Energy Value of Materials Management
+ Minimize the Climate Impacts of Materials Management
+ Reemphasize the Importance of Comprehensive Local Materials Management Planning
+ Minimize the Need for Export of Residual Waste
+ Engage all New Yorkers—government, business, industry and the public—in Sustainable Materials Management
+ Strive for Full Public Participation, Fairness, and Environmental Justice
+ Prioritize Investment in Reduction, Reuse, Recycling and Composting Over Disposal
+ Maximize Efficiency in Infrastructure Development
+ Foster Technological Innovation
+ Continue to Ensure that Solid Waste Management Facilities are Sited, Designed, and Operated

The quantitative goal of *Beyond Waste* is to reduce the amount of waste New Yorkers dispose by preventing waste generation and increasing reuse, recycling, composting and other organic material recycling methods. Currently, New Yorkers throw away 4.1 pounds of MSW per person per day, or 0.75 tons per person per year.[4] Through the implementation of reduction, reuse and recovery management priorities, the Plan seeks to reduce the amount of MSW destined for disposal via energy recovery or landfilling by approximately 10% every two years, reaching a level of 0.6 pounds of MSW per person per day, or 0.11 tons per person per year, by 2030. Achieving this target will require the engagement of manufacturers through product and packaging stewardship and the development of additional reuse and recycling infrastructure, as well as a strong partnership with other states and the EPA.

Achieving the goals and objectives of the SWMP may be pursued through policy initiatives within the state or within each planning unit. These policies may include an updated Solid Waste Management Act and product stewardship framework, expanded financial assistance for progressive solid waste and sustainable materials management, and education for consumers and businesses to help them reduce their generation of waste. Additionally, the state would like to see each planning unit be responsible for achieving these goals by taking on the following roles: acquire land for waste management and disposal facilities, construct solid waste management facilities, provide or contract for waste and recyclable collection services, conduct facility siting studies, manage application processes for state permits, lead the state environmental quality review (SEQR) process, operate or contract the operation of facilities, ensure compliance and reporting, enact flow control ordinances; and educate the public.

3. Local SWM Plans and Facilities

As discussed above, each of the five counties has been designated as their own planning unit, which grants the authority to take into account the objectives of the State's solid waste management policy; provide for, or take into account, management of all solid waste within the planning unit; and embody sound principles of solid waste management, natural resources conservation, energy production, and employment creating opportunities. The implementation of solid waste management practices in New York State has historically been the responsibility of local governments.

Since the Act of 1988, all five planning units have faced financial challenges while trying to implement their local solid waste management goals while also handling the day-to-day activities at the core of materials and waste management (e.g., separation, collection, recycling, transport, storage, transfer, and disposal). With shrinking municipal budgets and variations in waste disposal tonnages that provide much of the revenues needed to pay for facility and program costs, the planning units have struggled to successfully increase or improve the programs that already exist within the planning units. However, even with financial pressures, the planning units have worked to improve their solid waste management and recycling facilities that currently serve their constituents. Each planning unit is in various stages of planning how to efficiently and cost effectively enhance their current solid waste management and recycling facilities and programs to be more consistent with the *Beyond Waste* goals.

Cayuga County completed its original solid waste management plan approximately twenty years ago. Under the Department of Planning and Economic Development, Cayuga County is currently in the initial planning stage of updating their Solid Waste Management Plan. The Solid Waste Management Program Office within the Department of Planning and Economic Development has most recently been responsible for hazardous chemical collection events, which includes hazardous materials, electronic wastes, propane tanks, fluorescent bulbs, and tires. Additionally, the City of Auburn owns and operates a municipal



Madison County Landfill

solid waste landfill in the City of Auburn limits, which accepts waste from the City as well as areas within the County.

Cortland County completed its original Final Solid Waste Management Plan (SWMP) in 1993. The County's original SWMP called for the continuation of its integrated solid waste management system consisting of a County landfill and recycling center. In general the SWMP Modification called for the continuation of its integrated solid waste management system consisting of continued operation of the County landfill, recycling center and Town transfer station; and waste reduction and recycling programs.

Madison County's integrated solid waste management system consists of one central sanitary landfill in the Town of Lincoln, three transfer stations (located in the Towns of Hamilton, Cazenovia, and Sullivan), a central materials recovery facility(MRF) located adjacent to the landfill site, and four yard waste and recyclables drop-off locations (at the three transfer stations and the sanitary landfill).The curbside collection of municipal solid waste has traditionally been the responsibility of either the local municipality or individual residents and waste generators. All residents are permitted to utilize the transfer stations to dispose of their solid waste and/or recyclables. Residents can purchase a punch card to be used at the transfer station, on a pay-as-you-throw basis.

Madison County completed its original Final Solid Waste Management Plan (SWMP) in 1991, which was subsequently revised in December 2009 as the Comprehensive Solid Waste Management Plan Modification. In general the SWMP Modification called for the continuation of its integrated solid waste management system consisting of a regional landfill, central and intermediate solid waste transfer stations, and recyclables collection facilities. In addition, it called for the continued operations of the material recovery facility, yard waste composting facility, sharps collection program, and public recycling education program.

In the 1980s, the Onondaga County Solid Waste Management Program developed a plan to deal with the community's mounting garbage crisis. Realizing that there were no easy answers, they set out to design a safe, reliable, and cost-effective program that would serve the community's needs, at that time and into the future. They carefully analyzed the environmental impacts of different trash disposal alternatives and determined that no single method of disposal would solve the trash dilemma. Ultimately, a comprehensive and integrated solid waste management system was required to manage Onondaga County's waste.

At County government's request, the New York State Legislature created a public benefit corporation – the Onondaga County Resource Recovery Agency (OCRRA) to manage this new County-wide waste management system. The OCRRA service area consists of Onondaga County, with the exception of the Town and Village of Skaneateles. There are 33 municipalities encompassed within the system (1 city, 18 towns, and 14 villages).

OCRRA administers the County's solid waste management program with a prioritization of management methods that mirror New York State's Solid Waste Management Plan:

+ a waste reduction program,
+ an aggressive recycling program,
+ recovery of useful energy through solid waste combustion (i.e., modern waste-to-energy facilities), and
+ use of permitted landfill facilities.



Onondaga County Waste to Energy Facility

After a rigorous procurement process in 1988 and 1989, Ogden Martin Systems was selected to design, build, and operate the Onondaga County Resource Recovery Facility (WTE Facility). OCRRA entered into a service agreement with Ogden Martin Systems of Onondaga (currently Covanta Onondaga) in 1990. On December 18, 1992, with environmental permits in place and project revenue bonds totaling $178 million, formal groundbreaking ceremonies were held for the construction of the waste-to-energy facility. By late 1994 the Facility had its first official burn and by early 1995 the Facility was commercially operational.

Today, the Onondaga County WTE Facility continues to be an integral part of OCRRA's resource recovery system. About 45% of materials that could otherwise go to the WTE Facility are source separated for recycling. The remaining non-recyclable portion goes to the WTE Facility, which uses a mass burn combustion system (and temperatures of 1800° F–2000° F) to convert non-hazardous, non-recyclable trash into steam. The steam is then used to generate electricity that is sold to National Grid, providing enough electricity for approximately 25,000 to 30,000 households and the Facility itself. Ferrous and non-ferrous metals that would otherwise have gone to a landfill are recovered at the WTE Facility for recycling. The byproduct of the combustion process is a non-hazardous ash residue, which is about 10% of the original volume of the trash processed at the Facility. The ash residue is sent to a landfill for use as alternative daily cover.

Incorporated into the operations of the Facility is an air pollution control system, which helps the Facility comply with one of the strictest air permits in the nation, meeting federal and state emissions requirements. Emissions from the Facility are carefully monitored through a Continuous Emissions Monitoring System (CEMS) and annual stack testing. Since its start-up in 1994 the facility's operational and environmental performance has exceeded expectations.

An important component to the success of the WTE facility is the guaranteed delivery of municipal solid waste by all local haulers within the Planning Unit through the signing of Waste Hauler Agreements. Additionally, OCRRA has secured the required permits for construction of an in-county landfill in the Town of Van Buren; however, construction has not occurred given environmental and economic factors. OCRRA currently transports the ash by-product from the WTE facility and other non-burnable waste to the High Acres Landfill near Rochester, NY. OCRRA operates two transfer stations (Ley Creek and Rock Cut Road) where haulers and residents can bring their materials for disposal or recycling. Additionally, OCRRA has long term contracts with two (2) Material Recovery Facilities (MRFs) that offer more market stability for recyclable commodities and a uniform definition of "blue bin" materials.

Of the 33 municipalities in the OCRRA service area, 26 provide residential curbside collection of trash and recyclables through either municipal employees, or by contracting with a private waste hauler. Such transport and waste disposal services are supported by the residents' taxes. In the other 6 municipalities, residents must either contract directly with a waste hauler to provide trash and recyclables collection, or personally deliver these materials to one of OCRRA's two transfer stations (Ley Creek or Rock Cut Road). OCRRA does not provide any material collection services. All waste generators in the OCRRA service area, including businesses, schools, and residents, are required to "source separate" their recyclable materials pursuant to a local recycling law approved by the County Legislature. OCRRA offers an aggressive series of programs and supports an ongoing, high profile public education campaign promoting waste reduction and the recycling of discards where markets exist to create new products.

Oswego County has a full-service system so that all waste and recyclables generated in the County can be delivered to County facilities, and then on to their final destination for disposal or recycling. Residential solid waste and recyclables are currently collected by a combination of public and private haulers, roadside pick-up, and self-haul to the County transfer stations. The County has left to local municipalities, individual homeowners, and private haulers the decisions on how to best provide collection and delivery to the County facilities.

Oswego County completed its original Final Comprehensive Solid Waste Management Plan (SWMP) in May 1993, prior to which the Oswego County Legislature adopted Resolution #76 on June 15, 1989 establishing the County as the designated Planning Unit. In 2007 the planning process for the modified LSWMP was initiated at which time the County identified specific goals to guide the operation of the system in the coming years. These goals were consistent with the goals of the state's *Beyond Waste* plan.

TABLE 66–Summary of Disposal Facilities

Disposal Facility	Town or City	County	Facility Type	Owner/ Operator	Ownership	Waste Type	Site Life (years)
City of Auburn Landfill	Auburn	Cayuga	Landfill	City of Auburn	Public	MSW	5.4
Cortland County Landfill	Cortlandville	Cortland	Landfill	Cortland County	Public	MSW	20
Madison County Landfill (westside)	Lincoln	Madison	Landfill	Madison County	Public	MSW	105
Camillus C&D Landfill	Camillus	Onondaga	Landfill	Honeywell International, Inc./Town of Camillus	Private	C&D	4.4
Bristol Hill Landfill	Volney	Oswego	Landfill	Oswego County	Public	MSW	6.5
Onondaga County Resource Recovery Facility	Jamesville/ Onondaga	Onondaga	Municipal Waste Combustion Facility	Covanta Onondaga L.P.	Private	MSW	N.A.
Oswego County Energy Recovery Facility	Fulton	Oswego	Municipal Waste Combustion Facility	Oswego County	Public	MSW	N.A.

Notes:
1. Information gathered from NYSDEC Annual Reports, 2011, which are based on 2010 data.
2. Site life is based upon currently permitted capacity reported as available as of the end of 2010, and may underestimate the total useful life for those facilities that are able to obtain permit renewals and/or additional permitted capacity in the future.

Additionally Oswego County has built a comprehensive system of facilities and programs to manage the waste and recyclables generated in the County in an efficient, cost-effective and environmentally sound way. This existing system can serve as a strong foundation to meet the County's goals for the future. The following nine principal components of the system will serve the needs of the County over the next ten years: reuse & reduction, materials recycling, household hazardous waste facility (HHW), organics composting, construction and demolition debris processing, energy recovery facility, transfer stations, landfill, and information and education.

A summary of disposal facilities located in each county is provided in Table 66. Each of these facilities is considered to be a component of the Planning Unit's integrated solid waste management system. There are a total of seven disposal facilities including landfills and waste to energy facilities located within the region. Of the seven disposal facilities, two are waste to energy facilities; five are publicly owned; and four are owned by the county it is located within.

4. Total Volume of Waste Generated in NYS and CNY

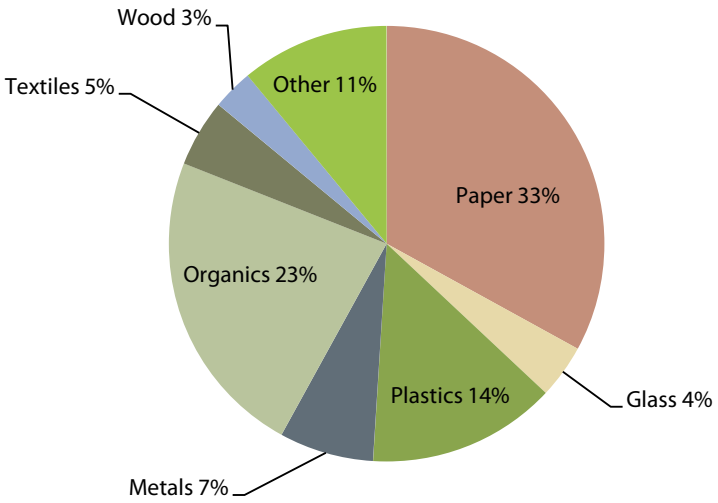
As shown in Table 67, the largest material stream in NYS is MSW, which makes up 50% of the total. The second largest stream is C&D waste, at

TABLE 67–Materials and Waste Management in NYS, 2008

Type	MSW		Industrial		C&D		Biosolids		Total	
	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%
Recycle/ Compost	3.7	20	1.4	39	7.2	55	0.9	47	13.1	36
Landfill	6	33	2.1	60	4.1	32	0.3	17	12.5	34
Combustion	2.5	14	<0.1	1	<0.1	0	0.4	24	3	8
Export for Disposal	6.1	33	1.7	0	1.7	13	0.2	12	8	22
Total	18.3	100	13	100	13	100	1.8	100	36.6	100

Source: NYS DEC 2010. Beyond Waste: A Sustainable Materials Management Strategy for New York State

FIGURE 13–Estimated MSW Generation in New York State



Source: NYS DEC, Beyond Waste

36% of the total. It is assumed that CNY has a similar profile; however, data availability is limited, particularly for non-MSW materials.

The composition of the MSW waste stream in New York State is shown in Figure 13. It should be noted that combustion rates are higher for CNY due to the fact that two of the five counties (Onondaga and Oswego, accounting for nearly 75% of the region's population) combust a large proportion of their MSW, as shown in Table 68.

Data collected by the New York State Department of Environmental Conservation (NYSDEC) and reported by transfer stations, landfills, waste-to-energy (WTE) plants, and recycling centers provide a baseline against which to measure waste reduction and reuse efforts, as well as to show some deficiencies in reported data:

Approximately 0.62 tons of Municipal Solid Waste (MSW) per capita per year is generated in the five counties of CNY. The waste counted in this indicator includes all MSW waste produced, whether it is incinerated or landfilled. However, this value includes only MSW and excludes unreported commercial waste, and also construction and demolition (C&D) debris. This exclusion is a likely reason why the estimated average tonnage of MSW per capita per year is less than the New York State average of 0.75 tons of waste per capita per year.

Commercial and industrial waste is counted separately by NYSDEC. Central New York's total waste generation rate is difficult to accurately estimate.

By weight, 33% of all reported waste (both MSW and C&D) ends up being landfilled. Landfilled waste—described in more detail by Figure 14—is primarily composed of MSW and C&D, but also includes WTE ash, sewage treatment sludge, and various organic materials. This indicator is of uncertain accuracy, as quite a bit of waste generated within CNY is landfilled out of county, and the waste source reporting is poorly represented in the datasets. For instance, OCRRA reports that 77,534 tons of ash were hauled to the Seneca Meadows Landfill in 2010; meanwhile, annual NYSDEC data report only 70,084 total tons of waste hauled to Seneca and only 474 tons of ash for the same reporting period.

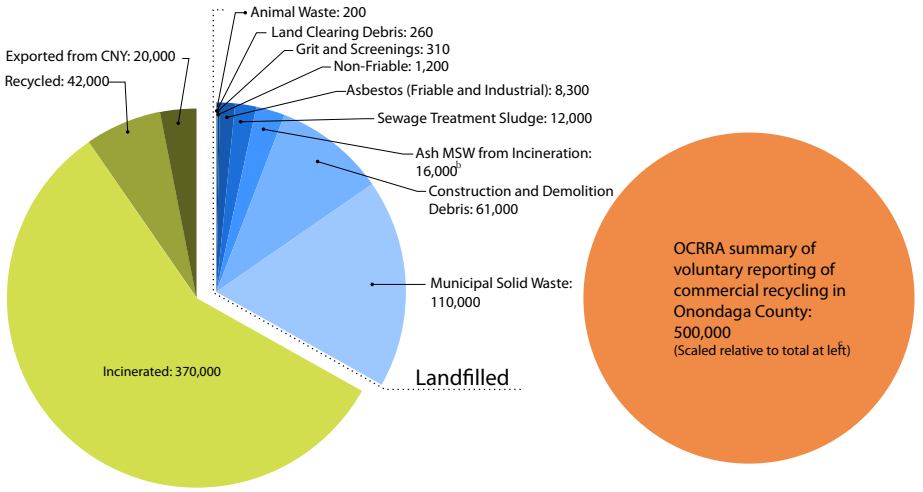
Percentage of waste that is recycled tells another complicated reporting story. Municipal recycling collection is reported to NYSDEC, and that value (42,280 tons) is represented by the indicator as 6.5% of the total volume of waste generated in the five - county region (Figure 15 and Figure 16). However, this significantly under-reports the actual recycling rate for three reasons: (1) Reuse and incineration of C&D

TABLE 68–2010 Waste Generated by County (tons)

County	MSW Sent to Landfill Facilities (tons)	C&D Sent to Landfill Facilities (tons)	MSW Sent to Landfill Waste Combustion Facilities (tons)	C&D Sent to Landfill Waste Combustion Facilities (tons)	Total Waste Generated (tons)
Cayuga	53,245	10,661	-	-	63,906
Cortland	25,035	3,510	-	-	28,545
Madison	36,963	7,560	-	-	44,523
Onondaga	14,503	40,350	312,846	-	367,699
Oswego	5,972	10,205	56,852	2,545	75,574
Central New York Total	135,719	72,288	369,698	2,545	580,252

Note: Totals may not sum due to independent rounding.

FIGURE 14–Total MSW reported to NYS DEC from CNY Counties in 2010



a Data culled form 2010 DEC Landfill reports rounded to 2-digits.
b Ash does not include Onondaga WTE plant ash which is hauled out of CNY.
c Reported in OCRRA's 2010 Recycling Report. Figure is OCRRA complete recycling calculation. DEC standard "Processible" waste reported as 230,000 tons.

Source: NYS DEC

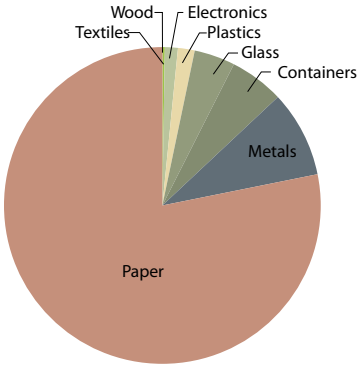


FIGURE 15–CNY Counties Municipal Recycling Composition as Reported to NYS DEC in 2010 in New York State (total 42,000 tons)

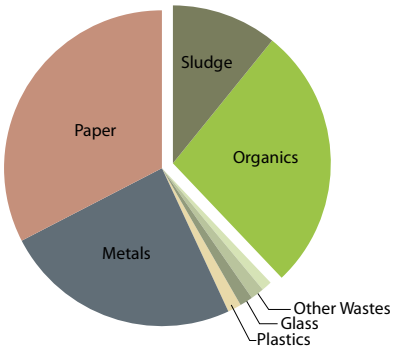


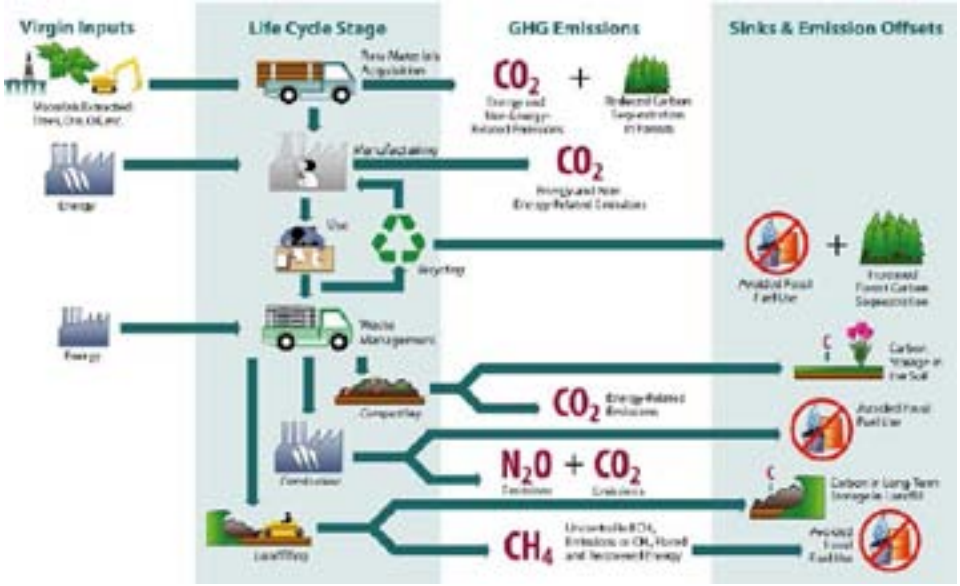
FIGURE 16–Onondaga County Municipal and Commercial Recycling Composition as Reported by OCRRA 2010 (total 540,000 tons)

debris isn't considered to be recycled; (2) Organics reuse programs (composting for example) are a significant activity for some counties and aren't included in the figures, despite the fact that these programs divert waste from landfills; and (3) privately hauled commercial recycling isn't reported. If OCRRA's commercial and organics collection data from Onondaga County are included, the recycling rate jumps to 43.5% of all wastes. Figure 14 includes a circle to the right, scaled relative to the total solid waste figure in the pie graph on the left, which was drawn from NYSDEC data. OCRRA's commercial recycling reporting figure alone is nearly 80% as large as all the waste/recycling collection reported in the NYSDEC charts.

5. Climate Change and Sustainable Materials Management

Concern about climate change has altered how communities handle and think about solid waste. The EPA has been studying the links between solid waste and climate change for over a decade. Their website contains detailed analysis and summary steps that individuals and businesses can take to reduce their carbon footprint. Figure 17 highlights the different sources of GHG emissions from waste. The disposal of solid waste produces GHGs in a number of ways. First, the anaerobic decomposition of waste in landfills produces methane, a GHG 21 times more potent than carbon dioxide. Second, the incineration of waste produces carbon dioxide as a by-product. In addition, the transportation of waste to disposal sites produces GHGs from the combustion of the fuel used in the equipment. Finally, disposal of materials indicate that new products are being produced as replacements; this production often requires the use of fossil fuels to obtain raw materials and manufacture the items.

FIGURE 17–Life Cycle of Waste

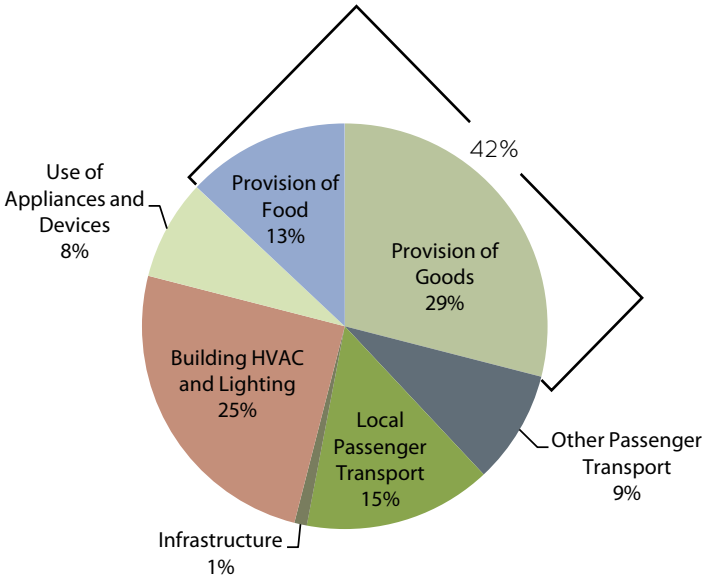


Source: U.S. EPA

The EPA released a report in September 2009 that shines new light on the greenhouse gas impacts of goods bought and thrown away by consumers.[5] Conventional greenhouse gas analysis apportions emissions based on industrial sectors – primarily electricity and heat, agriculture, industrial processes, transportation, land use change, and waste. This report instead used life-cycle analysis to incorporate all of the emissions associated with end-user materials and energy that are consumed by households, businesses and governments. In this new systems-based analysis, the greenhouse gas emissions that are embodied in the goods that are bought and used are quantified. These include the energy used at all stages of the product life cycle: to extract and process the resources, to manufacture and transport the products, to operate the retail outlets, burying in landfills, or burning in incinerators. As shown in Figure 18, the report concluded that the provision of goods and materials is responsible for the largest share, by far, of direct U.S. greenhouse gas emissions. Waste accounts for more than the emissions from the energy used in buildings, passenger transportation, or the provision of food – activities that get the lion's share of attention in government and business efforts to reduce greenhouse gas emissions.

A recent report on these issues, *Stop Trashing the Climate*, provides compelling evidence that preventing waste and expanding reuse, recycling, and composting programs is one of the fastest, cheapest, and most effective strategies available for combating climate change, finding that "significantly decreasing waste disposed in landfills and incinerators will reduce greenhouse gas emissions the equivalent to closing 21% of U.S. coal-fired power plants.[6] This is comparable to leading climate protection proposals such as improving national vehicle fuel efficiency. Indeed, preventing waste and expanding reuse, recycling, and composting are essential to put us on the path to climate stability."

FIGURE 18–Direct U.S. Greenhouse Gas Emissions by Sector



Source: U.S. EPA

6. Central New York Emissions

For the regional greenhouse gas inventory prepared as a part of the process of developing the VisionCNY Plan, both Scope 1 and Scope 3 emissions for solid waste were calculated. Scope 1 represents emissions from landfills located within the region, regardless of where the waste originated. Scope 3 represents emissions from waste generated by the region, regardless of where the waste is ultimately transported. To avoid double-counting, only Scope 3 emissions are included in the total. Scope 1 emissions from solid waste are reported here for informational purposes and are not included in the region's roll-up of total gross emissions as reported in the regional greenhouse gas inventory (see Appendix II, Section A for further explanation).

(a) Scope 1 Solid Waste Emissions

Solid waste Scope 1 accounts for emissions from landfills located within Central New York counties. Municipal solid waste landfill facilities in the region include City of Auburn Landfill, Cortland County Landfill, Madison County Sanitary Landfill, and Oswego County Bristol Hill Landfill. Scope 1 does not include emissions from waste combustion facilities to avoid double-counting. Combustion facilities within the region, Onondaga County Resource Recovery Facility and Oswego County Energy Recovery Facility, are also used to generate electricity and are included under the electricity generation sector.

Results indicate that landfills in the region emitted 112,450 $MTCO_2e$ in 2010. The majority of these emissions came from Oswego County Bristol Hill landfill (42%), followed by the Cortland County landfill (29%). Results are shown in Figure 19 and Table 69.

(b) Scope 3 Solid Waste Emissions

Scope 3 solid waste emissions account for emissions from waste generated within the Central New York counties, regardless of where the waste is sent. Results from the regional GHG inventory indicate that total emissions from waste generation in the region in 2010 were 102,812 $MTCO_2e$, which accounts for approximately 1% of the region's total gross GHG emissions. By comparison, the waste management sector accounted for 3% of New York's total gross emissions in 2008 and 1.9% of total U.S. emissions in 2010. Municipal solid waste generation contributed 85% of regional emissions (87,310 $MTCO_2e$) and C&D contributed 15% (15,502 $MTCO_2e$). Overall, 580,252 tons of solid waste was generated in the region in 2010. Figure 20 and Table 70 summarize the results. It should be noted that while Scope 3 emissions include more sources of waste than Scope 1, the result-

FIGURE 19–2010 Emissions from Landfills in Central New York ($MTCO_2e$): Scope 1 Solid Waste Emissions

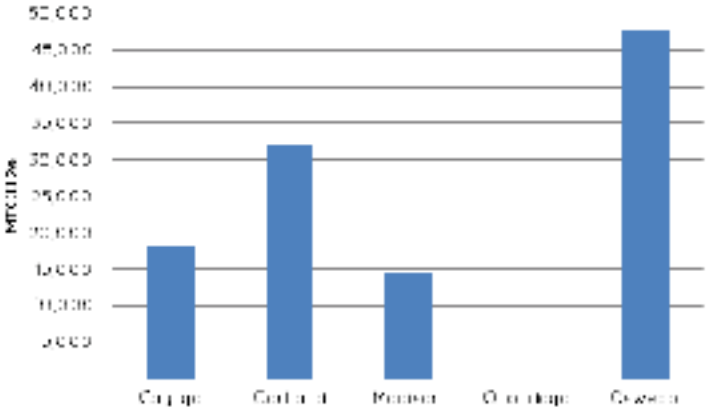


TABLE 69–2010 Emissions from Landfills in Central New York ($MTCO_2e$): Scope 1 Solid Waste Emissions

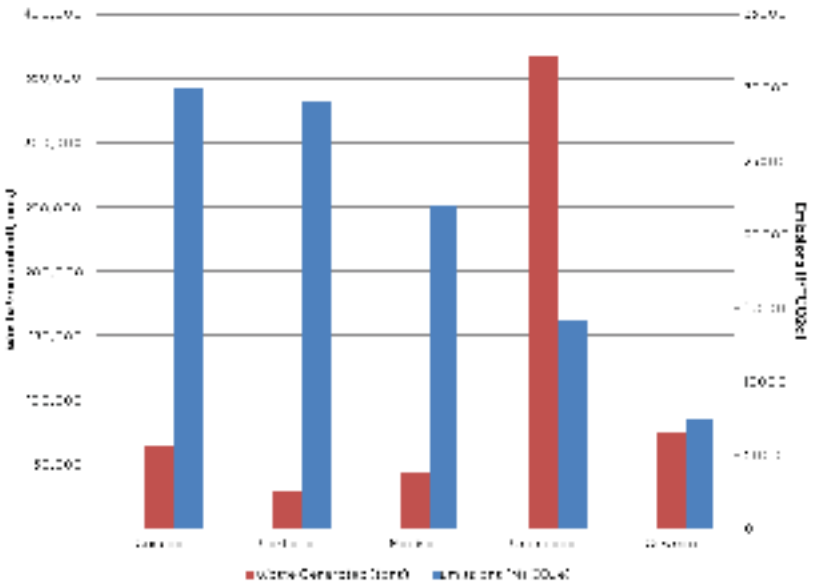
County	Landfill	Emissions ($MTCO_2e$)	Percent of Total
Cayuga	City of Auburn Landfill	18,077	16%
Cortland	Cortland County Landfill	32,197	29%
Madison	Madison County Sanitary Landfill	14,617	13%
Onondaga	-	-	0%
Oswego	Oswego County Bristol Hill Landfill	47,559	42%
Central New York Total		112,450	100%

Note: Totals may not sum due to independent rounding.

ing emissions are lower because Scope 3 accounts for the high proportion of waste that is incinerated. Emissions from the region's two waste-to-energy facilities are accounted for in the Scope 1 electricity generation sector.

Onondaga County generated the largest portion of that waste, which is driven primarily by population, but generated a much smaller portion of emissions. This is because 95% of waste from Onondaga County is sent to combustion facilities rather than landfills. A similar pattern occurs in Oswego County, where 91% of waste is combusted. All waste generated in Cayuga, Cortland, and Madison Counties was landfilled in 2010. As a result, those counties have higher per capita waste emissions than Onondaga and Oswego. Cortland County has the highest per capita waste emissions, as their waste is sent primarily to Cortland County Landfill, which does not have an LFG capture system. Note that emissions from composting are not included. Emissions from the collection and transportation of waste are included in overall transportation emissions.

FIGURE 20–2010 Waste Generation (tons) and Emissions ($MTCO_2e$): Scope 3 Solid Waste



The GHG emissions noted in Table 70 should be reviewed with cau-

TABLE 70–2010 Scope 3 Solid Waste Emissions ($MTCO_2e$)

County	MSW CH4 Emissions ($MTCO_2e$)	C&D CH4 Emissions ($MTCO_2e$)	Total CH4 Emissions ($MTCO_2e$)	Percent of Total	Emissions per Capita
Cayuga	27,709	2,286	29,994	29%	0.37
Cortland	28,334	753	29,087	28%	0.59
Madison	20,413	1,621	22,034	21%	0.30
Onondaga	5,542	8,653	14,195	14%	0.03
Oswego	5,312	2,189	7,500	7%	0.06
Central New York Total	87,310	15,502	102,812	100%	0.13

Note: Totals may not sum due to independent rounding.

tion. For example, Onondaga and Oswego County incinerate much of their solid waste – these emissions are not included in the figures above, but rather in electrical generation emissions noted in Chapter 2: Energy Management. Furthermore, the emissions calculated above used NYSDEC-provided data, which may differ substantially from county-provided MSW data. These factors all underscore the need for an organized, systematic method of accounting based on consistent regional definitions.

B. SUSTAINABLE FUTURE IN CENTRAL NEW YORK

1. Goals and Targets

In developing this plan, CNY sought to capitalize on the region's strengths, identify a path to overcome the region's challenges, and seize the opportunities by anticipating and tracking the trends and drivers of change affecting the region. Opportunities were assessed to reduce energy consumption and GHG emissions associated with the production, processing and deposition of municipal solid waste and industrial waste in the region.

The VisionCNY planning team began by engaging its Technical Advisory Committee to identify these strengths, challenges, opportunities and drivers of change with respect to material and waste handling. Opportunity identification in waste management was also conducted through direct contact with the solid waste planning units, review of available reports including NYSDEC documents, and the planning team's knowledge of local conditions and the solid waste industry in general.

Central New York has several existing recycling programs with high participation rates. As shown in the description of existing programs above, the region has also pursued a progressive approach to waste management with each county actively engaged in a piece of the material and waste handling arena. In addition, the region has a resource in the Environmental Finance Center at Syracuse University, which provides education and advice on waste and other opportunities to achieve sustainable gains.

Further improvements to the region's systems, and a move towards a materials management paradigm, will create opportunities to improve quality of life, reduce pollution, and create jobs and economic development. According to a recent report by the Tellus Institute,[7] achieving a 75% diversion rate for municipal solid waste (MSW) and construction and demolition debris (C&D) by 2030 will result in:

+ A total of 2.3 million jobs: Almost twice as many jobs as the projected 2030 Base Case Scenario, and about 2.7 times as many jobs as exist in 2008. There would be a significant number of additional indirect jobs associated with suppliers to this growing sector, and additional induced jobs from the increased spending by the new workers.

+ Lower greenhouse gas emissions: The reduction of almost 515 million metric tons of carbon dioxide equivalent ($MTCO_2e$) from diversion activities, an additional 276 million $MTCO_2e$ than the Base Case, equivalent to emissions from about 72 coal power plants or taking 50 million cars off the road.

+ Less pollution overall: Significant reductions in a range of conventional and toxic emissions that impact human and ecosystem health.

+ Unquantified benefits of reducing ecological pressures associated with use of non-renewable resources, conserving energy throughout the materials economy, and generating economic resiliency through stable, local employment.

Similar benefits can be reasonably expected for Central New York. Roughly apportioned to the region on a straight-line basis, this could result in as many as 5,900 jobs created and nearly 708,000 $MTCO_2e$ fewer greenhouse gas emissions above the Base Case.

The region is not without its challenges too. In the materials management area, most are tied to economics. The cost of Transport & Disposal (T&D) in particular poses a significant financial challenge. Every ton of MSW and C&D material that is reduced, reused, recycled, repaired or composted locally will represent a reduction in the environmental and fiscal impact of T&D. The cost of export represents a large portion of community operating budgets and continues to rise. Many counties lack the necessary funding to support staff or make the capital investment to initiate more effective materials management programs. More collaboration and sharing of resources such as public education materials and strategies between counties in the

region would be a cost-effective strategy to improve participation rates in recycling programs.

Other challenges involve regulatory enforcement and data collection and management. The issue of regulatory enforcement is perhaps best summarized in *Beyond Waste*: "Although most municipalities did adopt the requisite local source separation laws or ordinances before the statutory deadline of September 1992, in some cases, local laws still lack fundamental and important provisions such as requiring source separation in all generating sectors and providing for enforcement. In many cases where the laws include enforcement provisions, municipalities have not effectively used them, particularly for commercial and institutional generators." While there are multiple municipal and state laws mandating the separation of materials and prohibiting the disposal of recyclables in MSW and C&D waste streams, many municipalities lack an effective system of enforcement of these laws. Inconsistent definitions, tracking mechanisms, reporting, and data management render materials accounting very difficult.

Not surprisingly, the region's opportunities lie at the intersection of its strengths and challenges. Despite the region's robust existing recycling programs, the expansion of curbside recycling and composting programs can provide a significant increase for waste diversion from landfills. Farming and agricultural industries, in particular, dairy farming provide a distinct advantage in terms of using biodigesters which also can garner support from NYSERDA funding. Existing landfills can be harnessed for their renewable energy potential whether in the form of landfill methane recovery or the installation of solar PV facilities. Most notably, the region recognizes that the "zero waste" movement and the use of industrial ecology systems provide additional drivers for change.

Based upon public input and the information presented above, the planning team has established the following land use goal for Central New York:

GOAL: Improve the environmental performance and the economic development and job creation potential of the region's material management systems by reducing the production of waste and increasing materials reuse, recycling and energy recovery.

To achieve this goal, the following targets have been established for Central New York:

1) Reduce regional total solid waste generated per capita, including MSW, C&D, hazardous and industrial materials, by 75% (below 2010 levels) by 2030.

Solid waste consists of municipal solid waste, industrial waste, construction and demolition waste, and biosolid waste. Solid waste consists of municipal solid waste, industrial waste, construction and demolition waste, and biosolid waste. In 2010, 0.73 tons of solid waste per capita was generated in CNY. The target is to reduce regional total solid waste by 75% to .18 tons per capita per year by 2030.

Source: NYS DEC and Central New York Regional Greenhouse Gas Inventory November 2012

2) Reduce the amount of MSW generated and then disposed of in landfills or via energy recovery by 82% (below 2010 levels) by 2030.

Municipal solid waste (MSW) consists of inorganics, food scraps, yard trimmings, and other biodegradable wastes, and manufactured products and their associated packaging that are typically managed by municipalities by burning, burying, recycling, or composting. It is the largest material stream in NYS and makes up 50% of the total waste. Approximately 0.62 tons of MSW per capita per year is generated in CNY. The target is to reduce this by 82% to 0.11 tons of MSW per capita per year by 2030.

Source: NYS DEC and Central New York Regional Greenhouse Gas Inventory November 2012

3) Reuse 50% of C&D waste by 2030.

Construction and demolition waste (C&D) is the second largest material stream in NYS at 36% of the total. It is made up of uncontaminated waste from the construction, remodeling, repair, and demolition of utilities, structures, and roads and includes land clearing debris. In CNY in 2010, 75,685 tons of C&D waste was generated. The target is to reuse 50% of this (37,843 tons) by 2030.

Source: NYS DEC and Central New York Regional Greenhouse Gas Inventory November 2012

4) Increase the amount of food and yard waste composted by 75% by 2030.

There are currently three compost facilities operating in CNY that handle food and yard trimmings. They are Toad Hollow Farms in Onondaga County, Miller Murphy Hunter in Onondaga County, and Oswego County DSW. They handle 900 tons/year, 35,000 cubic yards/year, and 1,600 wet tons/year respectively. The target is to increase the amount of food and yard waste composted by 75% by 2030.

Source: NYS DEC

5) Increase the number of dairy farm-based anaerobic digesters operating in the region from seven to 20 by 2030.

Dairy farm-based anaerobic digesters produce a biogas from agricultural waste that can be used directly as fuel to produce electricity, or upgraded to natural-gas quality biomethane, helping to replace fossil fuels. There are currently seven dairy farm-based anaerobic digesters operating in CNY. The target is to increase the number of dairy farm-based anaerobic digesters operating in CNY to twenty by 2030.

Source: U.S. Department of Energy CHP database, Cornell Cooperative Extension

2. Strategies

Through group discussions with stakeholders, the planning team identified areas of key opportunities and challenges to achieving sustainable materials management in the region. After reviewing the goal, indicators and targets, and the key opportunities and challenges, a set of materials management strategies were identified for future implementation. Strategies were selected based on the contribution of each to advance the plan's overall materials management goal and targets. In addition, strategies were evaluated for their overall benefits to the region, as well as the costs and feasibility for implementation.

In establishing an action plan for the region, these strategies were prioritized according to their readiness for implementation in the short-term opportunities or long-term initiatives, with short-term defined as 1-5 years and long-term defined as 5-10 years, as these opportunities may require additional time and effort to develop and implement.

Key strategies that have been identified to achieve the sustainable management of materials include:

Short-Term Opportunities

a) Increase recycling of post-consumer waste through a regional education campaign and convenient public receptacles.

b) Increase reuse and recycling of construction and demolition materials.

c) Increase diversion of residential and commercial organic material from landfills according to the EPA's food recovery hierarchy.

Long-Term Initiatives

d) Establish municipal single-stream curbside recycling programs.

e) Institute "green fees" or "pay-as-you-throw" programs to incentivize waste reduction and recycling.

f) Convert municipal and private waste transport vehicles to alternative fuels.

g) Install methane collection and control systems, including landfill gas-to-energy (LFGTE) facilities and anaerobic digesters at dairy farms, waste water treatment facilities, and industrial businesses.

h) Support industrial symbiosis through a regional outreach and technical assistance program.

i) Improve the infrastructure for managing specialized materials, including agricultural plastics, electronics and household hazardous waste.

j) Establish local government sustainable procurement policies.

a) Increase recycling of post-consumer waste through a regional education campaign and convenient public receptacles.

Public outreach and education regarding waste diversion programs, reuse, and recycling, composting, and responsible disposal of special wastes is a key component of local solid waste management and recycling programs. Each county in Central New York has existing recycling and waste diversion programs that include dif-

ferent levels of funding and staff resources with regard to public outreach and educational activities. If, however, there are opportunities to enhance current public outreach and educational activities then improved recycling and waste diversion could result from increased participation in existing programs.

Potential enhancements to current public awareness and outreach activities could include the following initiatives: a concerted effort to increase the awareness of opportunities at large public gatherings; outreach targeted to increase recycling and waste diversion at local schools, colleges, business establishments and institutional facilities; and development of a recycling curriculum for use by teachers at local elementary and secondary schools.

In many cases, increased recycling awareness and volume depends on ease of availability to the public. Although public education and awareness is an important component to waste diversion and increased recycling, making it easier for the public to find and use recycling receptacles is also important. A few key steps to follow to make recycling in public spaces and/or public events a success, include: make recycling as convenient as possible, provide clearly-marked recycling containers, and use containers which can be easily serviced and quickly placed back in to service. Possible partners include local colleges and universities, Cornell Cooperative Extension, the Environmental Finance Center at Syracuse University, NYS DEC, and EPA.

b) Increase reuse and recycling of construction and demolition materials.

As noted in the *Beyond Waste* plan, C&D debris is defined as uncontaminated solid waste resulting from the construction, remodeling, repair and demolition of utilities, structures and roads and includes land clearing debris. Construction and demolition (C&D) debris can be a significant portion of a region's waste stream, and diverting it from landfills can help achieve and maintain diversion goals. The estimated composition of C&D debris generated statewide before recycling or other diversion is presented in Figure 21. The concrete/asphalt/rock/brick (CARB) and the soil/gravel material categories are by far the greatest material segments at approximately 35% and 27% respectively, with wood a distant third at 15%.

As of May, 2012 there were 79 permitted C&D processing facilities and 279 registered C&D processing facilities within New York

BIG BELLY SOLAR TRASH AND RECYCLING COMPACTION SYSTEM: ALBANY, NY



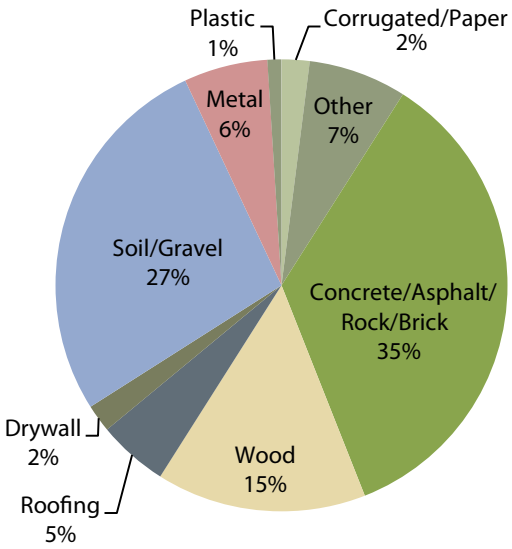
One option that may prove economical in high-traffic areas such as downtown Syracuse are solar-powered trash compactors, known as the Big Belly Solar Trash and Recycling Compaction System. Each of the trash disposal units costs about $4,000 while the recycling units cost about $9,000 each. While they take up as much space as an ordinary trash can, the capacity is five times greater so they have to be emptied less often, and require fewer pickups. The unit's solar panel extracts energy from the sun and stores it in a battery, which powers onboard controls software that takes fullness input from a photo eye that triggers compactions automatically. When the compactor reaches predetermined fullness levels that indicate a pickup is required, the unit's status is visible and trackable from any web-enabled computer and external LED indicators are triggered. The new solar compactors permit up to an 80% reduction in collection frequency, saving time and work and greatly increasing the efficiency of the collection process.

More than 100 installations were completed in Albany in 2011, including 93 trash compactors and 20 recycling bins, using a using grant funds obtained from the U.S. DOE. According to Dan DiLillo, assistant commissioner of General Service for the City of Albany, staff now only make three or four pickups each day, down from 100 before the installation of the Big Belly units. City officials and neighbors also report much less trash on the street.

State.[12] Permitted C&D processing facilities are able to receive and process uncontaminated and unadulterated wood, recognizable uncontaminated concrete and other masonry waste (including steel or fiberglass reinforcing embedded in concrete), asphalt pavement, brick, soil or rock that has not been in contact with a spill from petroleum product, hazardous waste, or industrial waste, and that is not commingled with other solid waste

Few outlets exist in Central New York for the processing of construction and demolition (C&D) debris into recyclable materials. One or more C&D Processing/Recycling Facilities could, however, be developed in unused buildings within the region that could be converted to C&D processing facilities where materials could be separated from C&D debris to be recycled or to be reused. One specific facility within Oswego County where such a development would be possible would be the former Oswego County Materials Recycling Facility located at its Bristol Hill Landfill site. Through financial support, the conversion of this facility could be realized. Other sites within the region may also be available for this type of facility.

FIGURE 21–Estimated C&D Debris Generated in NYS, By Weight



Source: NYS DEC

CONSTRUCTION AND DEMOLITION DEBRIS RECYCLING FACILITY: LEE COUNTY, FLORIDA



In May 2011, Lee County commissioned its Construction and Demolition Debris Recycling Facility (CDDRF). This $3.27 million facility has a processing capacity of 500 tons per day and compliments the County's efforts to divert materials from landfills and support its successful Business, Multi-Family, and Construction Debris Recycling Ordinance (implemented in 2008).

Adoption and implementation of a C&D recycling ordinance could be an effective method for diverting C&D debris from disposal facilities. A C&D recycling ordinance is a publicly adopted local law that gives an enforcement agency authority for the diversion activities required in the ordinance. Before adopting and implementing a C&D diversion ordinance, the process should begin by first researching local conditions related to C&D waste, and include local stakeholders throughout the development of the ordinance. Technical assistance and outreach to local governments could facilitate this process. Resources, including model ordinances, fact sheets, case studies and reports are available from the U.S. EPA (http://www.epa.gov/wastes/conserve/imr/cdm/recy-

cle.htm), the Institute for Local Self-Reliance Possible (http://www.ilsr.org/initiatives/deconstruction-waste-to-wealth), StopWaste.org (http://www.stopwaste.org) and others. Regional partners include local colleges and universities, Cornell Cooperative Extension, and the Environmental Finance Center at Syracuse University, which recently published a very useful Funding Guide for Capital Projects in Sustainable Materials Management.

c) Increase diversion of residential and commercial organic material from landfills according to the EPA's food recovery hierarchy.

According to the EPA, food residuals make up to 60% of residences' garbage. In addition, less than 3% of food scraps (which comprise 20% of the discards in landfills) are currently being diverted.[13] The more urbanized counties of Onondaga and Oswego have disproportionately large organic components in their solid waste streams due to disposal of yard waste. Removing organics from the waste stream (either at the source or after collection) has multiple benefits such as reducing the volume of waste to be landfilled and reducing GHG emissions from transport of waste and anaerobic decomposition at landfills. Other organics, such as food scraps and biosolids from wastewater treatment plants, are predominantly sent to landfills or incinerated. The separation of these types of organics should be more aggressively implemented to allow for local disposal or beneficial reuse. Combining food scraps and yard waste can create an ideal mixture for compost.

In 2007, the Onondaga County Resource Recovery Agency (OCRRA) began developing food waste processing capacity after gathering data that indicated food waste comprised about 15% of the local waste stream.[14] The County has recently received approval to collect 9,600 tons of food scraps from commercial and institutional customers. This waste will be aerobically composted along with yard waste utilizing aerated static pile (ASP) technologies. Thirty-two towns and villages in the area already produce their own mulch from collected yard waste.

OCRRA's food waste diversion program is aimed at the commercial and institutional sectors. The key to success has been the involvement of dozens of local businesses – and at least one local school district -- utilizing the Agency's food scrap processing system. The Marcellus School District's elementary, junior and senior high schools collect pre and post-consumer food wastes and milk from the students' breakfasts and lunches. The school reports an 87% decrease in trash in their first two months of food waste diversion, and project an annual disposal savings of $2,500. Additionally, Le Moyne College, Onondaga Community College and Syracuse University have joined OCRRA's food waste composting program. Syracuse University diverted over 300 tons of food waste in 2011, consisting mostly of fruit and vegetables discarded during food preparation along with some spoiled leftovers. The program has since expanded to include post-consumer waste (diners' uneaten food); SU now diverts roughly 9 tons of food waste from its garbage dumpsters each week. Other early food scrap composting adopters include nearly two dozen restaurants in a local shopping mall, a large coffee roasting company, and area hotels.

OCRRA's current program does not yet include residential customers as a viable compost customer, in part because residential customers may see an increase in collection costs as yet another collection vehicle is required to pick up materials at the curb. Additionally, contamination rates are expected to be higher in the residential market place, which would hinder the composting process and require rejection of loads.

Based on the EPA's Waste Reduction Model (WARM), OCRRA's efforts of composting 1,000 CY of food waste and 10,000 CY of yard waste annually versus waste to energy combustion would reduce greenhouse gas emissions by 40 metric tons of carbon dioxide equivalents (CO_2e), which is equivalent to the annual emissions of eight passenger vehicles.[15] Composting and compost use leads to a number of beneficial results, such as:

+ reductions in trash and waste,
+ reduced greenhouse gases,
+ healthier soil and plants,
+ better nutrient cycling,
+ greater fertility,
+ aids in erosion control, and
+ stormwater management.[16]

In addition to the benefits described above, OCRRA sells the finished compost in bulk, which provides a revenue source. Customers include landscapers, top soil producers, golf courses, and local residents.

Funding and staff capacity are obstacles to expanding OCRRA's model throughout the region. With additional support, other counties could develop their own compost facilities and programs. Possible partners include local colleges and universities, Cornell Cooperative Extension, the Environmental Finance Center at Syracuse University, NYS DEC, and EPA.

In addition to composting, efforts should be made to implement higher-priority recovery practices as described in the EPA's food recovery hierarchy, including in order of priority:

+ source reduction;
+ feeding hungry people;
+ feeding animals; and
+ industrial uses.

While the region has limited experience with these practices, there are many assets that could be leveraged to implement them. For example, the Food Bank of Central New York provides food, nutrition education and technical assistance to 410 programs including 268 emergency food programs in eleven counties. In total, the organization distributes distribute more than 10 million meals every year and over 28,000 meals each year). Efforts to increase the collection of safe but unused or unsold food from retail stores, restaurants and institutions could be made to provide resources to charitable organizations such as food banks. Food and food products not suitable for human consumption could be made available for agricultural or industrial uses including as a substrate to enhance the efficiency of anaerobic digesters. Technical assistance including public outreach and education and program administration could be provided by local colleges and universities, the Environmental Finance Center at Syracuse University, Cornell Cooperative Extension, non-profit organizations including food banks and agricultural service providers in partnership with the EPA, NYS DEC and other federal and state agencies. First steps may include developing an inventory of sources and uses, identifying potential sources of funding, and selecting or creating a program administrator.

d) Establish municipal single-stream curbside recycling programs.

Single-stream recycling allows residents to set out all of their recyclable paper and commingled containers together in one recycling

OCRRA FOOD WASTE COMPOSTING PROGRAM



Food waste delivered for composting at OCRRA's Amboy site Aerated Static Pile (ASP) composting pile



OCCRA Organic Compost

LeMoyne College, Onondaga Community College and Syracuse University have joined OCRRA's food waste composting program. Syracuse University diverted over 300 tons of food waste in 2011, consisting mostly of fruit and vegetables discarded during food preparation along with some spoiled leftovers.

bin, for processing at a single-stream recycling facility that is designed to separate the materials into marketable commodities. In a single-stream recycling system, the collection vehicles no longer need to keep paper products and recyclable containers in separate compartments of a truck.

The shift from dual stream to single stream recycling systems has been growing, as technological improvements during the past five to ten years have substantially improved the effectiveness of single-stream recycling facilities. In Central New York, for example, Onondaga County and Oswego County have both transitioned from a dual stream to a single-stream recycling program – and both utilize a privately operated single-stream recycling facility located in Liverpool.

The advantages of a single-stream system are associated with slightly higher recycling rates, due to added convenience for residents, and reduced collection costs associated with more efficient hauling of a single stream of materials. The main disadvantage of converting to a single-stream system is the substantial capital investment that could be involved if a new single-stream recycling facility is developed. The Oneida-Herkimer Solid Waste Authority, for example, recently converted its 20 -year old dual stream recycling facility to a single-stream recycling facility at a cost of approximately $9.5 million. However, Oswego County implemented its single-stream system after entering in to a contract with an existing single stream recycling facility.[8] This contractual option could be considered by other planning units in the region if they should decide to evaluate the costs and benefits that would be associated with transitioning to a single-stream recycling program. Technical assistance and outreach could be provided to local governments to help them consider and adopt this approach. Technical assistance could be provided by local colleges and universities, the Environmental Finance Center at Syracuse University, Cornell Cooperative Extension, and non-profit organizations.

Currently the five CNY counties handle their solid waste and recyclables collection programs differently either by contracting the services to a private entity, providing residents the option of selecting collection by a private subscription, passing the task to local governments through municipal collection programs, or providing local transfer stations for drop off by residents and commercial entities. In very general terms, residents either have their solid waste and recyclables picked up from the curb in front of their house (i.e., curbside collection) or they individually drive their materials to the local transfer station or landfill. Communities in which the collection services are either contracted out by a municipality or solid waste district to a private entity or are conducted by the municipality itself have fewer waste trucks on the road since fewer entities are conducting the pick-ups on each street. In communities where residents are given the choice to subscribe to the hauler of their choice, several trucks may be on a given road to conduct the collection services. For example, based on a preliminary survey of haulers servicing the Cortland County area, approximately fifteen (15) private haulers service that area. Similarly, thirteen (13) haulers offer subscription services to residents in Madison County.

Although not an exhaustive summary, a comparison of the collection services within CNY along with the differences in costs is provided below.

The City of Auburn currently operates a municipal collection program through their Department of Public Works. Approximately 11,411 households are serviced using this program, which collects both solid waste and recyclables. According to Mr. Mike Talbott, City of Auburn Superintendent of the DPW, there are four collection routes each week that are managed utilizing three solid waste trucks and one recyclables truck four days of the week. Mr. Talbott indicated that the City of Auburn's collection program costs approximately $800,000 annually, which equates to approximately $70 per household per year. In addition to collection, disposal costs range between $375,000-$500,000 per year, which equates to approximately $28-$43 per household per year . This results in an average cost for collection and disposal that currently ranges from approximately $98 - $113 per household per year in the City of Auburn.

The City of Cortland maintains a municipal collection program, which encompasses the City borders and is broken into five collection zones per week (one zone per weekday). This collection program is currently contracted out to Casella Waste Systems. In order to participate in the City of Cortland's program, trash must be placed in City-approved trash bags, which are purchased by the residents. The costs for these bags are as follows : 18 gallon bags - 5 bags for $15; 18 gallon bags - 10 bags for $25; 36 gallon bags - 5 bags for $20; and 36 gallon bags - 10 bags for $35. Assuming a typical household fills one 36 gallon bag per week in

the City of Cortland, that household would incur collection and disposal costs of approximately $182/year.

The Town of DeWitt in Onondaga County currently contracts with Butler Disposal to conduct curbside collection for its residents. Butler Disposal has three options to choose from with varying degrees of service. For $86/year, the household may put curbside one 32-gallon bag or container of garbage each week along with unlimited recyclables. For $200/year, the household may put up to three 32-gallon containers or bags of garbage out each week along with unlimited recyclables. Or the most expensive option, which includes unlimited garbage and recyclables, costs the resident $308/year.

The Town of Manlius in Onondaga County currently contracts with Syracuse Haulers to conduct their curbside collection program. The contracted collection program costs each household approximately $155/year .

Alternatively, Onondaga County residents are permitted to visit either the Rock Cut Road Drop-Off Site (Jamesville) or the Ley Creek Drop-Off Site (Liverpool). Should a resident choose to use a drop off center, they are charged a $10 or $25 entrance fee (depending on the type of vehicle) and each trash bag must be labeled with an approved OCRRA trash sticker, which can be purchased for $1.50/sticker. Additionally the Town of Spafford maintains a transfer station, which is open on Saturdays for residents of the Town. Residents are required to pay a $20/year fee to use this transfer station.

Approximately 59% of the households in Oswego County rely on private subscription service, 19% rely on the County transfer stations, and 22% are served by municipal (public) collection. The current cost of the County system including collection ranges from $92 to $360 per household per year. The calculated weighted average cost for the County system including collection is $212 per household per year. Based on the County's findings, the average cost per household for a subscription service is $270 per household per year compared to $123 per household for municipal collection and $125 per household for self-haul to one of the County's five transfer stations. The existing municipal collection programs currently in place in Oswego County are in the City of Fulton ($156/HH), Village of Mexico ($99/HH), Village of Parish $105/HH), Village of Phoenix ($127/HH), Village of Pulaski ($125/HH), Town of Redfield ($160/HH), and Town of Scriba ($92/HH), which are primarily more densely populated areas with the exception of the Town of Redfield.

Based on the information available, the average cost to a household for a subscription based curbside collection service in the 5-county region is approximately $270 per year and the average cost to a household for a municipal contract based service is approximately $135 per year. It is apparent that there would be a cost savings to the resident should a municipality contract curbside collection with a designated hauler. Based upon the information provided above, each hauler's rates depend on the level of coverage they maintain in a certain geographic area. The more customers in one specific area, the more efficient their routes can be and the more cost effective they can be to their customers. Conversely, should a hauler have to travel greater distances between customers, their rates would increase which would increase cost to their customers.

Due to the overlapping of collection areas (e.g., more than one hauler providing collection service on the same street), longer haul routes to collect the same number of households, and/or individual vehicles from each household hauling to a transfer station, it is likely that more truck fuel would be consumed and that more GHG emissions would be emitted as well with these alternatives. Therefore, transitioning to a municipal collection system from a subscription based system could result in a 12%-30% reduction in GHG emissions. Additionally, the perceived nuisance of having more than one solid waste truck on any given street would be eliminated. Given concentration of population, targeting dense population areas within Onondaga County and Oswego County that do not currently provide municipal collection services may be most effective.

As part of an expansion of publicly controlled curbside collection programs in the region, municipalities should consider purchasing recycling containers, waste "toter" receptacles, and automated collection vehicles which can reduce diesel fuel consumption and greenhouse gas emissions while providing cost savings to residents. In 2012, Dependable Disposal, a private hauler that services 20,000 homes in Onondaga County, began replacing OCRRA blue bins (which cost about $5 each) with much larger, 95-gallon lidded plastic containers (which cost about $55 each). These "toter" re-

ceptacles will be collected by an automatic truck, eliminating the need for anyone on the truck but a driver.[9]

High initial costs, which can be over $200,000 per automated collection vehicle, are a key barrier and municipalities would likely need additional support to adopt this technology on a wide scale. Possible partners include NYSERDA, NYS DEC, and the EPA.

e) Institute "green fees" or "pay-as-you-throw" programs to incentivize waste reduction and recycling.

As with many waste diversion strategies, a reliable and long-term source of revenue to help fund waste management and recycling programs is a challenge to achieve since the programs are typically funded by waste disposal fees. As a planning unit strives to reduce the amount of waste requiring landfill disposal, it is concurrently reducing the amount of revenue it collects from disposal fees. The fundamental policy of "waste paying for waste", which planning units in Central New York have employed for years as a means to provide economic incentives for waste reduction and recycling while also not relying upon local property taxes to pay for solid waste and recycling programs, is ultimately doomed for failure if the amount of waste requiring disposal declines substantially over time; less waste equates to less revenue to pay for waste diversion programs. In order to ensure a reliable source of revenue and enable the development, maintenance and sustainability of integrated solid waste management systems, some communities have instituted annual "green/sustainability" fees that are typically charged on a per parcel basis. These annual fees are typically charged to residential and non-residential properties to cover a portion of the costs associated with solid waste management and recycling programs and facilities, with the balance of system costs generally paid for from disposal fees to continue to provide an economic incentive to recycle and reduce waste requiring disposal.[10]

Tompkins County, NY, provides an example of a community that has implemented an annual green fee. The genesis for the green fee program began in 1990 with the creation of its trash tag program, which enabled Tompkins County to shift the funding source for its solid waste system from a completely tax-based to a disposal fee-based system.[11] Residents pay for disposal based on the amount of waste they produce, and hence residents realize a direct cost savings through their efforts at waste reduction and recycling. The Tompkins County trash tag program requires all residents to pay for waste disposal by weight. Residents and small businesses that place their waste at the curb purchase trash tags from their haulers who then pay the tipping fee at the landfill. Larger businesses, institutions, and those with their own dumpsters pay the waste disposal fee by volume as a part of their hauler's bill. Until the end of 1992 all ongoing solid waste operations, programs, and administration were paid for by users of the system. However, in 1992 some private haulers chose to take advantage of cheaper rates at neighboring landfills rather than the County's own landfill or transfer station. To assure adequate revenue for 1993 the County opted for multiple revenue streams to support its solid waste program, with 90% being covered by two sources: (1) a transfer station tipping fee reflected in trash tags, and (2) an annual user fee per household/hauler (i.e., a green fee). Licenses, grant moneys, revenues from sale of recyclable materials, and sewage composting fees provide the remainder of revenues to balance the budget. The annual fee helps to defray the costs of the County's Solid Waste Program, exclusive of garbage disposal.

Technical assistance and outreach could be provided to local governments to help them consider and adopt this approach. Possible partners include the Environmental Center at Syracuse University, NYS DEC, and the EPA.

f) Convert municipal and private waste transport vehicles to alternative fuels.

In recent years, some waste haulers have converted portions of their waste collection truck fleets from diesel to CNG. Increased use of clean, domestically produced fuels helps reduce our reliance on oil from overseas, which is good for energy security. According to the U.S. Department of Energy (DOE), nearly 87% of compressed natural gas used in the U.S. is domestically produced. CNG produces 60%–90% less smog-producing pollutants, gives off 30%–40% less greenhouse gas emissions, extends engine life, and provides a steady, lower cost per gallon (CNG is currently available at approximately $1.50 per gallon equivalent compared to diesel fuel, which can run up to $3.50 per gallon or higher). Consisting mostly of methane, CNG is odorless, colorless and tasteless. Strict safety standards make CNG vehicles as safe as gasoline-powered vehicles.[17]

Several CNY municipalities, including the City of Syracuse, have expressed interest in converting to CNG but high initial costs and the lack of access to convenient CNG fueling facilities are key ob-

stacles. Possible partners include local governments, NYSERDA, the EPA and the DOE.

g) Install methane gas collection and control systems, including landfill gas-to-energy (LFGTE) facilities and anaerobic digesters at dairy farms, waste water treatment facilities, and industrial businesses.

Methane (CH4) is the second most prevalent greenhouse gas emitted in the United States from human activities. In 2010, methane accounted for about 10% of all U.S. greenhouse gas emissions from human activities. Methane is emitted by natural sources such as wetlands, as well as human activities such as leakage from natural gas systems, landfills, wastewater treatment and the raising of livestock. Methane's lifetime in the atmosphere is much shorter than carbon dioxide (CO2), but CH4 is more efficient at trapping radiation than CO2. Pound for pound, the comparative impact of methane on climate change is over 20 times greater than carbon dioxide over a 100-year period.

There are a number of ways to reduce methane emissions. The EPA has a series of voluntary programs for reducing CH4 emissions. The EPA's AgSTAR Program supports efforts to reduce and capture methane by altering manure management strategies at livestock operations or animal feeding practices. The EPA's Landfill Methane Outreach Program promotes emissions controls that capture landfill methane, which comprises 16% of U.S. methane emissions.

A number of CNY landfills have installed landfill gas collection and control systems. The Madison County landfill has a gas collection and control system, which includes a landfill gas-to-energy (LFGTE) facility. This facility is operated by Waste Management, Inc., which generates electricity from combusting methane from the landfill. The electricity is in turn sold to the grid. Future intentions are to have the waste heat from the LFGTE facility be used by tenants of the nearby Agriculture and Renewable Energy (ARE) Park. To construct the Madison County Landfill gas-to-energy facility, the county received a $998,000 grant from the U.S. Department of Energy; the remainder of the $3 million total cost was paid by the private waste management company which owns the internal combustion engine. Madison County provided some of the labor to install pipes. The Auburn landfill practices landfill gas extraction, but because the 2 MW generators are underserved by landfill gas, the county has had to purchase natural gas to keep the generators running.

COMPRESSED NATURAL GAS (CNG) TRUCKS



Waste Management, Inc. (WM), recently announced that it has opened thirteen CNG stations across the country in the first half of 2012, of which 9 have publicly accessible fueling stations.[18] This brings WM's natural gas fueling stations to 31 with another 17 either in operation or in construction by the end of 2012. In 2012, natural gas vehicles will represent 80% of WM's annual new truck purchases. Based on the fact that WM is in the process of converting to CNG, it is likely that other waste haulers are also contemplating the conversion. However, not all waste haulers, including municipalities, have access to CNG fueling stations nor do they have the resources to convert to CNG. CNG engines require special fueling facilities as well as special maintenance facilities, both of which are expensive. The cost and availability of a network of CNG fueling stations would be an important consideration when waste/recycling truck owners assess the feasibility of such a conversion to CNG.

tors running at capacity. That energy is used to power the City's Wastewater Treatment Plant, and the excess is sold to NYSEG, the local utility. An unrealized opportunity for energy production exists, in that waste heat from the gas-to-electricity conversion process could be captured by recovery boilers, which could provide industrial users with hot water. The VisionCNY Plan recommends that steps be taken to install a landfill gas collection and control system at the Cortland County landfill, and to examine the feasibility of a LFGTE facility there.

Given the large number of dairy farms in the region, the use of anaerobic digesters represents another significant opportunity to reduce methane emissions in Central New York. An anaerobic digester is an air-tight, oxygen-free container that is fed an organic material, such as animal manure, sewage sludge or food scraps. A biological process occurs to this mixture to produce methane gas, commonly known as biogas, along with an odor-reduced effluent. Microbes break down manure into biogas and a nutrient-rich effluent. This biogas is then burned as fuel to make electricity. Dairy farms can produce about 1 Kw of power for every seven cows.

Anaerobic digestion is more extensively used outside of the U.S. where concern for treatment of animal waste has been a concern for a longer time. Currently there are approximately seven anaerobic digesters in operation in Central New York, including five at dairy farms and one at Morrisville State College. In addition, Cayuga County has recently developed a regional anaerobic digester facility that produces methane from the organic waste of several nearby dairy farms. This digester produces heat for the county jail, and generates electricity which is sold to the grid. The system also uses grease and food waste collected from restaurants to supplement the digester's organic waste supply.

Biogas generator at Sunnyside Farms, Cayuga County



While anaerobic digesters are not yet widely used in Central New York, it is becoming a more popular waste treatment option in the region for its ability to produce energy, control odors, and reduce the spread of pathogens.[21] For example, thermophilic digesters operating at 135 degrees have been shown complete elimination of Johne's bacteria. Daily spreading of manure, a long time continuing practice in animal agriculture in the United States will come under increasing pressure as environmental considerations prevent spreading during saturated conditions. The Natural Resource Conservation Service (NRCS) National Standard for Nutrient Management prohibits spreading manure on saturated soils. In New York State a low percentage of farms have enough storage to prevent them from spreading manure when the ground is saturated. In addition, in 2002 the EPA revised the Clean Water Act regulation for Concentrated Animal Feeding Operations (CAFOs). The new Federal Rule changes the animal thresholds over which an Animal Feeding Operation (AFO) is defined as a Medium CAFO, thereby changing which operations need discharge authorization by the CAFO General SPDES Permit (GP-04-02). The current thresholds for medium and large CAFOs are now between 200 to 699 mature dairy cattle and 700 or more, respectively. According to NYS Department of Environmental Conservation, there are more than 50 large or medium CAFOs in operation in Central New York.

Anaerobic digesters face a number of barriers to widespread adoption, including high costs for installation (over $1 million for a typical medium-sized farm in the region) and ongoing operation costs (including time and labor). In addition, energy expenditures amount to only about 5% of total operational costs on many farms, so there is little economic incentive to produce energy on site. While some technology providers now offer "turnkey" services, anaerobic digesters are complex systems and are still relatively new in CNY. Additional outreach and support could help to meet the VisionCNY Plan target of increasing the number of farm-based anaerobic digesters to 20 by 2030. Potential partners include lo-

cal governments, Cornell Cooperative Extension, local colleges and universities, agricultural support organizations, NYSERDA, NYS Department of Agriculture and Markets, the USDA, and the Innovation Center for US Dairy.

h) Support industrial symbiosis through a regional outreach and technical assistance program.

Industrial Ecology (IE) is an approach to sustainability in which industrial processes and products are considered integral parts of the complex global ecosystem. This philosophy - applying the fundamentals of 'ecology' to industry - seeks to discard the concept of 'waste' by optimizing and economizing flows and exchanges in material and energy to increase the circularity of the material and energy economies. The concept of IE can be summed up in the idiom, "one man's trash is another man's treasure".

The concept has many immediately practical applications. At its core, it seeks to improve process and material efficiencies, which frequently reduce energy use and pollution, often proving benefits to a company's bottom line. To this end, Lifecycle Costing (LCC), Lifecycle Assessment (LCA), Material Flow Analysis (MFA), and Integrated Chain Management (ICM) are well known, frequently applied parts of the IE toolkit. Rarer are aggregations of industries whose mutually beneficial networks of exchange create what is described as an Industrial Symbiosis (IS).

IS is a relatively new framework for sustainable practices.[19] There are few locally established pilot projects and no prevailing methodology for implementing IS. One thing is clear though from previous attempts to establish ground-up eco-industrial parks in the U.S.: IS cannot be planned from start to finish. IS must be opportunistic, capitalizing on existing industries and infrastructure. Typically, IS grows starting with a few key exchanges or out of a single large industry or facility that is constantly improving its operational efficiency.[20] Early relationships that may lead to fertile industrial symbioses exist in CNY and should be cultivated.

A number of global and local case studies in which IS has been deployed effectively were reviewed. The focus was on projects that have quantified reductions in GHG output, energy use, and landfill tonnage. As summarized in Table 71, seven case studies of relevant IS were evaluated and are ordered from broad topical relevance to specific applicability to CNY.

The first two case studies - Kalundborg and PRIOS - are examples of well-documented Industrial Ecosystems. They are instructional because researchers have quantified the significant economic and environmental benefits of these fully realized IS networks. NISP and Pennsylvania Waste Reporting illustrate the utility of state interaction in facilitating waste reduction and symbiotic relationships. The NISP case shows that a publicly-funded, pro-active organization can help remove the overhead cost for companies to develop their own waste-recovery policies. The long-term effects of Pennsylvania's waste reporting requirements have not been as closely monitored as NISP, but, what is clear is that the availability of data will increase the number of opportunities to realize sustainable, mutually beneficial material management practices.

The Pennsylvania requirements contrast with those of New York State, where fragmentation in reporting and lack of specific reporting requirements for commercial hauling limit the ability of managers and researchers to analyze regional reuse potential. The final three case studies illustrate IS opportunities developing in the northern United States: KIPC demonstrates the redevelopment of a former brownfield site; Silver Bay is an eco-park driven by meeting regional needs for quality affordable food and economic development; and the Genesee Valley Agri-Business Park shows that shovel-ready sites with expedited permitting are a major draw for prospective tenants and also provides an example of a successful industrial park development centered on the regional dairy industry. Each of these lessons is relevant to the environment in CNY.

Agriculture is a major industry in Central New York. Regionally, agriculture is dominated by corn and dairy, with the largest revenue generators being dairy farms, including milk-product sales and the sale of cattle and calves. The non-grain agricultural products, corn for grain, other grains, and cow, hogs, broilers, eggs and dairy sold are all products that leave the region, as indicated by their respective arrows. The most significant material in terms of tonnage is corn for silage or greenchop, which is consumed within the region. Similarly, the agricultural waste and excrement produced stays within Central New York.

Historically, agriculture has had a circular material flow pattern. However, as one follows the modern-day farm-to-table supply chain, circularity diminishes, and there is a general downstream flow of nutrients that results in losses to landfills and waterways. Regulation of farm wastes to improve waterways has had a great ef-

fect on closing the loop on nutrient loss upstream. Composting and organic collections programs, like those undertaken in Onondaga and Oswego, help close the loop downstream. Unfortunately, it is difficult to gain participation. State-organized programs such as the Massachusetts "land ban" program can yield significant increases in organic composting rates.

Pilot projects exist that demonstrate possible improvements at other points in this food delivery chain. NISP, for example, has demonstrated the feasibility of recycling dairy waste to anaerobic digestion from farm and processing facilities. OCCRA's organics composting efforts have returned many thousands of tons of nutrients to the region. Other potential symbiotic relationships exist between aquaculture and greenhouse operations, as evidenced in the Silver Bay Eco Park, as well as with milling plants for ethanol, which produce a dried grain byproduct that can be used as livestock feed.

Considering the quantity of materials that flow through agriculture and food processing facilities in the region, agricultural processors, agricultural waste processors, and food processing facilities should be target "anchor tenants" for an industrial park. Agricultural inputs include many items that other industries may consider waste. For example, non-potable water can be used for irrigation, or for smaller projects like aquaculture (see the Silver Bay case study). Waste like gypsum from C&D facilities can be used as compost or fertilizer.

Agri-industrial parks are extensions of the industrial park model, with an emphasis on agricultural production and its supporting activities. The opportunity for profitable byproduct-flows between tenants is particularly high within the biomass, energy, and water-intensive food processing industry. Agri-industrial parks can benefit from heat and steam derived from combined heat and power plants, or from co-locating with a biomass energy facility or anaerobic digester that can utilize farming byproducts or animal waste. Locating such digesters near large farms, wastewater treatment plants, or other institutions with large organic waste streams can reduce off-site waste hauling demand while providing renewable energy. Locating them near compost facilities can help to create high-end fertilizers from the resulting digestate, which can be applied back onto farms. Other potential agri-industrial park tenants include ethanol fermentation plants that use crop and food wastes or specific bioenergy crops (such as willow). The latter is the

TABLE 71–Summary of Case Studies

	Industrial Exchange Network	Number of Type of Industries & Number of Exchanges	Types of Sponsorship (Government/Private)
Establish Examples of Industrial Symbiosis	Kalundborg, Denmark	30 industries coordinating exchanges, including: Oil refinery, Power plant, Gypsum plant, Farms (Fish, Pig, etc.) Pharmaceutical manufacturing	Private; Initially informal, leading to formal organization
	PRIOS (Puerto Rico Island of Sustainability)	14 industries coordinating exchange, including: Pharmaceutical manufacturing, Wastewater treatment, Petro refinery, Power plant, Paint Manufacturing	Private, with government direction (e.g., requiring a power plant to use non-potable water)
State Sponsored IS Programs	Pennsylvania Waste Reporting Standards	All waste generators over 1 long ton/month must report.	Government directed
	NISP (National Industrial Symbiosis Programme), United Kingdom	Over 10,000 member organizations participating.	Government directed; support from government and subscription funding
Relevant Regional Pilots	Keystone Industrial Port Complex (KIPC) Bucks County, PA	Over 20 total tenants: primarily Renewable Energy technology manufacturers. Methane-to-electricity production, Concrete and asphalt crushing for reuse, Coal-fire residue used for shingles and sand-blasting.	Public-private partnership
	Silver Bay Eco Park Silver Bay, MN	6+ exchanges, including: Fish farm, Greenhouse for produce, Algal biofuel troughs, Wood pellet boilers.	Local Government
	Genesee Valley Agri-Business Park Batavia, NY	2 yogurt production facilities. Additional food-related businesses in consideration.	Public-private partnership

Lessons Learned	Significant Results
+ Social connections and the trust of community relationships helped establish partnerships. + Companies benefit from inputs that are: + Limited (e.g. available groundwater) + Can be supplied reliably (e.g. fly ash), + Cheaper (lower transportation costs and avoided waste).	+ Reduced 272,000 tons CO_2e/yr + Reduced 870 million gallons of water/yr + Over 1 million gallons of ethanol produced from straw + 150,000 tons of gypsum produced/yr from flue gas (SO_2) + $15m annual savings on $90m investment in shared infrastructure
+ Benefits are regionally-specific: + Single-industry dominated clusters benefit from aggregating their needs and waste streams. + Multiple-industry clusters benefit from internally sharing resource streams.	+ Reduced 99.5 tons SO_2/yr + Reduced 95.3 tons PM10/yr + Reduced 92.4 m gallons of water/yr + $10.3m in savings/yr for avoided energy, water, and discharge costs
+ Publicly-directed efforts are well-spent on information gathering and sharing	+ Saved 13 PJ of primary energy/yr + Reduced 900,000 tons of CO_2e/yr + Reduced 4,300 tons of SO_2e/yr + Reduced 4,200 tons of NO_x/yr
+ A publicly-funded, pro-active organization can help remove the overhead cost for companies to develop their own waste-recovery policies	+ Reduced 6.8 million+ tons CO_2 + Diverted 7.6 million+ tons of waste from landfills + Members saved over $260m
+ Proper incentives can fuel the development of a brownfield site into a major contributor to the local economy. + Individual localized operations such as energy derived from landfills and material recycling provide seeds for potential IS growth	+ $1b in economic growth and 3,000 jobs from renewable manufacturing and supporting sectors + Generates 40 MW electricity from captured methane
+ Rapid development of an ag/energy based, planned IS park possible with commitment of local stakeholders. + Meeting regional needs for quality affordable food and economic development are major drivers.	+ Created 95 to 135 jobs from the wood-pellet boiler and supporting logging activities + Reduced 127,500 tonnes CO_2e/yr
+ Shovel-ready sites with expedited permitting are a major draw for prospective tenants. + New York's dairy industry continues to show major growth in the yogurt market.	+ Plans identify 236 new jobs at the two plants

RIVERVIEW BUSINESS PARK: VOLNEY, NY





Site Plan and Rendering of Proposed Renewable Energy Park. Source: Operation Oswego County

In 2007, a renewable energy park was proposed for Riverview Business Park, in Volney, site of the former Miller brewery. The proposal called for the park to be anchored by a corn-based ethanol plant, along with a biomass energy project, wind turbines, a solar power installation and anaerobic digester. Other business activities proposed included a fish farm, a soda bottler and a hydroponic greenhouse. Engineers proposed a mix of enterprises that would create a closed-loop system. While the plan has not been fully implemented, Sunoco acquired the site in May 2009, and has established a corn-based ethanol production facility. Another element of the proposal which has been established on site is a plant which liquefies waste carbon dioxide from the ethanol plant.

subject of research at the SUNY College of Environmental Science and Forestry for its potential as a regionally produced dedicated energy crop.

Several opportunities exist in the region to develop or expand agri-industrial park activities. The Madison County ARE Park serves as a promising example, and with the addition of aquaculture and a greenhouse it could mirror the success of the Silver Bay case study. A number of other agricultural kernels of industrial symbiosis exist in CNY such as the Riverview Business Park.

Central New York has a wide range of large and small companies that represent a diverse mix of industries. There is ample opportunity for interaction between industries, and IS opportunities exist using both the cluster and dominant single-industry models described by PRIOS. Additionally, there are a number of organizations in place with the connections and industry recognition to pilot IS activities.

Figure 22 shows employment figures in selected waste generating industries (excluding farming). Industrial manufacturing and construction are the largest employment sectors, followed by non-metal/plastic/chemical manufacturing and food processing/food markets. While the material and energy data related to these employment statistics is not publicly available, the compositional diversity and relative scale of industries is apparent. The economic census shows that there are clusters of mid-size firms in manufacturing, many smaller firms in construction and agriculture, and a few very large firms in diverse industries. Large firms are particularly important players for IS, both for their scale and for the expertise and process knowledge they represent.

Adjacent or co-located industrial facilities provide the greatest opportunities for IS, as evidenced by the case studies cited in this report. Not only do they reduce the need for transporting water, heat, and other byproduct materials and their requisite infrastructure (roads, pipes, etc.), but they also foster the critical social relationships necessary to IS. Given these benefits, it makes sense to target the industrial parks in Central New York that already exhibit seeds of promise for IS growth. A few Industrial Parks in CNY exhibit kernels of IS including the Auburn Technology Park, Riverview Business Park, and the Finger Lakes East Business Park.

i) Improve the infrastructure for managing specialized materials, including agricultural plastics, household hazardous waste, and pharmaceuticals.

Household Hazardous Waste (HHW) is material that must be handled and disposed of properly due to dangers it poses to public health and the environment. Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be household hazardous waste (HHW). Products, such as paints, cleaners, oils, batteries, and pesticides that contain potentially hazardous ingredients require special care when disposed. The options of reduction, reuse, recycling, and disposal, listed in order of EPA's preferred waste management hierarchy, are all important tools to safely manage HHW. Benefits of proper HHW management include:

+ Reduction and recycling of HHW conserves resources and energy that would be expended in the production of more products.

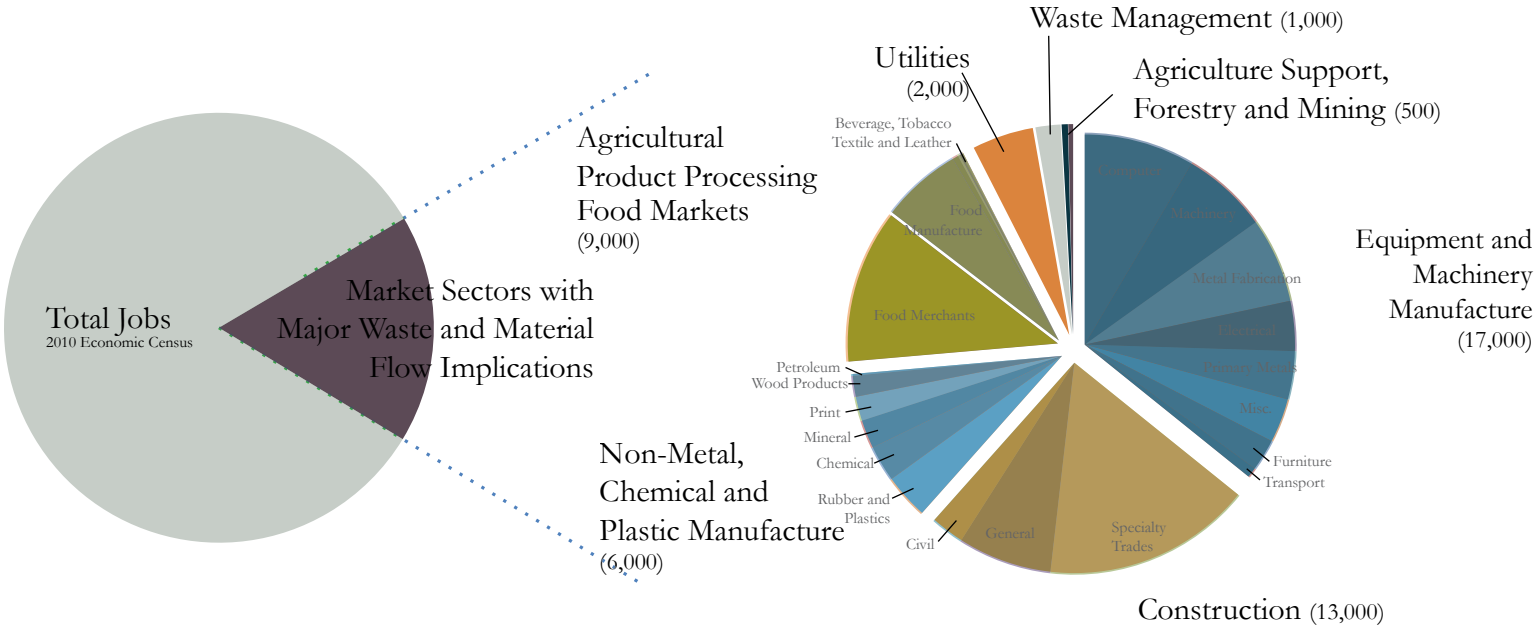
+ Reuse of hazardous household products can save money and reduce the need for generating hazardous substances.

+ Proper disposal prevents pollution that could endanger human health and the environment.

Certain types of HHW have the potential to cause physical injury to sanitation workers, contaminate septic tanks or wastewater treatment systems if poured down drains or toilets, and present hazards to children and pets if left around the house. Federal law allows disposal of HHW in the trash. However, many communities have collection programs for HHW to reduce the potential harm posed by these chemicals. The EPA encourages participation in these HHW collection programs rather than discarding the HHW in the trash.

Pharmaceuticals comprise a subset of HHW which can harm the environment and public health if improperly disposed. The semi-annual National Take-Back Day events are part of an initiative of the U.S. Drug Enforcement Administration (DEA) in coordination with state and local law enforcement agencies. This initiative has launched several nationwide events over the past few years to provide the public opportunities to safely dispose of expired, unwanted, or unused pharmaceuticals found in their homes. Other

FIGURE 22–Employment Statistics for Selected Waste Generating Industries in CNY



a Data from 2010 US Census Bureau Economic Census
b Represents a subset of major waste producing sectors not all sectors represented

Source: CNY RPDB

organizations also sponsor pharmaceutical take back events and municipalities may accept pharmaceuticals as part of their household hazardous waste collection efforts. Some law enforcement agencies may also have collection bins available for the public to drop off their unwanted pharmaceuticals.

In Central New York, Cayuga, Madison, Onondaga and Madison Counties, as well as the Town and Village of Skaneateles, accept HHW from residents and qualified small businesses and organizations on a periodic or as-needed (by appointment) basis. The VisionCNY Plan recommends that additional support be provided to local governments to expand their public education and outreach programs, to examine the feasibility of establishing year-round HHW collection facilities in each CNY county, and to participate in National Take-Back Day events. Possible partners include local governments, Cornell Cooperative Extension, the Environmental Finance Center at Syracuse University, colleges and universities, and non-profit organizations.

j) Establish local government Environmentally Preferable Purchasing programs.

The VisionCNY Plan recognizes that it is no longer enough to think about local government purchases only in terms of the short-term costs. Local governments must look at the "life cycle" of materials, products and services they purchase, and must champion the

MADISON COUNTY AGRICULTURE AND RENEWABLE ENERGY (ARE) BUSINESS PARK, LINCOLN, NY

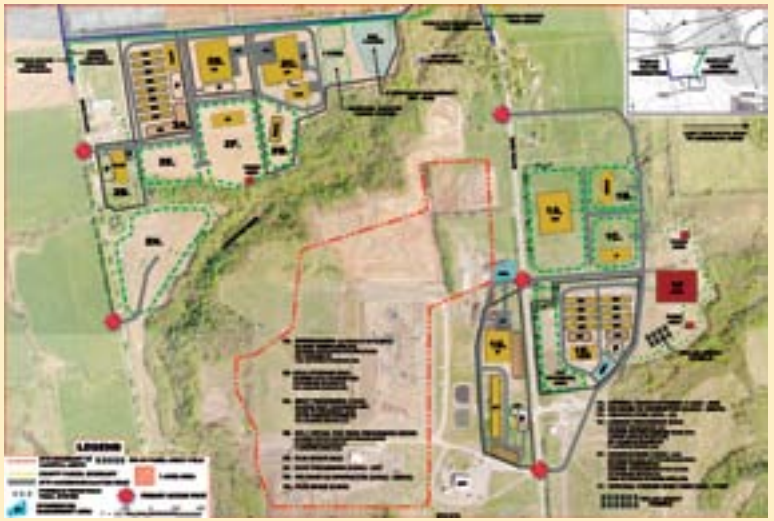


Agricultural plastics bundled for recycling.
Source: Madison County Department of Solid Waste

The Madison County ARE Park is a business and industrial site that aims to attract companies with a focus on renewable energy, recycling, and raw material use, including food and wood. Because of the existing LFGTE facility operated by Waste Management, tenants have access to 42.7 MBtu of high-quality, renewable heat and 12,000 MWh of reduced-price electricity, pending agreements on the site. Currently, Waste Management delivers electricity to the grid at wholesale price, and less than half the heat is being used by the recycling facility and lumber company in the park. This site already has a culture of industrial symbiosis; landfill gas provides cogeneration for Johnson Lumber and the county's recycling facility, solar power provides additional electricity, and waste wood is sold as wood pellets. Plans are also underway to utilize excess moist heat in a hydroponic greenhouse. U.S. Department of Energy (U.S. DOE) grants, NYSERDA grants, and local funding have helped make this project possible.

The ARE Park is a promising site for a newly created pilot program to deal with agricultural plastics, a significant problem throughout New York State. These "ag bags" are used for bailing and storing feed, manure, and grain on farms. Historically, this waste was often buried or burned on-site. While open burning of plastic has been illegal since October 2009, it still occurs at some farms. Most of the remaining "ag bags" are eventually landfilled, as they are typically too contaminated for recycling. Other plastics are also often landfilled, including "bulky plastics" like plastic bins or films. Karen Baase, Agricultural Educator from Cornell Cooperative Extension of Madison County, estimates that CNY generates approximately 630 tons of agricultural plastic to recycle annually, with 80 tons in Madison County alone.

Madison County began collecting agricultural plastics in December 2012. The program allows farmers, gardeners and other generators of agricultural plastic materials to drop them off at transfer stations in Cazenovia, Sullivan, Hamilton and the main landfill site in the town of Lincoln. Currently, the waste is shipped to Niagara Falls where it is processed into diesel fuel by JBI, Inc., which has developed a method of converting plastics into ultra-low sulfur diesel fuel. This process also works for contaminated waste streams. JBI is currently commercializing this process, and has received the necessary air permits from NYSDEC. The County hopes to sign a contract with JBI to develop a facility at the ARE Park. Madison County, whose waste and highway departments use $600,000 per year in diesel fuel, could be an attractive customer for JBI's renewable diesel, and could potentially save money from a deal to receive renewable fuels for their vehicles. However, capital funding remains a challenge. With proper seed money to cover feasibility studies, environmental quality review, and construction, a plastics-to-fuel facility could build on existing projects at the ARE Park.



understanding that, in the long run, it is appropriate to invest "up-front" for better products or services. It is through such a shift in focus—to life cycle cost analysis, and to the additional criteria noted above (packaging, shipping distance, reuse and recycling) that local governments can have a central role in reduction of greenhouse gas emissions from municipal operations.

Local governments in Central New York currently procure millions of dollars in goods and services each year (between 80 and 100 million in Onondaga County alone). The role of the municipal purchasing authorities has traditionally been to certify that the law was followed in making a purchase, and that the product is the most efficient use of tax payer dollars that allows local government departments to perform their primary function. The focus has historically been on the lowest cost product or service, without concern for how the product is packaged, from where it is shipped, how it is manufactured, how long its useful life is or how much of it can be reused at the end of that natural life.

Although the regional greenhouse gas inventory did not directly identify the emissions impact of local government purchasing, there is a new and growing awareness of the relationship between the public procurement practices and sustainable use of resources. Local government Environmentally Preferable Purchasing (EPP) programs are an example of leading-by-example (LBE) strategies which can educate residents and businesses about the measurable co-benefits of using sustainable materials, products and services including:

+ Lower purchase price for things such as remanufactured products
+ Reduced operational costs due to energy efficiency
+ Reduced disposal costs via the purchasing of more durable products
+ Reduced hazardous waste management costs by utilizing less toxic products
+ Reduced worker health and safety costs

Local governments are already taking action to adopt EPP programs. The Town of DeWitt has been purchasing sustainable products for some time and included EPP principles into its Sustainability Policy adopted in 2011. The Onondaga County Executive and the Division of Purchase have already taken an important step toward reducing greenhouse gases by putting into place a green and sustainable purchasing preference Administrative Directive. This directive calls for the Division of Purchase to consider the following on every contract and transaction: Recycled content, reusability, fuel usage, toxins produced and energy efficiency of each purchase. Onondaga County has begun purchasing basic supplies with a higher recycled content, including industrial paper supplies. Another of the Purchasing Department's recycling and reuse successes thus far has come at the end of useful life of purchased items. The Division of Purchase currently runs a highly successful surplus management program which "re-purposes" more than 90% of all fixed assets, either by redistributing the materials to other County departments, by giving the materials away to not-for-profit organizations or by auctioning the materials for reuse.

Technical assistance and outreach could be provided to some local governments to encourage them to adopt EPP programs by the Central New York Regional Planning and Development Board (CNY RPDB) which supports municipalities in CNY that have adopted the NYS Climate Smart Communities Pledge. Additional support could be provide in partnership with local governments, the NYS Association of Towns, the NYS Association of Counties, the Environmental Finance Center at Syracuse University, Cornell Cooperative Extension, colleges and universities, and non-profit organizations.

3. Alignment of Strategies and Targets

The following table illustrates the alignment of materials management strategies and targets.

TABLE 72–Alignment of Materials Management Strategies and Targets.

STRATEGIES	TARGETS				
	1	2	3	4	5
	REDUCE REGIONAL TOTAL SOLID WASTE GENERATED PER CAPITA, INCLUDING MSW, C&D, HAZARDOUS AND INDUSTRIAL MATERIALS, BY 75% (BELOW 2010 LEVELS) BY 2030.	REDUCE THE AMOUNT OF MSW GENERATED AND THEN DISPOSED OF IN LANDFILLS OR VIA ENERGY RECOVERY BY 82% (BELOW 2010 LEVELS) BY 2030.	REUSE 50% OF C&D WASTE BY 2030.	INCREASE THE AMOUNT OF FOOD AND YARD WASTE COMPOSTED BY 75% BY 2030.	INCREASE THE NUMBER OF DAIRY FARM-BASED ANAEROBIC DIGESTERS OPERATING IN THE REGION FROM SEVEN TO 20 BY 2030.
Short-Term Opportunities					
a. Increase recycling of post-consumer waste through a regional education campaign and convenient public receptacles.	●	●			
b. Increase reuse and recycling of construction and demolition materials.			●		
c. Increase diversion of residential and commercial organic material from landfills according to the EPA's food recovery hierarchy.		●		●	●
Long-Term Initiatives					
d. Establish municipal single-stream curbside recycling programs.	●	●		●	
e. Institute "green fees" or "pay-as-you-throw" programs to incentivize waste reduction and recycling.	●	●		●	
f. Convert municipal and private waste transport vehicles to alternative fuels.	●				
g. Install methane collection and control systems, including landfill gas-to-energy (LFGTE) facilities and anaerobic digesters at dairy farms, waste water treatment facilities, and industrial businesses.					●
h. Support industrial symbiosis through a regional outreach and technical assistance program.	●				●
i. Improve the infrastructure for managing specialized materials, including agricultural plastics, electronics and household hazardous waste.	●	●			
j. Establish local government sustainable procurement policies.	●	●	●	●	

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Burnett Park Zoo, Syracuse

Chapter 8: Climate Adaptation

***Climate change** is not a new phenomenon. What is new, however, is the rate of climate change over the last century and the ability of science to measure contributions made by human activity. What is notable about the increased rate of climate change is the effect it has on all natural systems.*

Understanding the basic scientific evidence of climate change, policy actions taken to address it, and the ongoing need for assessment to identify areas of impact, is necessary to the climate adaptation process on global, national and regional scales. While some preventive and mitigative actions may be too late, adaptation is an evolving process that must begin now.

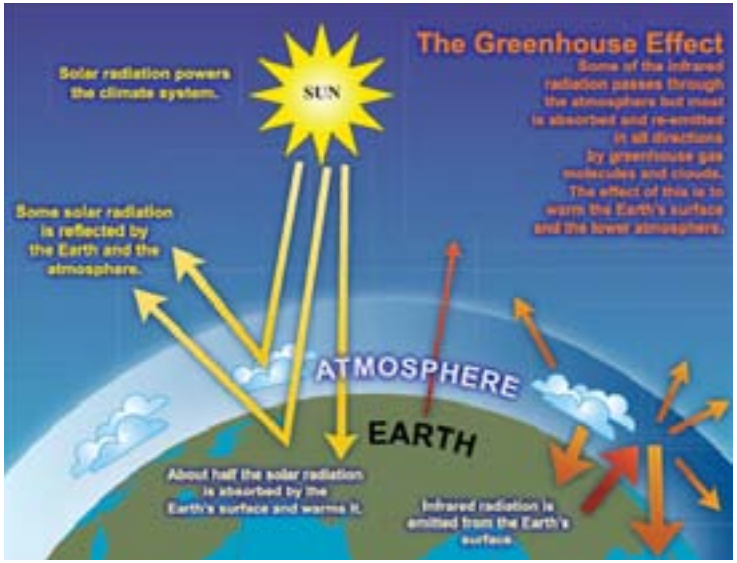
There are many natural processes at work that influence climate characteristics. One important phenomenon affecting Earth's climate is the greenhouse effect. This process involves the capture of sunlight radiated from earth back to the atmosphere, such that the temperature of earth remains warmer than it would be without this process and therefore conducive to the survival of humans and other species (Figure 23).

According to the Intergovernmental Panel on Climate Change (IPCC): without the natural greenhouse effect, the average temperature at Earth's surface would be below the freezing point of water. Thus Earth's natural greenhouse effect makes life as we know it possible. However, human activities, primarily the burning of fossil fuels and clearing of forests, have greatly intensified the natural greenhouse effect, causing global warming.[1]

The trapping effect of the greenhouse gases (GHG) at work in the natural greenhouse effect is accelerated with the addition of GHGs from human activities, such as fuel combustion for electricity generation, vehicle transport, and the animal-released methane from agricultural processes.

Climate change impacts all facets of life. The term "adaptation" refers to adjustment in natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects.[2] Given that these processes are already underway, adaptation and mitigation is the recommended framework for sustaining current living conditions on Earth. The terms are inter-related, and broadly defined as:

FIGURE 23–The Greenhouse Gas Effect



+ Adaptive capacity: the ability or potential of a system to respond successfully to climate variability and change

+ Mitigative capacity: the ability to diminish the intensity of the natural (and other) stresses to which it might be exposed[3]

CNY has an opportunity to be a leader in climate adaptation. This portion of the regional plan is meant to equip Central New York communities with the foundation to explore adaptation strategies appropriate for their conditions and vulnerabilities. Central New York is already a leader in environmental sustainability and conservation. While our communities can learn from the adaptation efforts of other regions, we must seize the opportunity to identify existing best practices and tools that increase regional resilience.

Many states and communities have already taken the lead in climate adaptation- communities such as Keene, New Hampshire and Boulder, Colorado have created climate adaptation plans and implementation strategies. Central New York cities, towns and villages have the chance to benefit from preparedness and flexibility, and reap co-benefits such as shared resources and efficiency that are involved in climate adaptation planning.

This chapter identifies areas for adaptation in Central New York communities with the goal of creating a more sustainable and resilient region amidst the uncertainty of global climate change impacts. Climate adaptation strategies necessitate a systems approach to planning and policy-making, which leads to many social, economic and environmental benefits. While areas for monitoring, assessment and continuous improvement exist, actions taken today will make a significant impact when paired with long-term planning efforts.

A. EXISTING CONDITIONS

1. Global, National, and New York State Climate Change

Scientific evidence to support the occurrence of climate change is creating a critical need for action at the global, national, regional, and local levels. In Central New York, there is an immediate need for the implementation of green infrastructure, protection and expansion of wetland resources, and improved buffer zones around sensitive ecosystems. Despite uncertainties associated with the complex issue of climate change, enough information is available to develop scientifically credible, no-regrets strategies that address climate-related threats and impacts. Individuals in the public and private sector, including stakeholders from state and local agencies, non-profit organizations, businesses, and citizens are encouraged to take actions now that will reduce the negative impacts of climate change.

Information is provided below on the impacts of climate change that have been documented at the global, national, state, and regional levels.

+ The trapping effect of the greenhouse gases (GHG) at work in the natural greenhouse effect is accelerated with the addition of GHGs from human activities, such as fuel combustion for electricity generation, vehicle transport, and animal-released methane from agricultural processes. These emissions sources contribute to global climate change.

+ Global warming has resulted in a temperature rise of 1.1°F in the past three decades and 1.4°F in the past century.

+ Global temperature projections include a 0.4° F warming trend over each decade for the next two decades.

+ In 2010, United States GHG emissions increased 10.5% over 1990 emissions levels.

+ Many communities have already taken the lead in climate adaptation planning- communities such as Keene, New Hampshire, Boulder, Colorado and Homer, Alaska.

+ The first half of 2012 was the warmest period over 118 years of record-keeping.

+ Temperature in NYS increased by less than 1° F over the past 60 years.

+ Temperatures are expected to rise across the state: 1.5°-3°F by the 2020s, 3°-5.5°F by the 2050s, and 4°-9°F by the 2080s.

+ Annual precipitation rates have increased by approximately 2.8 inches over the past 60 years.

+ Heavy precipitation events are increasing in New York, with a 64% increase in extreme precipitation frequency from 1948-2011.

+ Heat waves are likely to become more frequent, intense, and longer in duration; the number of cold days (minimum temperature at or below 32° F) per year will decrease.

+ Increasing water temperatures will have consequences for aquatic ecology in local lakes and streams.

+ Increasing air temperatures will continue to impact the water cycle, with changes anticipated in the quantity and timing of snowfall, rainfall rates, and evaporation. This will impact the local economy, with changes anticipated for recreation, forestry, and agriculture.

+ Warming trends will increase the northward movement of plant and animal species.

+ Increased flooding in flood zones and along Lake Ontario and other shorelines could impact public safety and infrastructure.

+ Wastewater and water delivery infrastructure is vulnerable to the impacts of climate change. New York has more than 600 wastewater treatment plants serving over 15 million people, and more than 30% of the state's treatment facilities and systems are over 60 years old. Older systems and combined sewer overflows present an ongoing risk from increased precipitation and severe storm events.

The United States Climate Action Report for 2010 (Fifth National Communication under the UN-FCCC) indicates that climate changes are underway and projected to grow across the nation. These changes include heavy downpours, rising temperature and sea level, rapidly retreating glaciers, thawing permafrost, lengthening growing seasons, lengthening ice-free seasons in the ocean and on lakes and rivers, earlier snowmelt, and alterations in river flows.[4]

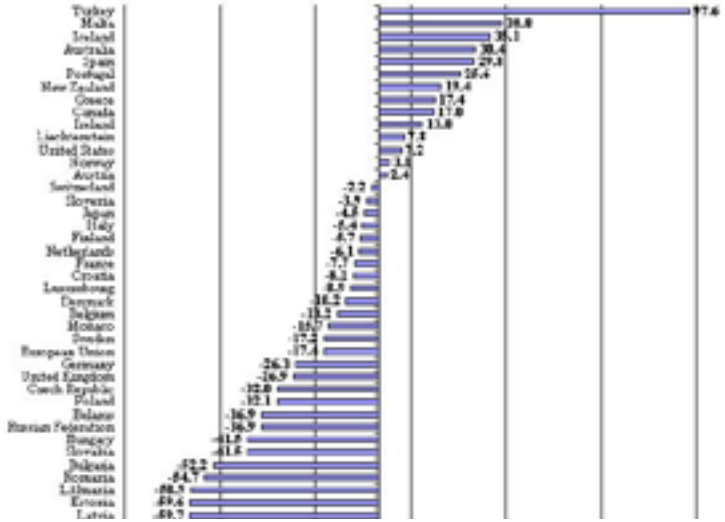
Climate change impacts are occurring in different regions of the world. Climate change issues such as greenhouse gas emissions, temperature fluctuation and sea level rise will affect nearly all nations at different scales.

(a) Greenhouse Gas Emissions

Across the globe GHG emissions rates vary, particularly given the time frame of analysis conducted and the state of development of individual nations. Figure 24 shows the percentage change from 1990 emissions levels for all parties to the United Nations Framework Convention on Climate Change (UN-FCCC). For example, based on 2009 emissions data, the United Kingdom has seen a 26.9% decline in emissions.[5]

Global emissions levels are expected to rise according to projections generated through scenario modeling efforts. Scenarios cover a range of potential actions (including business as usual) affecting GHG emissions in the future. Global climate models generally indicate that emis-

FIGURE 24–Changes in GHG emissions excluding LULUCF (%)



Note: "Excluding Land Use, Land Use Change and Forestry (LULUCF)" refers to the exclusion of carbon sinks such as forests, which would reduce the overall emissions total due to the carbon storage potential of trees.

sions rates will continue to rise, and even if emissions were to stabilize, their impacts would continue to be felt in the long-term:

+ Both past and future anthropogenic carbon dioxide emissions will continue to contribute to warming and sea level rise for more than a millennium, due to the time scales required for removal of this gas from the atmosphere.[6]

United States emissions totaled 6,821.8 teragrams or million metric tons of CO_2e in 2010.[7] This total represents an increase of 10.5% over 1990 emissions levels.[8] Energy-related emissions increased in the United States during 2010 (just over 3% from 2005 levels), following a slight decline in 2009 (Figure 25).[9]

Of the three most regularly reported greenhouse gases, carbon dioxide (CO_2) emissions are highest for the nation in the fossil fuel burning sectors of electricity generation, transportation and industry, respectively, while the highest methane (CH_4) emissions result from natural gas systems and enteric fermentation processes of agricultural livestock. National nitrous oxide (N_2O) emissions are highest in the agricultural soil management sector, which involves the application of fertilizers to farmland.[10]

National emissions trends and projections fluctuate primarily based on shifts in fossil fuel combustion. The Energy Information Agency (EIA) forecasts that "energy-related CO_2 emissions in 2035 are only 3% higher than in 2010 (as compared with a 10% increase in total energy use)," due to the projected decline in carbon intensity of fuels combusted.[11]

(b) Temperature

Each year of the 21st century has ranked among the 14 hottest since record keeping began in 1880. Temperature data has been tracked for over a century and scientists have observed that global warming equates to a temperature rise of 1.1° F in the past three decades and 1.4° F in the past century.[12] Figure 26 illustrates the warming trend of the last century.[13] IPCC temperature projections include a 0.4° F warming trend over each decade for the next two decades.[14] According to the National Climatic Data Center, the first eight months of 2012 were the hottest ever recorded in the continental United States. The summer period of June, July and August was also the third

FIGURE 25–Energy-related carbon emissions, 1990-2011

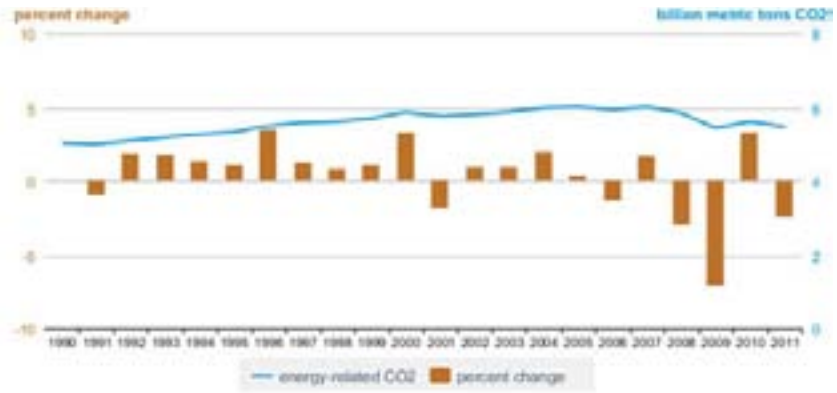
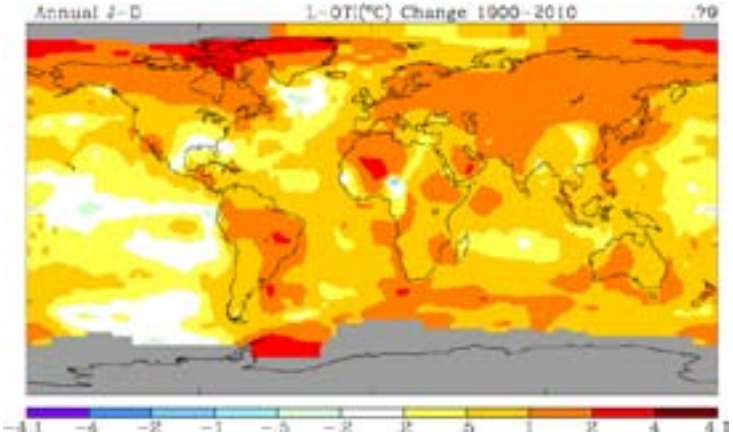


FIGURE 26–Global Temperature Changes during the 20th Century, 1900-2010



hottest ever recorded. The nation is averaging 4° F above average for the year. This represents a full degree higher than the same period in 2006, which was the second hottest January-August on record. Record keeping began in 1895.[15]

As an indicator of average daily temperature fluctuation, heating and cooling degree days indicate the number of days above or below 65° F in a year. From 2001 to 2008 the number of heating degree days averaged 4,259, which was 3.8% below the 20th-century average. Over the same period, the annual number of cooling degree days averaged 1,335, which was 5.4% above the long-term average.[16]

(c) Sea Level

Sea levels are measurably rising across the globe. According to the IPCC's Fourth Assessment report:

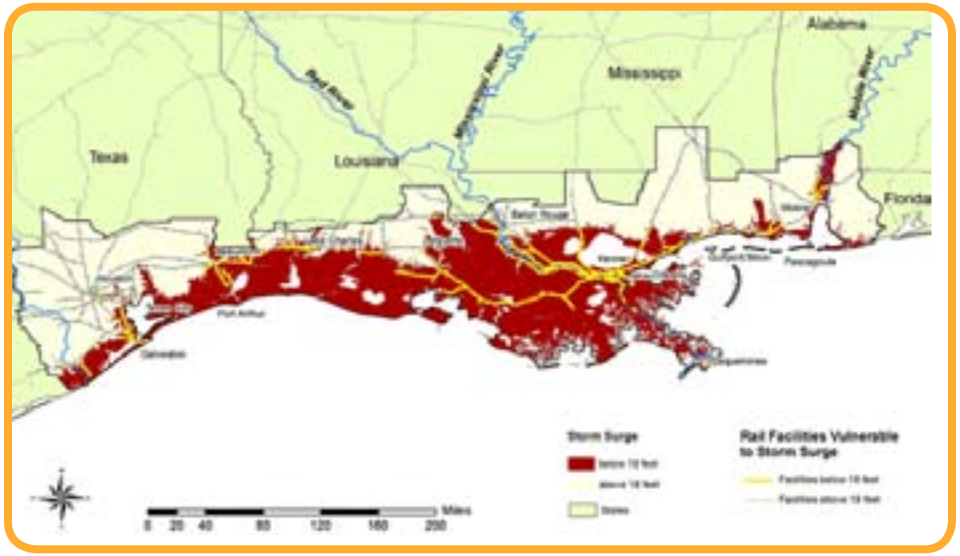
"Rising sea level is consistent with warming. Global average sea level has risen since 1961 at an average rate of 1.8 [1.3 to 2.3] mm/yr and since 1993 at 3.1 [2.4 to 3.8] mm/yr, with contributions from thermal expansion, melting glaciers and ice caps, and the polar ice sheets. Whether the faster rate for 1993 to 2003 reflects decadal variation or an increase in the longer-term trend is unclear."[17]

Melting of glaciers and ice sheets is occurring in conjunction with global temperature increase to create sea level rise. Additionally, changes in snowfall, ice and length of frozen periods resulting from temperature increase, are also impacting water bodies, such as lakes.[18] Given the interdependence of all ecological processes, melting patterns leading to sea level rise are impacting ecosystems at all scales.

Records indicate that most of the United States coastline has experienced sea level rise equivalent to 2 mm to 3 mm per year.[19] United States regions experiencing sea level rise will continue to experience impacts in sectors such as transportation. Along the Gulf Coast alone, approximately 3,864 kilometers (2,400 miles) of major roadways and 396 kilometers (246 miles) of freight rail lines are at risk of permanent flooding within 50–100 years as climate change and land subsidence combine to produce a projected sea level rise of approximately 1.2 m (4 ft) (Figure 27).[20]

FIGURE 27–Sea Level Rise along the Gulf Coast

Along the Gulf Coast alone, approximately 3,864 kilometers (2,400 miles) of major roadways and 396 kilometers (246 miles) of freight rail lines are at risk of permanent flooding within 50–100 years as climate change and land subsidence combine to produce a projected sea level rise of approximately 1.2 m (4 feet).



Impacts from rising sea level include higher and more frequent flooding of wetlands and adjacent shores; expanded flooding during severe storms and high tides; increased wave energy in the near-shore area; upward and land-ward migration of beaches; accelerated coastal retreat and erosion; intrusion into coastal freshwater aquifers; damage to coastal infrastructure; and significant impacts on the coastal economy.

These impacts are being felt within the coastal population centers and beach ecosystems of New York State where the coastline has risen by approximately one foot since 1900. Hurricane Sandy, the super storm which struck the northeast in October 2012, destroyed homes and devastated shoreline communities when sea levels in the New York metropolitan area rose 14 feet above average low-tide levels.

(d) Arctic Sea Ice

The Arctic ice cap has been melting at a faster rate in recent years, and melting is reducing not only the breadth, but also the depth of the ice cover- an indication that ice thickness is declining due to multiple years of warming.[21] In September 2012, sea ice covering the Arctic Ocean fell to the lowest extent in the satellite record, which began in 1979. Satellite data analyzed at the National Snow and Ice Data Center shows that Arctic sea ice cover reached its lowest extent ever recorded on September 16. The ice cap is 49% smaller than the 33-year average obtained from satellite observations.[22]

Arctic warming can have significant effects on weather throughout New York State and along the east coast by contributing to a weather pattern called the "Greenland Block".[23] The term refers to conditions that develop when warming temperatures occur over Greenland for several weeks, causing additional warming trends to occur in a northwest direction across the Arctic. The block contributes to a change in the jet stream which results in the movement of cold air moving southward, causing major winter storms in the Great Lakes region and along the east coast.[24] The duration of these weather patterns typically last for weeks, rather than an entire winter season. The shifting jet stream from the Greenland Block contributed to the nine-day winter storm event in February 2007 (with 140 inches of snow in Oswego County), the massive snow storm that hit the east coast in February 2010, and the persistent lake effect snow that closed schools and impacted travel in Oswego County during 2011.

2. Challenges Associated with Climate Change

(a) Policy Challenges

To date, there is no comprehensive climate policy at the global or national level. In 1992, the United Nations (UN) established the Framework Convention on Climate Change (UN-FCCC) as an international treaty aimed at stabilizing atmospheric greenhouse gas concentrations at a level that would prevent dangerous interference with the climate system. Since 1992, the UN has convened conferences of the parties to develop global climate change policy and adaptation measures. The first conference took place in 1997 in Kyoto, Japan, and the most recent conference was in Durban, South Africa, in 2011. Each of these conferences attempted to strengthen global commitments to climate change adaptation and mitigation amid scientific uncertainty, resource constraints and issues of equity. The global policy context has evolved throughout the last decade, with much of the focus on the responsibility of developed countries to address the challenge of disproportionate burdens of climate change impacts on the developing world.

Over the last decade, nationally, climate change policy has remained a consistently challenging and bipartisan issue. The United States Global Change Research Program (USGCRP) coordinates and integrates federal research on changes in the global environment and their implications for society. The program began as a presidential initiative in 1989 and was codified by Congress through the Global Change Research Act of 1990 (P.L. 101-606), which called for "a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change." Thirteen departments and agencies participate in the USGCRP, which was known as the U.S. Climate Change Science Program from 2002 through 2008. The program is steered by the Subcommittee on Global Change Research under the Committee on Environment, Natural Resources, and Sustainability, overseen by the Executive Office of the President, and facilitated by an Integration and Coordination Office. During the past two decades, the United States, through the

USGCRP, has made the world's largest scientific investment in the areas of climate change and global change research. Since its inception, the USGCRP has supported research and observational activities in collaboration with several other national and international science programs and delivers a variety of publications that highlight scientific advances pertaining to global change. In addition to detailing scientific progress, USGCRP products illustrate the impacts of global change and highlight the Nation's response to these changes. As mandated by Congress, the USGCRP produces regular assessments of global change and annual reports showcasing the Program's progress in achieving its annual goals. To date, the USCCRP has issued two National Climate Assessment reports, in 2000 and 2009, and the draft of the Third National Climate Assessment is presently available for review and comment.[25] The USGCRP also assessed climate impacts to the Northeast in 2009 (http://nca2009.globalchange.gov/northeast).

Further executive action has been taken by Federal agencies. The United States Environmental Protection Agency (EPA) declared that greenhouse gas emissions posed human and environmental health risks under the Clean Air Act in 2009. National policy regarding the limits of toxic air pollutants by coal-fired power plants was also implemented by the EPA under the Clean Air Act in 2011.[26] The federal Interagency Climate Change Adaptation Task Force published its Progress Report on Federal Actions for a Climate Resilient Nation in 2011, outlining the need for climate adaptation strategies across the United States and articulating the efforts already underway at the federal level.[27] Challenges regarding resource constraints and federal versus state action on climate change remain. Despite the lack of comprehensive national climate policy, growing membership to organizations such as ICLEI Local Governments for Sustainability and increases in commitments such as the United States Conference of Mayors Climate Protection Agreement signify an emerging consensus regarding local government action to address climate change. Furthermore, ongoing development of global sustainability indices and emissions accounting tools continue to influence regional planning and policymaking in the United States.

At the state level, New York has instituted executive orders regarding energy efficiency and conservation, developed aggressive statewide emissions reductions targets, and undertaken climate change adaptation assessments. In 2010 New York State released an interim progress report on the state climate action plan, and the New York State Sea Level Rise Task Force produced its "Report to the Legislature." In 2011, the state published *ClimAid: Responding to Climate Change in New York State* (*ClimAid*), outlining climate change impacts and areas for adaptation.[28]

The New York State ClimAid report identified the following observed climate changes throughout the state:

1. Annual average temperatures in New York State have risen about 2.4 degrees since 1970, with winter warming exceeding 4.4 degrees.
2. Sea level along New York's coastline has risen about one foot since 1900.
3. Since 1900, there has been no discernible trend in annual average precipitation for the state as a whole.
4. Intense precipitation events (heavy downpours) have increased in recent decades.

(b) Equity and Environmental Justice

The term, "environmental justice" refers to the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.[29] The issue of climate change, whether considered in terms of temperature rise, emissions or public health, affects all people- and also some more than others. The global issue of equity arises regarding how developed countries continue to develop- emitting more than developing countries, thus disproportionately contributing to climate change and all of its associated impacts. Additionally, equity and justice are a challenge when considering the adoption and implementation of global climate policy; given the lack of resources within

developing countries and their desire to grow as other developed countries have, climate change policy must address the issue of resource distribution and development rights.

At a regional level, equity and environmental justice issues are apparent in planning decisions. The lack of water experienced by one community, in the event of drought induced by a warming climate, may be precipitated by the planning and resource consumption patterns of another community. Additionally, limiting air pollution in one region, while permitting growth and associated pollution to increase in another, presents equity challenges for communities living under each set of circumstances. Awareness and consideration of equity and justice issues is a key component of climate adaptation planning.

3. Central New York Climate Change

Climate impacts throughout the northeast are expected to cause warmer temperatures and increased frequency of storm events. Warming trends will result in longer growing seasons, warmer winters, and summer heat stress. Increased winter precipitation is also expected, along with increased variability and extreme events. The potential impacts of climate change emphasize a critical need in Central New York for the implementation of green infrastructure, protection and expansion of wetland resources, and improved buffer zones around sensitive ecosystems.

Climate characteristics in Central New York are influenced by land topography and national weather trends. Extreme events occasionally impact the region and include periods of excessive heat (the summer of 2012 is an example), flooding from heavy precipitation events and spring snow-melt, and lake-effect snowfall because of the region's close proximity to Lake Ontario. Climate conditions will continue to have a significant impact on Central New York's diverse economy, with precipitation and temperature impacts on agriculture, industry, commerce, and recreation. Temperature and precipitation increases in Central New York are anticipated to cause increased flooding and stormwater runoff with secondary impacts on wastewater treatment plants and pollutant loading to water resources. Warming trends are expected to result in longer dry periods during the summer months, while contributing to the northward spread of invasive species. Increased temperatures are expected to cause lower tributary flow rates and water levels in lakes, rivers and streams, with a shift in aquatic species composition.

The following sections address the priority risks associated with climate change in Central New York including water resources, forest ecosystems, agriculture, energy, and public health. The last section of the chapter presents a table with recommendations designed to address Central New York's goals for climate adaptation.

(a) Central New York Greenhouse Gas Emissions Inventory

Methodology

The Central New York greenhouse gas (GHG) inventory took place from June-December 2012. This analysis was conducted for all five counties in CNY, with an initial baseline assessment completed at the county level and a final allocation of emissions to the municipal level. This work was done in coordination with the nine other regions of the state through the New York State Greenhouse Gas Working Group, which aggregated the methodologies developed by each region and then selected recommended approaches to include in a NYGHG protocol. This document serves as the basis for future analyses by each region, and will function as a benchmark for future protocol iterations.

Methodologies developed by the EPA, ICLEI, The Climate Registry, and others formed the basis for protocol development and re-

FIGURE 28–Per Capita Emissions by County

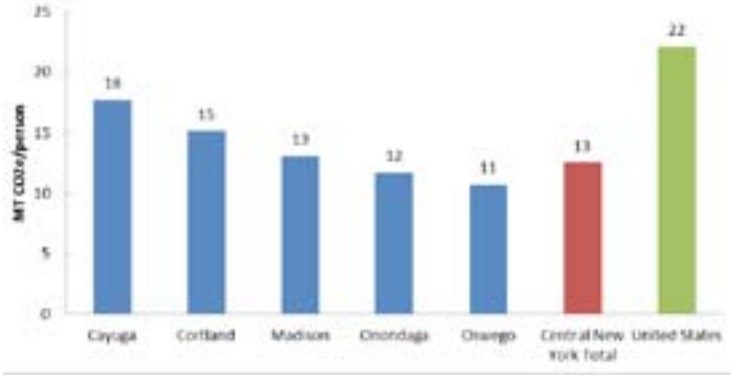
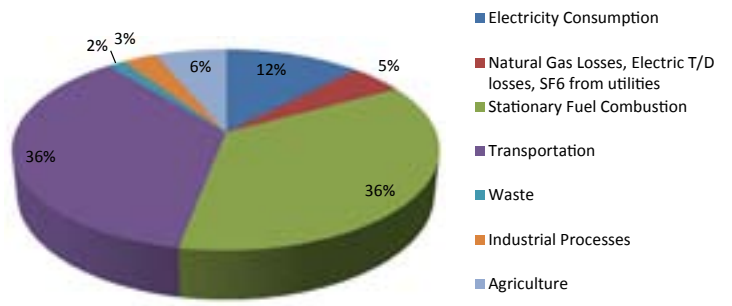


FIGURE 29–Total Emissions by Sector (excluding LULUCF) (in $MTCO_2e$)



gional inventory analysis. Additionally, reporting follows a similar paradigm used in the United States National Inventory Report and Intergovernmental Panel on Climate Change standards to ensure consistency. Sectors analyzed include energy generation, residential, commercial and industrial energy use, solid waste, agriculture, on-road transportation, non-road transportation, land use and forestry, industrial processes, and wastewater treatment.

Results

Central New York emissions comprise 4% of New York State totals (254 million $MTCO_2e$ in 2008). Considered in aggregate, the region's emissions total 9.9 million metric tons of CO_2e ($MMTCO_2e$). This total does not take into account carbon sinks, such as forests, which store and capture carbon so that it is not released into the atmosphere (see Appendix II, Section A for additional regional GHG inventory information). The per capita emissions for the region are 13 $MTCO_2e$ per resident. Transportation sources, such as gasoline used by passenger vehicles, are the largest sources of emissions in Central New York, at 43% of the region's carbon footprint. Stationary fuel combustion from sources such as residential heating fuel follows at 27% of the region's carbon footprint (Figure 28 and Figure 29).

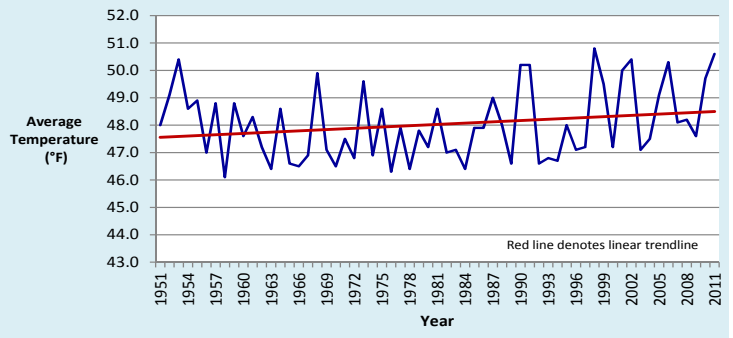
The Central New York gross regional product (GRP) totaled over $31 billion in 2010. Emissions per dollar of GRP are approximately 0.0003 $MTCO_2e$. Emissions are forecasted to grow 19% across these sectors by 2030. The transportation sector is the primary source of projected emissions growth over the next eighteen years. As part of the baseline for assessing climate change impacts, the regional GHG inventory provides analysis that will aid communities in targeting specific sectors for climate action and adaptation planning processes.

(b) Temperature

New York's climate is in the process of changing and data shows evidence of warming temperatures, especially during the winter months. The average annual temperature is 47.4° F but since 1970, average temperatures throughout the state have increased by approximately 0.6° F per decade. Winter warming has increased by over 1.1° F per decade. The state has also experienced more frequent days with temperatures above 90° F.[30]

The first half of 2012 had the warmest temperatures in 118 years of record-keeping. Temperature anomalies for July show that twenty first century temperature increases are already in the top 10 readings on record. In Syracuse, summer temperatures reached record highs. 101° F was recorded on July 17 while the normal for that time period is 79° F. In 2012, Syracuse had the fourth warmest June to August period out of the 111 years of record-keeping. The average temperature was 72.7° F, which is 3.4° F above the 30-year normal. Temperature trends are evident when viewing the average air temperature recorded between 1951 and 2011 at the Hancock Airport Weather Station in Syracuse (Figure 30). According to modeling estimates, temperatures in New York State are expected to increase by 1.5° to 3°F by the 2020s, 3° to 5.5°F by the 2050s, and 4° to 9°F by the 2080s. The warming trend is expected to impact all sectors of so-

FIGURE 30–Change in Temperature Syracuse New York, 1951-2011



ciety and all regions of the State. Risks associated with temperature increases in Central New York include a greater frequency of intense heat waves, increased likelihood of summer droughts, and periods of extreme rainfall that will likely affect food production, natural ecosystems, and water resources.

Winter weather conditions in Central New York could be influenced by climate change as well as the presence of an El Niño or La Niña. El Niño, part of the El Niño Southern Oscillation (ENSO), refers to a fluctuation in sea-surface temperatures over the tropical Pacific Ocean which causes the water to be warmer than average. During the La Niña phase, like the past two winters, water is colder than average over the same area. Both phases of ENSO can have profound effects on weather patterns in this region and around the globe. The relative strength of El Niño will also influence the amount of snowfall for the northeast. A weak system will produce above normal snowfall and a strong system will produce snowfall levels below average.[31]

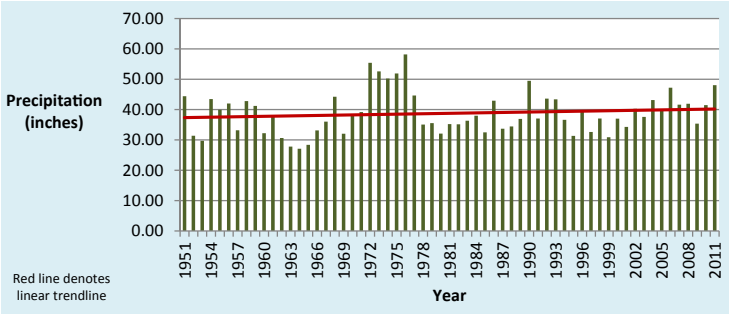
(c) Precipitation

New York has a temperate climate with annual precipitation of 47" per year. Precipitation rates are normally sufficient in Central New York to maintain municipal and industrial water supplies, transportation and recreation resources, and provide enough moisture during the growing season for agricultural crops, lawns, gardens, shrubs, forests, and woodlands. The average annual precipitation in New York State, however, has been increasing in both intensity and annual totals.

Precipitation in Central New York is impacted by cyclonic storms which pass from the interior of the country through the St. Lawrence Valley. Lake Ontario also provides a source of significant winter precipitation in the form of "lake-effect" snow. The precipitation rate averages approximately three inches per month throughout the year. Snowfall is moderately heavy with an annual average just over 100 inches. There are about 30 days per year with thunderstorms, mostly during the warmer months. Annual precipitation totals for Syracuse New York are presented in Figure 31.

Intense precipitation events, characterized by heavy downpours, have increased in New York State in recent decades. Central New York has recorded an increase in heavy precipitation, more winter precipitation falling as rain, reduced snowpack and earlier spring snowmelt resulting in earlier peak river flows. Projections for future precipitation rates are less certain, however, than projections for temperature. ClimAID analyses for New York suggest that precipitation levels may increase, especially during the winter months, but the nature of this change is unclear.

FIGURE 31–Change in Precipitation Syracuse New York, 1951-2011



Drought

Severe drought conditions in Central New York are rare but dry periods occasionally occur, resulting in declining water supplies and



Flooded road in Oswego County, 2010
(photo credit: Gary Walts, The Post-Standard)

low soil moisture for field crops and other vegetation. The last major drought in the region occurred in 1999 and it lasted for four months. A very dry spring and summer caused major crop failures and some wells ran dry. Many streams and rivers were also brought to their lowest recorded levels. In 2012, Syracuse experienced its 9th driest summer with only 6.39 inches of rainfall. This is 4.27 inches below the 30-year normal.

Flooding

Flooding and extreme precipitation events in Central New York threaten public health and safety by contaminating drinking water, threatening food and water supplies, weakening infrastructure and promoting insect-borne diseases. Flooding is normally influenced by a combination of climate and topographic characteristics. The greatest potential for flooding in Central New York is typically seen during the early spring when heavy precipitation, warming temperatures, and rapid snowmelt produce heavy flows and high tributary runoff rates. Conditions can be further exacerbated by ice jams, saturated soils, beaver dams, clogged storm sewers, and dam failures.

Significant flooding in Central New York is more common in the municipalities that are located within the Erie Ontario Lowlands, a region characterized by flat terrain and high groundwater levels. Municipalities in this region include the towns of Sullivan, Lenox, the Cities of Oneida and Syracuse, and the villages of Chittenango and Canastota, among others. During periods of heavy runoff and high flow rates, large quantities of water flow down the tributaries and often cause erosion. Flooding occurs when these waters reach the lowland region. Flood waters often contain large quantities of sediment and transport tree limbs and other debris that cause logjams.

FEMA Flood Zones

The Federal Emergency Management Agency (FEMA) is conducting a nationwide effort to update its flood insurance maps. In Central New York, re-delineation of flood boundaries has resulted in many new properties requiring flood insurance and significant changes for local residents that will need new or upgraded flood insurance policies. Several local, state and federal officials within Central New York have raised issues with the FEMA mapping process, which has caused a delay in final decisions regarding flood maps for areas in Onondaga County.

Community Rating System (CRS)

The Community Rating System (CRS) is a voluntary program for communities that participate in the National Flood Insurance Program (NFIP). The program is designed to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management. CRS credits are awarded for floodplain management activities. Flood insurance premium discounts are also awarded as a way to promote flood hazard awareness and mitigation while strengthening floodplain management strategies. CRS premium discounts are offered as incentives for communities to go beyond the minimum floodplain management requirements and to develop extra measures to protect areas from flooding. Twenty-nine communities in New York State are participating in CRS. The City of Syracuse (Onondaga County) and the Village of Moravia (Cayuga County) are the only municipalities in Central New York that participate.

Water infrastructure

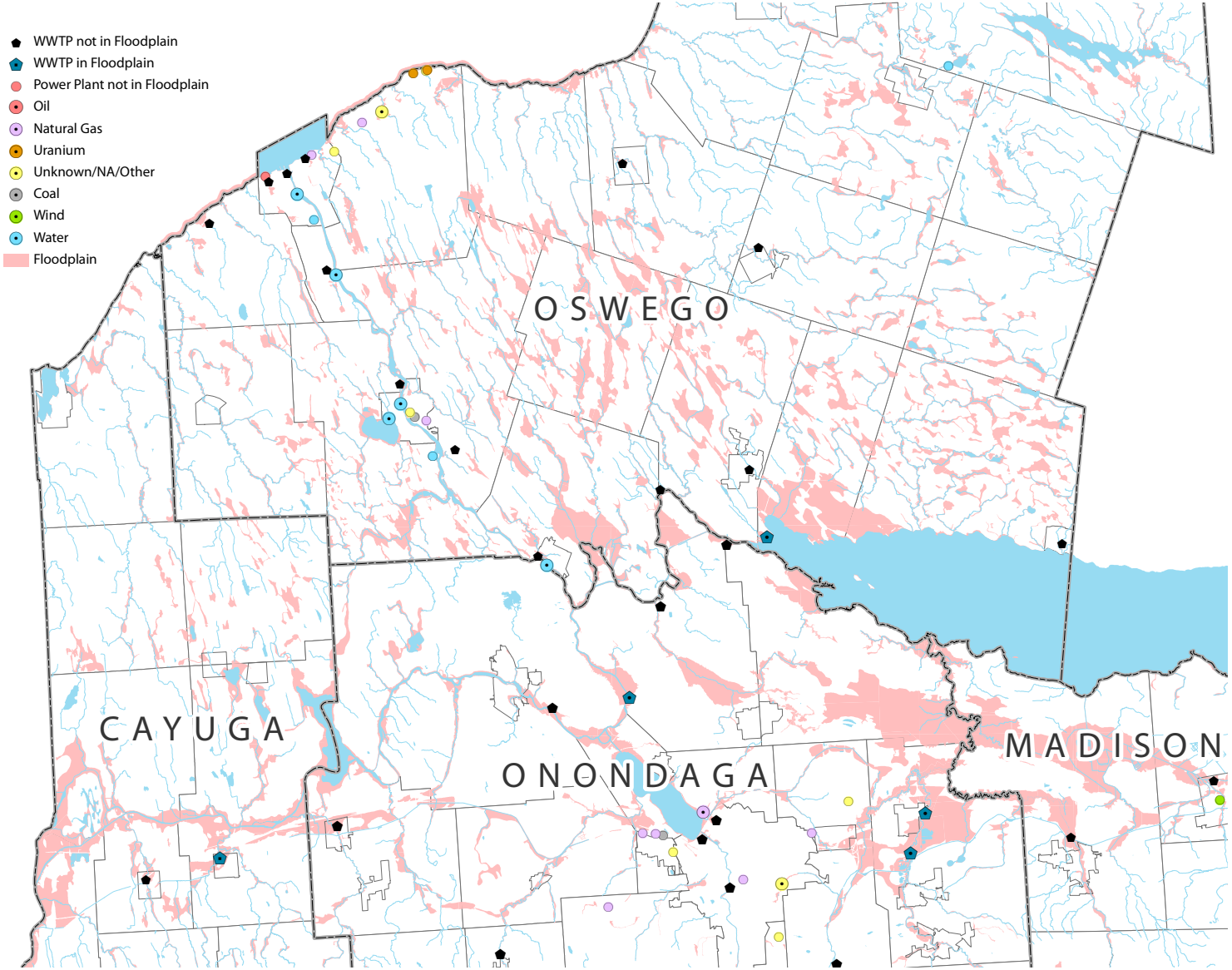
Wastewater and water delivery infrastructure is also vulnerable to the impacts of climate change. New York has more than 600 wastewater treatment plants serving over 15 million people, and more than 30% of the state's treatment facilities and systems are over 60 years old.[32]

TABLE 73—Wastewater Treatment and Power Generation facilities located in FEMA floodplane in Central New York

County	Number of Wastewater Treatment Plants Located in the Floodplain	Number of Power Plants Located in the Floodplain
Cayuga	3	0
Cortland	0	0
Madison	1	0
Onondaga	4	3
Oswego	1	5

MAP 30– Infrastructure situated in areas of flooding vulnerability in Central New York

The map to the right depicts FEMA flood zones in relation to treatment plants and power plants. Infrastructure that is situated in areas where flooding is likely to occur is a priority climate vulnerability in Central New York. Water supply and wastewater treatment systems throughout Central New York are expected to be impacted by climate change especially with increased flooding in low lying and flood-prone areas (Table 73).



Under strict water pollution standards, infrastructure improvements have been made statewide; however, older systems, such as CSOs, present an ongoing risk in the event of climate change impacts, such as flooding or heavy precipitation events.

Infrastructure that is situated in areas where flooding is likely to occur is a priority climate vulnerability in Central New York. Water supply and wastewater treatment systems throughout Central New York are expected to be impacted by climate change especially with increased flooding in low lying and flood-prone areas (Table 73). The map in Map 30 shows FEMA flood zones in relation to treatment plants and power plants. The potential for increased frequency of flooding events throughout the region emphasizes the need for community leaders to consider alternative flood policies and future land use and development trends.

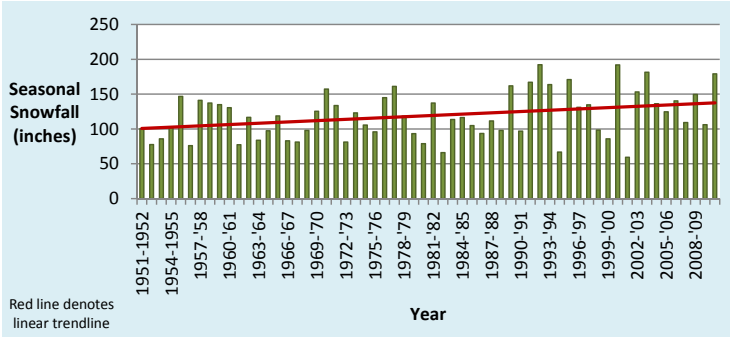
Snow Cover

Since the 1920s, Northern Hemisphere snow cover has steadily declined, despite increased precipitation. According to the National Research Council, between 1966 and 2005, the total area of Northern Hemisphere snow cover shrank by approximately 1.4% per decade. Snowfall deficits for Syracuse in relation to other cities throughout the United States are displayed in Table 74.

TABLE 74—Biggest U.S. snowfall deficits for the winter of 2011–2012

Location	Departure from average through Feb 1, 2012	Snowfall through February 1	Average entire season
Syracuse, NY	-45.8"	31.8"	116"
Buffalo, NY	-37.6"	24.6"	94"
Duluth, MN	-36.7"	16.9"	81"
Rochester, NY	-33.1"	16.7"	92"
Sault Ste, Marie, MI	-31.9"	54.3"	117"
Erie, PA	-29.9"	36.5"	89"
Williston, ND	-26.9"	1.8"	42"
Muskegon, MI	-24.5"	39.5"	96"
Marquette, MI	-24.0"	93.9"	141"
Bismarck, ND	-23.8"	5.9"	44"

FIGURE 32—Change in Seasonal Snowfall in Syracuse, NY 1951–2009



Topography, elevation, and proximity to Lake Ontario influence the amount of snowfall throughout Central New York. The depth of snow cover is presented in Figure 32.

The long term trend for the past sixty years shows increasing snowfall for the Syracuse region, but a decreasing trend is apparent from 2003 to 2009. If snow cover continues to decrease in Central New York, soil temperature and depth of freezing will be impacted. Additionally secondary effects on root biology, soil microbial activity, nutrient retention, and the overwintering capacity of insects, seeds, and pathogens could have far-reaching consequences.

"Lake-effect snow" is a term that refers to snow that falls near a large lake at a high rate per hour. It forms when cold air masses move over a large lake with warmer water temperatures. When the bottom layer of air is warmed by the lake water, moisture from the lake evaporates into the cold air. The moisture rises, then cools and condenses, forming clouds, and producing snow. Lake-effect clouds often form in narrow bands. The size and direction of these bands and the resulting rate of snow fall changes depending on the shape of the body of water, the temperature differential, and the prevailing wind direction and speed.

FIGURE 33–Variation in Syracuse Annual Snowfall



Source: David Eichorn

Due to the proximity to Lake Ontario, all counties in Central New York are susceptible to lake-effect snowfall but Oswego County, located in the Tug Hill region, is especially vulnerable because of its position in relation to the prevailing westerly winds. The area is recognized as having a short growing season and as being one of the wettest and snowiest areas of New York State.[33] The large amount of snowfall throughout the Tug Hill region each winter impacts flood events in the spring when the snow melts.

Variability

Rather than simply focusing on the annual totals in temperature or precipitation, it is important to consider the variation in these totals over time. Snowfall totals, for example, for the Syracuse area show increasing variation (Figure 33). The graph shows that the distance between the red trend line and the data points connecting the blue line grow increasingly farther apart from 1990-2012. This indicates that the disparity in annual snowfall totals from year to year, and over specific periods, is growing larger now than in the recent past (since the 1950s).[34] Increased variation in snow and precipitation levels are monitored because of their effect on ecosystems, agriculture and recreation. Cornell University cites the potential for "changing precipitation patterns" corresponding to increasing winter precipitation and decreased summer precipitation as a result of climate change in New York State.[35] These impacts have the potential to contribute to drought, flooding and changes in stream flow patterns. The combination of changing rates of precipitation, combined with changing precipitation totals will be an important consideration in building the adaptation capacity of Central New York communities.

(d) Water Resources

Across the state, water quality and quantity comprise areas of vulnerability to climate change. The potential impacts include increases in heavy downpours and localized flash flooding; increases in frequency and length of dry periods in the summer which could lead to water shortages and conflicts; and impacts from increased temperatures on water ecosystems.[36] Heavy precipitation rates increase in stormwater runoff with impacts on wastewater treatment plants and pollutant loading to water resources. Lower tributary flow rates and water levels in lakes, rivers and streams could cause a shift in aquatic species composition and a reduced capacity of tributaries to assimilate effluent from wastewater treatment plants.[32] The frequency of downpours has also increased over the past fifty years and this trend is expected to continue. Warmer air temperatures are expected to continue with impacts on the water cycle. This will have consequences for water temperatures in lakes and streams, and changes are anticipated with the quantity and timing of snowfall, rainfall, and evaporation. The warmer temperatures are extending the summer recreation season in Central New York, resulting in more time for people to enjoy fishing, boating, and other outdoor opportunities and contributing to economic benefits for the recreation industry.

Nearly all studies that analyzed data from the Northeastern United States have estimated that annual stream flow should show primarily temporal change as a result of climate impacts such as precipitation variation. Additionally, these studies project increased late winter and spring flows and a shift in the timing of spring snowmelt. This means that even if there is more annual stream flow, it may be distributed unevenly over the year with lower flows in the late summer and autumn and higher flows in the late winter and spring. This temporal shift in flow rates has already been observed in stream records.[37]

Lakes can potentially serve as efficient barometers of environmental trends because they respond rapidly to physical and biological changes. Since Central New York has experienced a gradual increase in air temperature, lake data has been analyzed to determine the presence of corresponding increases in water temperature. Lake temperature trends are significant because higher water temperature affects lake fisheries and overall biological productivity. Higher air and water temperature normally contributes to increasing algae production and decreasing dissolved oxygen concentrations. These conditions can then accelerate the biological stress on lake organisms.[38] The following section presents information on water temperature from lakes located throughout CNY.

Lake Ontario

Year-round temperatures in Central New York communities are moderated by the influence of Lake Ontario. A long-term warming trend has been recorded throughout the Great Lakes in recent years. According to the Great Lakes Environmental Research Laboratory (GLERL), there is also a long-term downward trend in Great Lakes wintertime ice cover, although there is considerable year-to-year variability. According to GLERL data, Lake Ontario has been running at or above normal temperatures during the past six years but temperatures are not at unprecedented levels. Limnologists predict that if the Great Lakes continue with record warm temperatures, the region could experience above-average lake-effect snowfall.[39]

The water budget of Lake Ontario and the other Great Lakes will continue to be influenced by regional warming trends, with direct implications for drainage basin runoff rates, direct precipitation onto the lakes, and evaporation from the lake surfaces. Central New York is frequently impacted by storm and frontal systems moving eastward across the continental United States. Winter temperatures are moderated considerably by Lake Ontario, and areas in Oswego County are often faced with higher snow fall due to lake-effect snow. The moderating effect of Lake Ontario on temperatures is especially important during the spring and fall. The lake waters warm slowly in the spring, which reduces the warming of the atmosphere over adjacent land areas. Plant growth is impacted by this process and a variety of freeze-sensitive crops, namely tree and vine fruits, benefit from these conditions. In the fall, the lake water cools at a slower rate than the surrounding land areas and serves as an extended source of heat. The cooling of the atmosphere at night is moderated or reduced, the occurrence of freezing temperatures is delayed, and the growing season is lengthened for freeze-sensitive crops and vegetables.[40]

Citizens Statewide Lake Assessment Program

The Citizens Statewide Lake Assessment Program (CSLAP) is a lake monitoring and education program administered by the NYSDEC and New York State Federation of Lake Associations. Since 1985 the program has provided dependable water quality and physical data from over 240 lakes, ponds, and reservoirs throughout New York State. Based on current monitoring data, it is not clear if there is a direct correlation between water temperature and climate change in Central New York during the time frame evaluated through CSLAP. Thirty-six lakes in the CSLAP's Central Region were sampled between 1986 and 2009. Data shows that the frequency of higher water temperatures has increased, but most lakes have not exhibited any definitive long-term warming trends. The CSLAP summary for this time period indicates that:

> Since 1986, the frequency of higher than normal air and water temperatures has increased, and the frequency of lower than normal temperatures has decreased. This may be the strongest signal in the CSLAP dataset that global climate change has affected Central region lakes, although these trends are not statistically strong[41]

Twenty eight CSLAP lakes are located in the five-county Central New York region but of this total, only 18 have been sampled long enough to evaluate temperature trends. As of 2011, only DeRuyter Reservoir (Madison County) had exhibited an increasing water temperature trend (correlation coefficient > 0.5 and P value < 0.02) and three lakes—Duck (Cayuga County), Melody (Cortland County), and Craine (Madison County)—showed slightly increasing water temperature trends (correlation coefficient > 0.33 and P value < 0.05). The remaining 14 lakes showed no discernible water temperature trends. In future sampling seasons, CSLAP will continue to evaluate global climate change in New York state lakes through the collection and analysis of surface and hypolimnetic (lake bottom) temperatures and through an evaluation of ice-in and ice-out dates.

Onondaga Lake Water Temperature

Onondaga Lake water temperature data provided by the Onondaga County Department of Water Environment Protection was analyzed to evaluate potential impacts from climate change. Maximum, minimum, and average water temperatures were collected during a 27-year period (1985 to 2011) from a depth of less than 6 m. The data was then plotted on three separate graphs to show summer (May to September), winter (October to April), and 12-month averages. Water temperatures exhibited minimal variation on all three graphs and no clear trends could be established.

Oneida Lake Water Temperature

Scientists at the Cornell University Biological Field Station (CUBFS) have documented an increasing trend in Oneida Lake water temperature during the summer months. Researchers routinely measure lake water temperature on a weekly or daily basis at various depths and locations. Data shows that June to August temperatures have increased significantly since 1975. The total increase in the 36 years from 1975 to 2011 is 1.6° C (or 2.9° F).[42] Temperature measurements collected from 1968 to 2005 showed similar increases at 10 m depths.[43]

In addition to air temperature, zebra mussels may have a minor influence on lake water temperature in Oneida Lake. Since the first observation of zebra mussels in Oneida Lake in 1991, the filter feeding bivalves have caused a decrease in algae concentrations in the water column which allows for increased light penetration to lower lake depths. Increased light penetration promotes the growth of aquatic vegetation, increases bottom-dwelling algae mats, and may also increase lake water temperatures.[44] While zebra mussels may have a more significant impact on deeper lakes, research indicates that the increase in water clarity associated with the zebra mussel populations has only minor effects on the hydrodynamics of Oneida Lake.[41]

(e) Fisheries

Oneida Lake fisheries data has been collected by the CUBFS since the mid-1950s. Their research provides an important assessment of the walleye and yellow perch fisheries, while documenting valuable insights into the response of lake ecosystems to issues such as exotic species and climate change. According to researchers, warming water temperatures may be contributing to fish community changes such as increased populations of largemouth and smallmouth bass, gizzard shad, and other species near the northern extent of their range. Additionally, at the southern edge of their range, Burbot may be in decline.[45] The lake water warming trend is also thought to have caused the elimination of cisco, a cold-water relative of the whitefish. Elsewhere, brook trout, commonly found in New York State tributaries, are at risk due to changes in habitat resulting from climate change and the presence of invasive species. Brook trout are expected to become increasingly vulnerable as water and air temperatures rise.

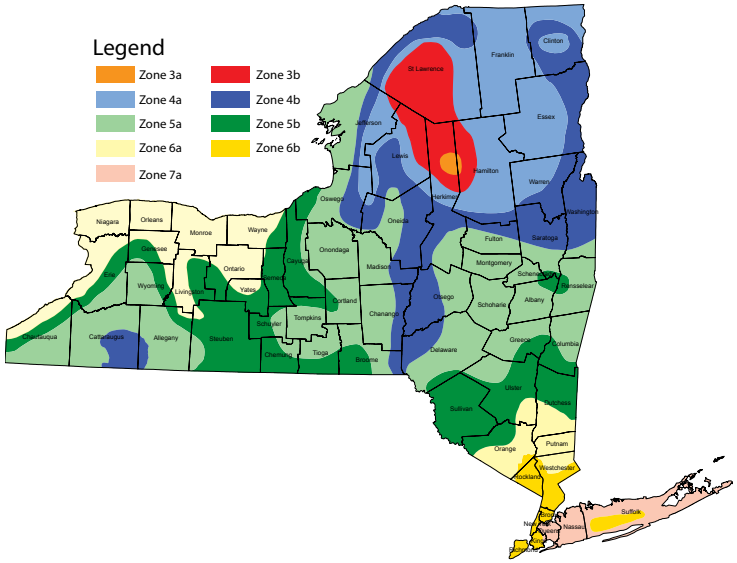
(f) Ice Cover

Ice cover can be an additional way to observe the impacts of climate change. Researchers at the CUBFS routinely monitor physical characteristics and chemical parameters on Oneida Lake while taking a special interest in the impacts of climate warming. Their data indicates that water temperature and ice duration trends reflect warmer conditions.[46]

CUBFS research shows that ice cover on Oneida Lake has lasted for shorter periods of time in recent decades. Ice formation usually begins in December and complete ice cover occurs in late December or January. For the first time in recorded history, complete and sustained ice cover did not occur during the winter of 2002. Records of ice break-up (ice-out dates) are available from the Oneida Fish Culture Station in Constantia, CUBFS, and various diaries compiled back to 1826. The ice-out date has decreased by eleven days during this time period. CUBFS data shows that ice duration was, on average, about one month shorter in 2012 than in 1975.[47] Ice duration for the winter of 2011-2012 was only 25 days, the shortest recorded since 1975. The annual number of days of ice cover is expected to be reduced by 39% to 86% over the coming century, while inter-annual variation in ice cover duration will increase.[48]

Ice thickness is an additional indicator of warming trends. According to the CUBFS, ice thickness reached as much as 120 cm in the mid to late 1970s, and within the last decade, maximum ice thickness has averaged about 31 to 36 cm. Winter ice fishing is also impacted by warming trends. Anglers regularly drilled through over two feet of ice thirty years ago, but now twelve to fifteen inches is more common.[46]

MAP 31–USDA Hardiness Zones



Source: U.S.D.A.

People are less likely to fish during the winter months unless the ice cover is solid. As a result, local businesses have experienced declining revenues during the winter months.

(g) Plant Hardiness Zones

In January 2012, the United States Department of Agriculture issued its new Plant Hardiness Zone Map (Map 31). This resource serves as a valuable tool for gardeners, farmers, researchers and policy makers. The map was changed in part to reflect shifting climate patterns across the United States.[49] This is the first revision of the hardiness zones since 1990. The new map shows how the average temperature bands have moved slowly upward over the last 20 years. The new map is approximately one 5° F half zone warmer than the previous map throughout much of the United States.[50]

The map updates were made using more sophisticated and fuller data collection. With new technology, maps are now developed to assess the effects of elevation, prevailing winds, bodies of water, and urban heat islands. Although climate is a complicated and multifaceted function, this clear trend toward warming temperatures is an additional indication of a changing climate. Syracuse and most of Central New York moved from zone 5a to zone 5b, an indication that winter temperatures are warmer than they used to be. Parts of Oswego and Auburn moved from zone 5b to the warmer 6a zone.

(h) Storm Event Frequency

Storm intensity is influenced by air temperatures. As air temperature rises, the moisture in the atmosphere increases which contributes to a greater intensity and frequency of precipitation events. Warming air temperatures are caused by emissions of heat-trapping gasses in the atmosphere including pollution from fossil fuels. Warm temperatures in the atmosphere cause higher levels of evaporation which intensifies the water cycle. As a result, precipitation events are more intense and result in higher levels of rainfall. Over 80 million daily precipitation records from 1948-2011 have been analyzed for the United States, producing the following findings:

+ Extreme downpours—rainstorms and snow falls are now happening 30% more often on average across the contiguous United States than in 1948.

+ New England has experienced the greatest change with intense rainstorms, now happening 85% more often than in 1948.

+ Not only are extreme downpours more frequent, but they are more intense. The total amount of precipitation produced by the largest storm in each year at each station increased by 10% over the period of analysis, on average across the contiguous United States. [51]

New York State experienced a 64% increase in extreme precipitation frequency from 1948-2011.82 On average, storms that used to occur every 12 months now occur every 7.7 months in the mid-Atlantic region, and from 1948-2011, the largest annual storm precipitation measured by weather stations across New York increased by 25%.[52] According to meteorologists, the total annual amount of precipitation has been changing, as well as the distribution and intensity. As an example, Tropical Storm Lee resulted in significant damage for Central New York. In May 2011, Governor Cuomo formally requested that

President Obama declare a major federal disaster for 26 counties in New York State, including Cayuga, Madison, and Onondaga counties. FEMA estimated more than $38 million in infrastructure repair and debris removal.

(i) Air Quality

Air quality is a concern for New York State. The increasing presence of air pollutants over the last century has been stemmed by regulation under the Clean Air Act and the increasing efficacy of pollution control equipment. However, the factors that contribute to climate change, namely greenhouse gas emissions and temperature increases, continue to adversely affect air quality.

New York has several counties that fluctuate in attainment status for certain criteria air pollutants (e.g., nitrogen dioxide, ozone, carbon monoxide, particulate matter, sulfur dioxide, and lead).[53] The pollutants that the state is currently mandated to address under non-attainment regulations are ozone and particulate matter (under 2.5 micrometers). Given that various sectors and processes emit criteria air pollutants, coordination among decision-makers to improve air quality is required. Ozone levels, for example, can have an adverse effect on human health, ecosystems and agriculture. High concentrations irritate nasal, throat and bronchial tissues and the pollutants attack certain components of the body's defense system. High concentrations of ozone can also harm forests (thereby altering wildlife habitats), reduce crop yields, and damage materials such as rubber, plastics, synthetic fibers, dyes and paints.[54]

(j) Forest Ecosystems

Climate change is likely to have substantial effects on the composition and function of New York State forest ecosystems.[55] Changes in forest composition as a result of increasing temperatures may pose an additional threat to animal species already identified as endangered, threatened, or of special concern to the state.[56] Forests may also experience an increase in insect populations due to climate change because the longer, warmer growing seasons provide an opportunity for additional insect generations per year, while allowing insects to migrate farther north of their normal range. In addition, climate change affects trees through drought stress, which reduces their ability to resist insect infestations.

In the eastern United States, invasive insects combine with air pollutants to amplify increasing climate stresses on forests. Ground level ozone reduces or eliminates growth advantages by added warmth and atmospheric CO_2. Acid rain continues to reduce forest tree growth while nitrate deposition saturates forests, reduces growth, and contributes to pollution of streams and estuaries. As a result, the health of older trees and seedlings is vulnerable to climate extremes.[57] Additionally, in Central New York, temperatures may eventually become too warm for species such as sugar maple trees. The maple syrup season has decreased by 2 to 4 days in the past thirty years.[58]

(k) Invasive Species

Climate change is influencing the rate and extent of invasive species in Central New York. Hydrilla, an aquatic plant that was recently identified in the Cayuga Lake inlet, is an example of the northward spread of invasive plants that once preferred warmer temperatures to our south. More invasive pests will arrive as the temperature becomes warmer and some will likely move farther north if they cannot survive higher temperatures. Plant and animal species that are stressed by climate change are more susceptible to invasive pests and pathogens.

Climate change in New York State is influencing the loss of hemlock forests which are currently threatened by an invasive insect called the woolly adelgid.[59] NYSDEC officials predict that warming trends could make it easier for the insect to continue its northward spread.[60] The hemlock woolly adelgid (HWA) is an aphid-like insect that feeds on hemlock trees by extracting nutrients from the needles. Trees become badly damaged and often die after several years. The HWA was first discovered in New York State in the early 1980s and infestations are now found in 25 counties. In Central New York and other areas, the concern is that this infestation will have cascading, far-reaching effects on a variety of wildlife species and their ecosystems.

Eastern hemlocks provide a unique and essential role in the forest ecosystem by creating a damp and shaded microclimate that supports plant communities. The trees maintain cool stream water temperatures for fish and stream salamanders and provide important winter habitat

and food for wildlife. Declines in hemlock from HWA can result in the loss of unique plant and animal populations and drastic changes to ecosystem processes. Brook trout, commonly found in New York State tributaries, are especially at risk because they rely on Hemlock forests to provide cold water and shade necessary for their survival. In addition, the loss of hemlock forests would cause more sunlight to penetrate to the forest floor, warmer soil and water temperatures, and an increase in the number of invasive plants that normally do not exist in the cooler, shady conditions found under a healthy hemlock forest. Continued monitoring is needed, along with the development of indicators to mark the extent of invasive species movement and the ability to provide a rapid response to new infestations.

(l) Energy

Potential statewide climate change impacts related to the energy sector include increases in peak demand loads for cooling as the occurrence of heat waves increases; temperature increases reduce the efficiency of power plants due to decreased cooling capacity; hydropower plants are impacted by drought conditions resulting from decreased precipitation; transformers and distribution lines are affected by extreme weather events; and biomass availability is affected by weather conditions during the growing season.[61]

Heating and cooling degree days are indicators of temperature increase or decrease over an annual time frame but these measures are also indicative of energy use, given that heating degree days often correlate with natural gas used for heating, and cooling degree days correlate with electricity used for cooling. Table 75 illustrates a statewide warming trend, the increased demand for electricity for cooling, and the decreased demand for heating.

TABLE 75–New York State HDDs and CDDs from 2000-2010

Year	HDDs	CDDs
2000-2001	6,028	502
2009-2010	5,495	944
% difference	9% decline	88% increase

Note: Heating Degree Days (HDD), Cooling Degree Days (CDD)
Table Data Source: NOAA

There are secondary impacts on the energy sector that might also result from climate change, such as supply and availability of natural gas and electricity markets, which in turn will affect energy prices. For example, the vulnerability of transmission infrastructure and shifting investor confidence combined with changing insurance pricing strategies will likely shift utility cost burdens onto consumers in the form of higher energy prices.

(m) Agriculture

Dairy production is the largest component of New York State's agricultural sector and apples and grapes lead New York fruit crops in value. The agriculture sector encompasses more than 34,000 farms that contribute $4.5 billion annually to the state's economy.[62] Precipitation and temperature conditions in Central New York contribute to a diverse agricultural industry, especially field crops such as alfalfa, oats, and corn. The temperature buffering effect from Lake Ontario supports a productive fruit tree industry, especially apples and peaches.

Warming temperatures and increased atmospheric CO_2 are expected to have both positive and negative impacts on agriculture in Central New York. A longer growing season may provide economic benefits to the agricultural sector but may also require a shift to different crop varieties that are more tolerant to heat and drought conditions. There may also be decreased productivity of certain agricultural sectors such as dairy and grapes, resulting from heat stress and changes in frost or thaw cycles.[63] Increasing temperatures will also have an indirect influence on the rising cost of food.

A warming climate is changing the timing of spring planting. Plant growth characteristics are determined by temperature, sun, rainfall, and humidity. Plant bloom dates in the Northeast are now occurring approximately four to eight days earlier than in the 1960s. Across New York, the last frost is now eight days earlier than in the 1970s. By the end of the century, New York's growing season is projected to be four to six weeks longer. Longer growing seasons could potentially increase crop yield if precipitation and nutrient rates are sufficient. Some crops, however, may have yield or quality losses as a result of

summer drought, increased frequency of strong rainfall events, higher summer temperatures, inadequate winter chill period, increased risk of freeze due to variable winters, and increased insect, disease, and weed pressures. With increasing temperatures, milk production may decline for dairy herds exposed to prolonged heat stress. Expanded water management issues could develop due to changes in the frequency of flooding, drought, and other precipitation events. The extended growing season is also expected to increase the potential for weeds and insect pests which could lead to additional use of herbicides and pesticides.

(n) Public Health

Reduced air quality caused by increased emissions, smog, wildfires, pollens, and mold resulting from global warming processes is expected to contribute to increased respiratory-related illness throughout the state and Central New York region, and will contribute to potential increases in temperature-related deaths and vector-borne (e.g. carried by mosquitoes or other insects) diseases.[64] New York State had 20 heat-related deaths in 2011,[65] compared with just 10 in 2010.[66] This 50% increase across the state is reflected in the national increase of 206% from 2009-2010 (138 deaths up from 45).[67] In the absence of climate adaptation measures, there is increased likelihood of food and waterborne disease as well as an increased demand for health services. Reduced water quality will also create public health and economic challenges.[68] Asthma and cardiovascular disease, both prevalent in Central New York, and all New York State regions, are expected to increase as a result of climate impacts such as temperature change and reduced air quality due to higher pollen and mold levels.

A concern within Central New York communities is the growing population of mosquitoes which have the potential to spread diseases such as the West Nile Virus (WNV) and eastern equine encephalitis (EEE). The risk of human exposure to WNV and EEE is expected to rise with the increase in temperatures and moisture.[69] Warmer temperatures, longer summers, and mild winters make it possible for mosquito eggs to survive the winter and contribute to increasing populations.[70] Lyme disease is also expected to increase in Central New York. The disease is caused by the bacterium, Borrelia Burgdorferi, and is transmitted to humans through the bite of infected blacklegged ticks. The occurrence of Lyme disease in Central New York appears to be getting worse, and since 2008 the number of Lyme disease cases in Onondaga County alone has risen from 14 to more than 127 cases in 2011. Mild winters, a longer summer season, and higher deer densities are thought to be contributing factors that will potentially increase with climate change.[71]

(o) Hazard Mitigation Planning in Central New York

Hazard mitigation refers to activities that reduce loss of life and property by lessening the impacts of natural, technological and man-made disasters. It is often considered to be the first of the four phases of emergency management which include mitigation, preparedness, response and recovery. Proactive mitigation leads to more cost-effective projects, while reactive mitigation tends to lead to severe damage repair and often more costly fixes.

The Disaster Mitigation Act of 2000 is federal legislation that requires state and local governments to prepare local plans that will evaluate natural hazards and the strategies to mitigate them. Disaster mitiga-

TABLE 76–Status of mitigation plans in Central New York

County	Title	Date Complete
Cayuga	In progress	Cayuga County doesn't have a Hazard Mitigation Plan but a resolution was recently presented at the Judicial & Public Safety committee authorizing the County Planning and Emergency Services Department to accept a New York State Office of Emergency Management/FEMA grant to develop one. The County Emergency Management staff will be administrating the grant and Planning will be providing technical assistance. The Hazard Mitigation officer is housed in the Cayuga County Department of Planning and Economic Development. A Steering Committee has been developed and a kick-off meeting with the city, town, and village representatives was held on September 26th. Tetra Tech EM Inc. will coordinate the project.
Madison	Madison County Multi-Jurisdictional Hazard Mitigation Plan (2004)	Estimates are provided on the value of building inventories, transportation systems, and utilities. Hazards are described for floods, hurricanes, winter storms, transportation accidents, fires, ice storms, tornados, and ice jams. Extensive summaries are presented for each municipality with detailed plans for specific threats such as severe storms, dam failure, flooding, fire, and power failure. Hazards addressed in Madison County report include severe storms, transportation accidents, winter storms, fires, ice storms, floods, hurricanes, tornados, ice jams, infestation, extreme temperatures, epidemics (human and animal), droughts, earthquakes, dam/ levee failure, and wildfire. Comprehensive information about flood prone areas is included.
Onondaga	Onondaga County Multi-Jurisdictional Hazard Mitigation Plan (2010 with 2011 revisions)	Onondaga County's comprehensive plan includes detailed information for each municipality on the governing body, growth and development trends, comprehensive plans, natural hazard event history, legal and regulatory capabilities, and fiscal capability. The plan includes the identification and prioritization of hazard mitigation initiatives including everything from retrofits to logjam removals. The plan will be updated within a 5-year cycle. Hazards addressed in Onondaga County report include severe storms, Severe winter storms, Floods, Ground failure (landslides, subsidence), Earthquake, Drought, Extreme temperatures, Floods, Hail, Hurricane, Ice jams, Infestation , Wild fire, Windstorms
Oswego	Multi-Jurisdictional Hazardous Mitigation Plan (updated 2012)	Oswego County received national recognition as being a "Storm Ready Community". The county office works closely with New York State, the National Weather Service, and the local public safety community to improve the county's readiness to respond to potentially dangerous weather situations. Hazards addressed in the Oswego County report include: severe storm, ice storm, earthquake, tornado, flood, wildfire, winter storm (severe), ice jams, coastal storm, extreme temperature, landslide, drought, terrorism, dam failure, fire, epidemic, hazmat, and radiological emergencies. The County has a 10-mile Emergency Preparedness Zone around their three nuclear power plants and developed a Radiological Emergency Preparedness Plan (current as of March 2011) in the event of nuclear emergencies. The County reviews, revises, and exercises the emergency preparedness plan on an annual basis with representatives of the nuclear industry and New York State.
Cortland	Cortland County Hazardous Mitigation Plan (1012)	Hazards addressed in the Cortland County report include severe storms, floods, and earthquakes. Information is also included on mitigation strategies and plan maintenance procedures. The Cortland Hazard Mitigation Plan was adopted by FEMA in July 2011 and was approved by 19 municipalities in February 2012 but this information is not yet available on the county website.

tion planning in Central New York, an important step in creating more resilient communities, includes measures to adapt to climate-related impacts. Continued development and public availability of hazard mitigation plans is critically important in order to strengthen the ability of local communities to respond to natural disasters in an efficient and immediate manner. Table 76 shows the status of mitigation plans in Central New York.

B. SUSTAINABLE FUTURE IN CENTRAL NEW YORK

1. Goal and Targets

The cause and effects associated with climate change is a growing priority with no simple solutions. One of the objectives in presenting information in this chapter was to provide science, not speculation, with a comprehensive analysis of long-term trends. The review of climate trends involved an analysis of basic scientific evidence, as well as policy actions taken to address it. The primary issue associated with climate variability is not only documentation that changes are taking place, but the rate at which change has occurred over the last century, as well as the contributions made by human activity. Unprecedented rates of climate change are taking place at the global, national, state, and local levels, as documented by increasing temperatures and changing precipitation patterns that are associated with increased flooding frequency, more summer droughts, and heat waves. The associated impact of climate change is creating added stress on infrastructure, agricultural crop and livestock management, land use, and human health.

Global warming has resulted in an average temperature rise of 1.1° F in the past three decades and 1.4° F in the past century. Temperature projections include a 0.4° F warming trend over each decade for the next two decades. As with global data, documentation of climate change in Central New York is an evolving science but an analysis of long-term trends shows clear evidence of a changing climate with secondary impacts observed in lake water temperature and fish populations. Central New York data was compiled for air temperature, lake water temperature, precipitation rates, snowfall totals, and storm event frequency. Over the past 60 years, temperature in the region has increased slightly and annual precipitation rates have increased by approximately 2.8 inches. Heavy precipitation events are also increasing in New York, with a 64% increase in extreme precipitation frequency from 1948-2011. The collection of these primary datasets led to further analysis of secondary impacts. An investigation of increasing water temperatures in Oneida Lake, for example, led to further analysis of the impacts on fisheries, as provided by the Cornell Biological Field Station.

Central New York climate data emphasizes the immediate need to address remedial action at the local level in a similar fashion to actions currently being implemented at the state and national levels.

Heat waves are expected to become more frequent and longer in duration and increasing water temperatures will have consequences for aquatic ecology in local lakes and streams. Increasing air temperatures will continue to impact the water cycle, with changes anticipated in the quantity and timing of snowfall, rainfall rates, and evaporation. This will impact the local economy, with changes anticipated for recreation, forestry, and agriculture.

New York, along with other states such as New Hampshire, Colorado, and Alaska, is taking a proactive response to climate adaptation planning. Individuals in the public and private sector, including stakeholders from state and local agencies, non-profit organizations, businesses, and citizens are taking actions to reduce the negative impacts of climate change. With the increasing prioritization of climate change preparedness, Central New York communities need a continued focus on aging infrastructure, plant and animal species modifications, agricultural adjustments to planting and harvesting strategies, and protection of human health due to decreasing air quality. There is a continuing need to address the potential for increased flooding through the implementation of green infrastructure measures, protection and expansion of wetland resources, and improved buffer zones around sensitive ecosystems.

Municipalities, businesses, colleges, and universities are currently tackling climate change preparedness through the initiation of greenhouse gas inventories, climate strategies, and emissions reductions. An additional priority for CNY is the continuation of climate monitoring and assessment to identify impacts to our natural resources, economy, human health, and social well-being. Although the effects of climate change are projected to continue, Central New York has the capacity

to address many climate-related risks now, thereby reducing negative impacts and taking advantage of potential opportunities.

Based upon public input and the information presented above, the planning team has established the following land use goal for Central New York:

GOAL: Adapt successfully to a changing climate and improve the resilience of the region's communities, infrastructure and natural systems.
To achieve this goal, the following targets have been established for Central New York:

1) Reduce per capita regional greenhouse gas emissions to 40% below 2010 levels by 2030.

Greenhouse gas emissions come from a variety of sources, from transportation to energy generation. A regional greenhouse gas inventory has been completed, and specific emission sources can be identified for reduction. The 2010 regional greenhouse gas emissions per capita were 12.51 $MTCO_2e$. The goal is to reduce this number to 40% below 2010 levels by 2030 (7.506 $MTCO_2e$).

Source: Central New York Regional Greenhouse Gas Inventory November 2012.

2) Increase the number of communities participating in the NFIP community rating system from 2 to 10.

The National Flood Insurance Program's (NFIP) Community Rating System is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions. Two communities in Central New York (City of Syracuse and the Village of Moravia) currently participate in the NFIRM Community Rating System. The target is to have ten communities participating by 2030.

Source: FEMA listing October 2012

3) Complete 25 community vulnerability assessments by 2030.

Community vulnerability assessments are undertaken to identify and quantify the risks faced by communities under increasing climate change impacts. The results of these assessments can then be included in the appropriate planning processes. Currently, no communities in Central New York have completed community vulnerability assessments. The target is to have 25 completed by 2030.

4) Increase the number of climate smart communities in CNY from 13 to 26 by 2020 and to 40 by 2030.

Climate Smart Communities (CSC) is a state-local partnership to reduce greenhouse gas emissions, save taxpayer dollars, and advance community goals for health and safety, economic vitality, energy independence, and quality of life. Municipalities join Climate Smart Communities by adopting the CSC pledge. There are currently 13 climate smart communities in CNY. The goal is to double the number of Climate Smart Communities in CNY, bringing the total to 26 by 2020 and to 40 by 2030.

Source: NYS DEC

5) Reduce the percentage of the region's total land value found in floodplains from 14% to 10% by 2030.

There are about 410 square miles of floodplains in CNY. There are 43,359 parcels that lie partially or completely within these floodplains. The total assessed value of these parcels is $6,150,204,534, which is 14% of the assessed value of all land in CNY. The target is to reduce the percentage of the region's total land value found in floodplains to 10% by 2030.

Source: County Real Property Tax records

2. Strategies

Through group discussions with stakeholders, the planning team identified areas of key opportunities and challenges to achieving sustainable climate adaptation in the region. After reviewing the goal, indicators and targets, and the key opportunities and challenges, a set of climate adaptation strategies were identified for future implementation. Strategies were selected based on the contribution of each

to advance the plan's overall climate adaptation goal and targets. In addition, strategies were evaluated for their overall benefits to the region, as well as the costs and feasibility for implementation.

In establishing an action plan for the region, these strategies were prioritized according to their readiness for implementation in the short-term opportunities or long-term initiatives, with short-term defined as 1-5 years and long-term defined as 5-10 years, as these opportunities may require additional time and effort to develop and implement.

Key strategies that have been identified for climate adaptation include:

Short-Term Opportunities

a) Conduct vulnerability and risk-assessments and cost-benefit analyses to identify key areas for climate adaptation.

b) Develop local greenhouse gas inventories and climate action plans and increase the number of Climate Smart Communities.

c) Implement measures to mitigate impacts to critical infrastructure.

Long-Term Initiatives

d) Provide assistance to address climate impacts on agriculture, make the regional food supply system more resilient to climate change, and enhance rural economic security.

e) Develop systems to prepare for and respond to more frequent and extreme storms and flooding events.

f) Develop a regional inventory of flood-hazard occurrence areas.

g) Complete a regional dam inventory and assessment program.

h) Create a central repository of regional climate data and provide channels for the distribution of information.

i) Develop and implement emergency and hazard mitigation plans.

j) Develop a comprehensive forest management program.

a) Conduct vulnerability and risk-assessments and cost-benefit analyses to identify key areas for climate adaptation.

Various evaluations are needed in order to identify and quantify the risk faced by Central New York communities under increasing climate change impacts. Vulnerability assessments involve several steps as part of the adaptation planning process, namely: a thorough determination of objectives and scopes (e.g., appropriate spatial and temporal scales, engaging key stakeholders, and suitable targets); data collection involving climate projections and ecological impacts; evaluation of climate sensitivity of specified targets and degree of exposure or adaptive capacity; and an application of the assessment to appropriate planning processes. To date, no Central New York community has completed a climate vulnerability assessment. As adaptation efforts get underway in the region, it is likely that conducting such evaluations will yield various economic, environmental and social co-benefits.

Risk assessments and cost-benefit analyses would document the location, age, condition, community served, and relative value of facilities and will provide information needed to evaluate the present value of retrofit procedures and costs required to protect infrastructure from climate-related damage. Identification and prioritization of at-risk areas in the region is required for appropriate resource allocation through long-term planning initiatives.

b) Develop local greenhouse gas inventories and climate action plans and increase the number of Climate Smart Communities.

Local greenhouse gas (GHG) assessments empower communities to identify and address areas of high emissions. Through GHG inventories, it is possible for communities to identify co-benefits for their operations, namely: opportunities for cost-savings; process efficiencies in how consumption data is tracked and organized; operational efficiencies from cross-functional and inter-departmental coordination; areas of highest emissions and energy use; areas of lowest emissions and energy use; changes in emissions resulting from changes in energy consumption over time; and the potential emissions impact of projected energy use reductions and planned energy conservation measures. Central New York communities participated in seven GHG inventories in 2012, and progress to-

ward the target of doubling the number of inventories completed by 2030 is underway.

Climate action plans (CAPs) offer a roadmap for implementing projects and initiatives targeted at reducing energy use and GHG emissions. CAPs encourage communities to be creative in achieving energy reduction goals, and utilize existing technologies and research while thinking of future efficiencies that fit within their specific community context. Much like GHG inventories, climate action planning processes result in several co-benefits for community operations: they can utilize existing stakeholder engagement channels; development of energy conservation measures and GHG reduction strategies results in process efficiencies for government operations; CAPS offer opportunities for cost-savings; CAPs strengthen community identity and resiliency; they offer opportunities for direct residential and commercial sector involvement with the ability to measure impacts, unlike other planning processes; and CAPs require and cultivate inter-departmental and cross-functional collaboration.

Central New York has already secured the participation of 13 communities in the Climate Smart Program. This initiative offers the opportunity for CNY communities to publicly acknowledge (and be recognized for) commitment to climate action. Through the Climate Smart pledge and the commitment to conduct a greenhouse gas inventory and climate action n planning efforts, participating communities are already identifying areas for reduced energy use and renewable installations. The Village of Skaneateles, for example, completed its GHG inventory, has undertaken a net zero building project for its Village Hall, and is now developing a Village climate action plan. The City of Auburn undertook a two-year GHG inventory analysis as part of its Climate Smart commitment, as have several other communities like the Town of Cazenovia and the Village of Fayetteville.

c) Implement measures to mitigate impacts to critical infrastructure.

Wastewater, water delivery and power generation infrastructure is vulnerable to the impacts of flooding and extreme storm events and older systems, such as combined sewer overflows (CSOs), present an ongoing risk from flooding or heavy precipitation events. Infrastructure that is situated in areas where flooding is likely to occur is a priority concern in Central New York. The potential for increased frequency of flooding events throughout the region emphasizes the need for community leaders to consider alternative flood policies and future land use and development trends.

This can be accomplished in a number of ways. For example, local zoning regulations are needed to prevent new development in flood-prone or high hazard areas and updated building codes are needed that require more effective flood-resistant structures in flood zones. When feasible, bury existing power lines and require this for new construction projects in order to minimize damage and outages resulting from heavy precipitation and severe storm events. Underground power lines would reduce problems with snow, damaged tree limbs, and wind that often contribute to downed power lines and electrical outages for local residents.

Repair deficient combined sewer infrastructure to improve capacity during high-water events and implement storage and reuse systems for wastewater in all treatment plants to reduce impacts on infrastructure, water quality and ecosystems during flooding events. Flood and stormwater control measures and other green infrastructure plans along Central New York watershed corridors should be encouraged for new and existing development. Retaining walls along major rivers such as the Salmon River need to be secured to prevent washouts during periods of flooding and major storm events.

d) Provide assistance to address climate impacts on agriculture, make the regional food supply system more resilient to climate change, and enhance rural economic security.

Climate change will likely impact agricultural practices in the United States through more frequent water shortages, extreme weather events, flooding, and shifts in growing seasons. The agricultural sector has a strong record of innovation and adaptability, but the magnitude of climatic changes projected for this century including increased frequency of extreme events, exceed the variations that have been managed in the past and will challenge all elements of agricultural production systems.[72] Agricultural production volatility due to climate variability and change can lead to surplus and deficits, exacerbating food insecurity in some population groups due to transportation disruptions and other factors. Food assistance programs can expect to experience increases in the number

of requests for assistance under severe weather conditions such as flooding, hurricanes, and tornadoes.

Adaptive behavior can include changes in consumption, production, education and research and will require the collaboration of a host of regional stakeholders including local government, Soil and Water Conservation Districts, colleges and universities, and agriculture advocacy organizations and technical assistance providers such as Cornell Cooperative Extension, Central New York Agricultural Council, New York Farm Bureau, New York Agricultural Society, New York Farm Viability Institute, food service providers such as the Food Bank of Central New York, and others. While adaptive responses to climate change will continue to develop over time, some options for local and regional action have been identified.

First, regional stakeholders can work with local governments, rural communities and producers to restore and conserve the region's farmland, manage rural lands for tourism and outdoor recreation, and find ways to use lands to enhance green employment opportunities. Generating and retaining green jobs and economic opportunities through natural resource and recreation programs will be critical to protecting the region's natural resources and agricultural economy. Local Soil and Water Conservation Districts can work with Cornell Cooperative Extension and others to assist private landowners and public managers to restore and protect forests, crop, and grazing lands, provide incentives such as conservation easements to maintain working lands, preserve open space, and restore public forests. Local governments, for example, can implement high-impact targeted practices in critical and/or impaired watershed and quantify improvements in water quality. To combat potential increases in polluted agricultural runoff from heavier precipitation events, farmers can use buffers and modify or reduce fertilizer and pesticide application. Technical assistance can be provided to communities to ensure they are fire-adapted, return prescribed fires to ecosystems where needed.

Second, colleges and universities and Cornell Cooperative Extension can conduct research to improve seed and feed, improve agricultural practices, and provide outreach and education to ensure all producers have necessary risk management tools and knowledge will help to support a sustainable and competitive agricultural system in Central New York. Dairy farmers, for example, can reduce the loss of livestock during extreme heat events by improving ventilation in barns and increasing shade. Farmers and researchers can work to develop and breed crops that are more tolerant of droughts or to increased precipitation and flooding. Attention should be paid to integrating research results into local policies and conservation practices such as agriculture and farmland protection plans. Information should be disseminated to local policy makers and agricultural producers, and support should be provided to land managers who use these practices.

Finally, food service providers and agricultural organizations can work together to develop a regional food system that will be more resilient to climate change and enhance food security for needy populations. Diversifying agricultural practices, helping farmers to develop new crop varieties to withstand changing climate conditions, and developing regional food production and distribution systems such as year-round greenhouse and aquaculture facilities powered by clean energy, food hubs and mobile processing facilities, and farmer's markets will improve regional self-sufficiency.

Federal agencies including US EPA, USDA and others are developing tools to support local producers and communities to adapt to climate change.[73] The USDA Climate Change Program Office was created to address the climate change impacts on agriculture and food production and issued its Climate Change Adaptation Plan in June 2012.[74] The details of USDA's overall adaptation plan to address climate change will continue to be refined over the next several years, and USDA has already sponsored several activities aimed at minimizing the risks of climate change to agricultural activity throughout the United States. Funds for the development of research, outreach and technical assistance programs may be sought from federal and state agencies such as US EPA, USDA, NYS Department of Agriculture and Markets, and NYSERDA as well as foundations and agricultural organizations such as the New York Farm Viability Institute and the Sustainable Agriculture Research and Education (SARE) program.

e) Develop systems to prepare for and respond to more frequent and extreme storms and flooding events.

Increasing precipitation events in Central New York are anticipated to, and have the potential to, cause flooding and increased stormwater runoff rates, with secondary impacts on wastewater treatment plants and pollutant loading to water resources. Extreme weather events threaten public health and safety by contaminating

drinking water, threatening food and water supplies, weakening infrastructure and promoting insect-borne diseases. The greatest potential for flooding in Central New York is typically seen during the early spring when heavy precipitation, warming temperatures, and rapid snowmelt produce heavy flows and high tributary runoff rates. Flooding can be further exacerbated by ice jams, saturated soils, beaver dams, clogged storm sewers, and dam failures.

Successful models in support of establishing initiatives to address the potential for extreme storms and flooding events include a "Reverse 911" emergency notification and call-back system, utilizing the New York Alert/NOAA weather alert systems that are already in place, will help to notify residents of emergency information and evacuation routes. In addition, a Regional Emergency Shelter Network will assist residents during power outages and extreme temperatures; a National Weather Service's StormReady® program will provide communication and safety skills during storm events. Oswego County is a good example of a county that has been recognized as a "Storm Ready Community". Extreme storm events along the Oswego River and on Lake Ontario increase the need for more frequent harbor dredging at the Port of Oswego to mitigate erosion and sedimentation and to meet depth requirements for vessel transport. Back-up water transmission supply facilities at key locations across the region will ensure adequate supply of public water during periods of system outages. And finally, an agricultural demonstration project is needed that improves cooling capacities in dairy barns and animal facilities through the installation of fans, sprinklers, and cooling systems.

f) Develop a regional inventory of flood-hazard occurrence areas.

Significant flooding in Central New York, typically occurring during the late winter and early spring, tends to be more common in the municipalities that are located within the Erie Ontario Lowlands. This region is characterized by flat terrain and high groundwater levels. Municipalities in this region include the towns of Sullivan, Lenox, the Cities of Oneida and Syracuse, and the villages of Chittenango and Canastota, among others. During periods of heavy runoff and high flow rates, large quantities of water flow down the tributaries and often cause flooding in downstream communities when the water reaches the lowland region. The flood waters often contain large quantities of sediment and transport tree limbs and other debris that cause logjams. A comprehensive inventory of flood-hazard areas in Central New York is needed in order to document and prioritize flood-hazard occurrence areas, to evaluate the economic impacts on homes and businesses, and to provide recommendations for remediation.

g) Complete a regional dam inventory and assessment program.

Extreme weather events in Central New York threaten public safety by weakening dams. With aging infrastructure and the increasing recurrence of storm events, dam failures are a growing concern, especially for downstream communities. Little York Lake Dam, for example, is located on the West Branch of the Tioghnioga River in the Cortland County Town of Homer. Construction of the dam was completed in 1956 but a refurbishment is needed to address flood hazard issues in the community. A comprehensive inventory and assessment of dams in Central New York is needed to evaluate the age and condition of existing structures and to prioritize retrofit opportunities. Such an assessment should be conducted in conjunction with other infrastructure inventories to determine areas of greatest risk within communities.

h) Create a central repository of regional climate data and provide channels for the distribution of information.

It will be increasingly important to share regional and local climate data as adaptation planning efforts get underway in Central New York. A central repository, or "CNY Climate Change Clearinghouse," would ensure accessibility for all communities in the region, and it would facilitate climate impact data sharing, which would aid in reporting and planning initiatives across Central New York.

The climate data repository would include current data and historical trends for temperature, precipitation, lake water temperature, public health, storm events, flooding, emergency planning, greenhouse gas emissions, adaptation resources, and surveillance and monitoring data. The availability of this data is currently limited at the local municipal level; therefore, the development of a central data exchange system would better equip Central New York to undertake climate adaptation planning efforts at a regional scale. A central repository would also facilitate more accurate tracking of progress toward climate adaptation targets such as assessing and decreasing the economic value of property located in floodplains

and efforts taken to reduce climate impacts, such as providing community cooling centers.

i) Develop and implement emergency and hazard mitigation plans.

Central New York counties have the opportunity to utilize existing planning efforts for the development of hazard mitigation plans to increase public awareness of areas in need of adaptation. While Cortland, Madison, Onondaga and Oswego Counties have completed hazard mitigation plans, all counties must increase public access to these documents in order to disseminate increasingly important information about community hazard management.

Hazard mitigation plans, in conjunction with emergency management plans, provide an existing opportunity to reach residents and stakeholders regarding areas for adaptation within communities. For instance, the Oswego County Multi-Jurisdictional Hazardous Mitigation Plan (2012) includes information about the County's designation as a "Storm Ready Community," and describes the County's approach to numerous extreme events, including ice storms, drought, extreme temperatures, and radiological emergencies. Given the annual review cycle, Oswego County's hazard mitigation planning efforts offer an existing framework to incorporate climate adaptation measures into the plan, and to assess and benchmark the county's contribution to the regional hazard mitigation target.

j) Develop a comprehensive forest management program.

Central New York communities must consider the effect of climate impacts on the health of the region's forests. Additionally, ensuring the long-term sustainability of forests directly impacts social and economic interests for the region. Of the 18.9 million acres of forested land state-wide, over 1.2 million acres span Central New York, and approximately 88,000 acres comprise State Forestland in the region. These forests are under threat by invasive species, such as the wooly adelgid, and warming temperatures that affect forest health and growing seasons.

Models of forest management in the region include the City of Syracuse Urban Forestry Master Plan, which focuses on the social and natural capital of forests, as well as the energy benefit resulting from urban tree-planting initiatives that reduce urban heat island effect. In rural areas of the region, forest management programs will build adaptive capacity and influence land use planning decisions. Given that forests store carbon dioxide, effective forest management can also impact the mitgative potential of community contributions to regional emissions. Ongoing research at Central New York institutions like SUNY-ESF aims to identify solutions to invasive issues and forest impacts from changing climate conditions.

3. Alignment of Strategies and Targets

The following table illustrates the alignment of climate adaptation strategies and targets.



April, 2011 storm, Clinton Square, Syracuse (photo credit: The Post-Standard)

TABLE 77–Alignment of Climate Adaptation Strategies and Targets.

Strategies	TARGETS				
	1	2	3	4	5
	REDUCE PER CAPITA REGIONAL GREENHOUSE GAS EMISSIONS TO 40% BELOW 2010 LEVELS BY 2030.	INCREASE THE NUMBER OF COMMUNITIES PARTICIPATING IN THE NFIP COMMUNITY RATING SYSTEM FROM 2 TO 10.	COMPLETE 25 COMMUNITY VULNERABILITY ASSESSMENTS BY 2030.	INCREASE THE NUMBER OF CLIMATE SMART COMMUNITIES IN CNY FROM 13 TO 26 BY 2020 AND TO 40 BY 2030.	REDUCE THE PERCENTAGE OF THE REGION'S TOTAL LAND VALUE FOUND IN FLOODPLAINS FROM 14% TO 10% BY 030.
Short-Term Opportunities					
a. Conduct vulnerability and risk assessments and cost-benefit analyses to identify key areas for climate adaptation.		●	●	●	●
b. Develop local greenhouse gas inventories and climate action plans and increase the number of Climate Smart Communities.	●			●	●
c. Implement measures to mitigate impacts to critical infrastructure.		●	●		●
Long-Term Initiatives					
d. Provide assistance to address climate impacts on agriculture, make the regional food supply system more resilient to climate change, and enhance rural economic security.	●				●
e. Develop systems to prepare for and respond to more frequent and extreme storms and flooding events.		●	●		
f. Develop a regional inventory of flood-hazard occurrence areas.		●	●		●
g. Complete a regional dam inventory and assessment program.			●		●
h. Create a central repository of regional climate data and provide channels for the distribution of information.			●		●
i. Develop and implement emergency and hazard mitigation plans.		●			
j. Develop a comprehensive forest management program.	●				

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Projects included in the content of this report and the appendix were identified by the planning team as part of a public outreach effort and are meant to provide examples of ways to implement the strategies identified in the plan. These projects are in no way prioritized or guaranteed to receive funding through Phase II Implementation Funding of the Cleaner, Greener Communities Program. Projects not listed in the content of the plan or appendix will have equal opportunity to submit an application for funding through Phase II. Regardless of being listed in the plan, a Consolidated Funding Application must be submitted in order to be considered for funding in Phase II. All projects must address the qualifications and eligibility requirements as listed in the Cleaner, Greener Communities Phase II solicitation notice.



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