Climate Action Plan

Town of Richland
Village of Pulaski

APRIL 2016

Grindstone Creek

Photo Credit: Maureen Anderson

Central New York Regional Planning & Development Board

NEW YORK STATE OF OPPORTUNITY. Climate Smart Communities

Central New York c2ip climate change innovation program ...a Program of the Central New York Regional Planning and Development Board

CNY Energy Challenge ...a program of the Central New York Regional Planning & Development Board

A MESSAGE FROM THE SUPERVISOR AND MAYOR

Dear friends and neighbors,

The Town of Richland and Village of Pulaski are committed to becoming greener, more sustainable communities. Not only have we adopted the Climate Smart Communities pledge, we have also undergone many energy efficiency projects that have helped reduce our ecological footprint while saving taxpayer dollars. This Climate Action Plan provides a course of action for the town and village to continue efforts to improve sustainability and maintain the lowest possible costs.

In 2011, the Town of Richland installed a 100 kW wind turbine at the Richland well site that generates approximately 65,000 kWh per year, offsetting about 64% of electricity used on site and reducing emissions annually by about 15 $MTCO_2e$. The town has also upgraded lights and fixtures to LED at the Haldane Ice Arena and Town Barn to reduce energy usage and costs. Both the town and village have adopted the New York State Unified Solar Permit to reduce costs associated with going solar and encourage the renewable energy market in New York. Both the town and village are also working to expand pedestrian sidewalks and multi-use trails to encourage non-vehicular traffic and recreational opportunities in the community. The Village of Pulaski is also working to divert truck traffic from the village core by working towards easy on, easy off access to Route 81, which would also reduce emissions from transportation in the village. These and other projects have already begun to make our community more sustainable.

This Climate Action Plan provides a benchmark of the town and village's energy use and emissions and outlines a variety of other similar actions that the town, village, and our community members can take to reduce energy use, emissions, and dollars spent on energy. Together we can enhance the quality of life in Richland and Pulaski by continuing to make our community more sustainable.

Sincerely,

Daniel Krupke, Town Supervisor

Karl Hax, Village Mayor

ACKNOWLEDGEMENTS

The Town of Richland and Village of Pulaski wish to thank the following community members, organizations, and staff for their contributions to developing this Climate Action Plan:

ADVISORY COMMITTEE

Maureen Anderson - Comprehensive Planning Board

Shawn Doyle - Village of Pulaski Planning Board

Donna Gilson - Richland Town Board, Comprehensive Planning Board

Dawn Holynski - Chairwoman of the Richland/Pulaski Comprehensive Planning/Climate Action Plan Committee, former Richland Town Board member

Bill Larrabee - Village of Pulaski Planning Board

Kern Yerdon - Richland Town Board

OTHER STAFF

Michele Cusyck - Village Clerk

Mike Martin - Village Police Chief

Bill Noreault - Village DPW Superintendent

Mary Yerdon - Town Water Clerk

CNY REGIONAL PLANNING AND DEVELOPMENT BOARD

Chris Carrick, Energy Program Manager

Amanda Mazzoni, Planner

Anne Saltman, Principal Planner

Boats in Harbor

Photo Credit: CNY RPDB

The Central New York Regional Planning and Development Board

The Central New York Regional Planning and Development Board (CNY RPDB) is a public agency that was established in 1966 by Cayuga, Cortland, Madison, Onondaga, and Oswego Counties under the provisions of Article 12B of the New York State General Municipal Law. The CNY RPDB provides a comprehensive range of services associated with the growth and development of communities in Central New York with a focus on the following program areas: Energy Management, Community Development, Economic Development, Environmental Management, Information and Research Services, Intergovernmental Coordination, and Transportation Planning.

CONTENTS

EXECUTIVE SUMMARY

A Climate Action Plan (CAP), often considered a blueprint for the future, evaluates how a community can reduce greenhouse emissions and adapt to climate change. The CAP also identifies the extent to which local actions support New York State's goal for a clean-energy economy. New York State's goal is to reduce greenhouse gas emissions by 80% (below the levels emitted in 1990) by the year 2050. To help reach this goal, local representatives have joined many other municipalities throughout the State to compile a CAP for Richland and Pulaski.

The CAP provides local goals for reducing energy use from municipal operations and from the Richland and Pulaski community as a whole and includes specific recommendations for categories such as transportation, solid waste disposal, and building energy efficiency. The objectives of the Climate Action Plan are to:

(1) Present information on emission reduction projects and programs that are currently being implemented in Richland and Pulaski;
(2) Provide municipal elected officials, community leaders, and residents with information and support to advance these and additional energy sustainability programs throughout the community;
(3) Identify opportunities for new emission reduction programs and initiatives; and
(4) Engage and encourage local participation in greenhouse gas emission reduction strategies.

A Climate Action Plan Advisory Committee comprised of municipal representatives and community leaders met during 2015 and early 2016 to discuss emission reduction goals and specific strategies for reaching them. The committee agreed on a goal to reduce municipal greenhouse gas emissions by 65.2% by the year 2020 and reduce community emissions by 13.2% from the GHG inventory baseline year (2011).

This CAP was prepared for Richland and Pulaski with guidance from the Central New York Regional Planning and Development Board (CNY RPDB). The CNY RPDB provided this assistance under the sponsorship of the New York State Climate Smart Communities Program.

The CAP is not intended to provide precise information about the potential emission reductions that can be achieved by specific recommendations, and cannot be used as a substitute for thorough project or program planning. Instead, the document provides estimates of emission reductions for specific local recommendations. The report is designed to help public officials, community leaders, and residents decide which actions may be worthwhile for the community to pursue in the coming years and is intended to be a flexible framework for local climate protection.

NEW YORK STATE OF OPPORTUNITY. Climate Smart Communities

Central New York C_2IP climate change innovation program
... a Program of the Central New York Regional Planning and Development Board

Climate Smart Communities Program

The Climate Smart Community (CSC) program is a successful partnership between the New York State Department of Environmental Conservation and local governments. The program helps communities reduce greenhouse gas emissions, save taxpayer dollars, and advance community goals for health and safety, economic vitality, and energy independence. 170 municipalities in New York State (including the Town of Richland and Village of Pulaski) are CSCs. The CNY RPDB is the Climate Smart Communities coordinator for five counties in Central New York (Cayuga, Cortland, Madison, Onondaga, and Oswego) and provides technical assistance for greenhouse gas inventories, climate action plans, and energy efficiency projects. The CNY RPDB's work as Climate Smart Communities coordinator is referred to as their Climate Change Innovation Program (C_2IP).

South Park

Photo Credit: Half-Shire Historical Society

Right: Barbara Youmans and Paul Ingersoll at Pulaski Cemetery on Memorial Day. Both are descendants of the first child born in Pulaski, Benjamin Ingersoll (1805)

Photo Credit: Half-Shire Historical Society

INTRODUCTION

What is climate change?

Global concern with climate change is primarily focused on the amount of greenhouse gases in the atmosphere. Greenhouse gases, such as carbon dioxide, water vapor, and methane, among others, are an essential part of our atmosphere, and they serve a vital role in making our planet warm enough for life.

Greenhouse gases trap energy (in the form of long wave radiation) that is being emitted by the Earth, keeping it in the atmosphere to warm the planet. As the amount of carbon dioxide in the atmosphere has increased or decreased over time, the planet's temperature has changed in roughly the same proportion.

Scientists have determined this relationship by studying Antarctic ice core samples that reveal the atmospheric carbon dioxide from 400,000 years ago to present day. There is currently more carbon dioxide in the atmosphere than at any time in history, as measured by these samples.[1] Atmospheric testing shows that we have 402 parts per million (ppm) atmospheric CO_2[2], which is higher than at any other time in history.[3]

1 Visit http://www.antarctica.ac.uk/press/journalists/resources/science/ice_cores_and_climate_change_briefing-sep10.pdf to learn more about the Antarctic ice core findings with accompanying graphs for temperature and CO_2.

2 According to the Scripps Institute and NOAA, Mauna Loa Observatory

3 In January 1998, the collaborative ice-drilling project between Russia, the United States, and France at the Russian Vostok station in East Antarctica yielded the deepest ice core ever recovered, reaching a depth of 3,623m (Petit et al. 1997, 1999). The extension of the Vostok CO_2 record shows the present-day levels of CO_2 are unprecedented during the past 420k yr. Pre-industrial Holocene levels (~280 ppmv) are found during all interglacials, with the highest values (~300 ppmv) found approximately 323k yr BP.

Scientists expect that this is leading to a gradual warming of the planet in most areas.

Developing the Plan

The Richland and Pulaski Climate Action Plan was developed by an advisory committee made up of Maureen Anderson, Comprehensive Planning Board; Shawn Doyle, Village of Pulaski Planning Board; Dawn Holynski, Richland Town Board; Bill Larrabee, Village of Pulaski Planning Board; and Kern Yerdon, Richland Town Board. The committee was provided technical assistance by the CNY RPDB, who analyzed energy and emissions reduction strategies for the Plan utilizing data from the GHG inventory report. CNY RPDB provided information and suggestions to the advisory committee as to which energy efficiency strategies would be most successful in the town, how many $MTCO_2e$ the strategies would prevent, co-benefits of the strategies, and other case studies explaining where the strategies have been implemented successfully. They also provided information about cost of implementation, possible funding sources, and payback period for the strategies. For more information on how the strategies were developed, including assumptions and references, refer to Appendix C: Action Strategy Summary Document.[4]

4 Available on town and village websites

Thinking Sustainably: The Village of Skaneateles, NY

The Village of Skaneateles serves as a showcase for energy efficiency and environmental stewardship. Renovations were completed in 2013, making the new Village Hall the first municipal net-zero energy building in New York State. The project was launched in 2012 when municipal officials partnered with the Central New York Regional Planning and Development Board (CNY RPDB) under its EPA-funded Climate Change Innovation Program. With an initial EPA grant from the CNY RPDB and funds from the sale of the old Village Hall, municipal officials repurposed a vacant fire station in the Village Center and turned it into the net-zero energy facility. The building, which now houses administrative offices and a police station, is expected to produce more energy than it consumes.

The renovations included a 54 kW PV system on the roof, a geothermal well field and heat pump system to provide on-site energy extracted from the ground, LED lighting, and green exterior upgrades such as insulation and energy efficient windows. The improvements are expected to reduce energy usage by more than 62,000 kilowatt hours of electricity each year and will result in the avoidance of 46 metric tons of greenhouse gas emissions annually. The building has an educational display in the lobby so that visitors can see how the building is performing. The village made every effort to utilize technologies developed in Central New York including the HVAC system that was manufactured in Auburn. Local leaders also worked with the CNY RPDB to complete a greenhouse gas inventory in 2013, and energy efficiency goals and recommendations were presented in a Climate Action Plan that was adopted by village trustees in September 2014.

Climate Impacts in the Northeast[1]

Temperature: Average temperatures across the Northeast have risen more than 1.5 degrees Fahrenheit since 1970, with even more significant changes in average winter temperatures, rising 4°F between 1970 and 2000.

Precipitation: The Northeast region is projected to see a 20 to 30% increase in winter precipitation, and, due to increases in temperatures, less winter precipitation will fall as snow and more will fall as rain.

Additionally, heavy, damaging rainfall events have already increased measurably across the Northeast in recent decades. For example, Hurricane Irene and Superstorm Sandy brought intense rains to the region in 2011 and 2012, causing widespread flooding.

Drought: Rising summer temperatures coupled with little change in summer rainfall are projected to increase the frequency of short-term (one to three month) droughts in the Northeast, therefore increasing stress on both natural and managed ecosystems.

1 US EPA, http://www.epa.gov/climatechange/impacts-adaptation/northeast.html

Implementing the Plan

In order to implement the strategies in this plan and achieve Richland and Pulaski's sustainability goals, the creation of a permanent sustainability committee is highly recommended. The sustainability committee would be comprised of a group of residents who are committed to Richland and Pulaski's sustainable future and are willing to volunteer their time to help implement the strategies explained in this plan. It is recommended that the Climate Action Plan /Comprehensive Plan committee continue to meet in this capacity and work towards implementation of the strategies within this plan. Others who are interested are welcome to participate in the future as well.

Progress towards the Climate Action Plan's goals can be measured over time by conducting subsequent GHG emissions inventories. Future inventories can be compared against the baseline years to determine progress.

Global Weather Extremes

Regions throughout the world are experiencing dramatic weather extremes. A primary influence on wind and precipitation variability can be attributed to the natural climate cycles of El Nino and La Nina that originate in the equatorial Pacific region. The cycles influence the direction and characteristics of jet streams, causing them to meander in the northern and southern hemispheres. The heat and water vapor resulting from these cycles enter the atmosphere and influence weather patterns around the globe.

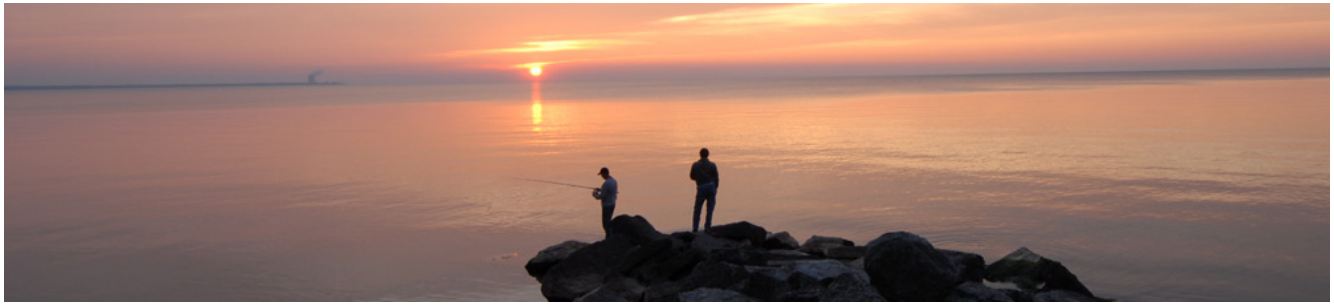
Winter festival

Photo Credit: Half-Shire Historical Society

Another significant influence on weather patterns can be attributed to human activity. The long-term accumulation of greenhouse gases in the atmosphere is trapping heat and increasing temperatures in both terrestrial and aquatic ecosystems. The average surface temperature worldwide has increased approximately one degree Fahrenheit within the past four decades. As a result of this warming trend, Arctic sea ice has lost approximately 40% of its summer sea ice since the 1980s and autumn ocean temperatures have risen 3.6 to 9°F. As the ocean temperature increases, more moisture is released into the atmosphere. During the past twenty five years, scientists have measured a 4% average rise in water vapor in the air column which increases the potential for strong storm events. The following sections present information on how these global findings impact local climate characteristics in New York State and in Central New York.

NEW YORK STATE WEATHER CHARACTERISTICS

Central New York's climate is characterized by warm, dry summers and cold, snowy winters. Local weather patterns are influenced by topography, prevailing westerly wind direction, and proximity to Lake Ontario. Frost can be expected from early October until late May and the growing season is approximately 18 to 20 weeks long. Although serious droughts are rare, most growing seasons do experience limited periods of low soil moisture.



Selkirk Shores State Park at sunset

Photo Credit: nyparks.com

In 2011, the New York State Energy Research and Development Authority (NYSERDA) released a comprehensive assessment of the projected effects of climate change in New York State's critical systems and natural resources over the next century. ClimAID: the Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State is a 600-page report that presents projected changes in climate for seven geographic regions in the State. It has served as a valuable resource for planners, policymakers, farmers, local governments and residents. The ClimAID report outlines the potential impacts of climate changes on eight sectors: water resources, coastal zones, ecosystems, agriculture, energy, transportation, telecommunications and public health, as well as steps that government, businesses, and private citizens can take to adapt to those impacts. According to the report, the annual average temperature in New York has risen approximately 2.4°F since 1970, with winter warming exceeding 4.4°F. Sea level along New York's coastline has risen about a foot since 1900 and the frequency of intense precipitation and heavy downpours has increased in recent decades.

In 2014, NYSERDA released updated data and projections of climate changes throughout the State that will likely result in greater impacts on flooding, agriculture, winter tourism, and many other areas. The report applies up-to-date climate models and methods to evaluate potential changes to New York State's climate as a result of increasing greenhouse gas emissions. The results reinforce the importance of preparing New York for the realities of a changing climate. The study confirms and refines the following projections that had originally been presented in the ClimAID report:

+ Sea level could rise significantly, permanently flooding some areas and increasing the likelihood of damage to coastal infrastructure from storm surge, including roads and bridges.
+ Inland and upstate, heavy downpours and subsequent flooding are expected to increase. In the winter, more rainstorms in place of snow are expected.
+ While winters will be milder, summers are expected to see more extreme and longer heat waves, with more droughts as well[5]

Flooding is a growing concern throughout New York State, especially with the rise in urban development and the increased frequency of storm events. Although some areas are more prone to flooding than others, there are no areas in the State that are completely exempt from flood hazards. There are over 52,000 miles of river and streams in New York State and along their banks there are 1,480 communities that are designated as flood prone. An estimated 1.5 million people live in these flood prone areas and many more work,

5 "Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation". 2014 www.nyserda.ny.gov/ClimAID.

LOCAL CLIMATE CHARACTERISTICS

travel through, or use recreational facilities located in these areas.
Richland and Pulaski are expected to experience a gradual increase in air temperature as well as an increase in the frequency and intensity of extreme weather events. Higher temperatures will likely contribute to greater insect and disease pressures, and the increasing occurrence of storm events will contribute to flooding, stormwater runoff, and sediment loading to Lake Ontario.

Elected officials in Richland and Pulaski committed to climate awareness and environmental protection by signing a pledge to become Climate Smart Communities. They have also worked with the CNY Regional Planning and Development Board (CNY RPDB) for the past year on projects associated with the Climate Change Innovation Program. The Oswego County Soil and Water Conservation District (SWCD) helps communities such as Richland and Pulaski address the impacts of storm events by implementing measures to reduce runoff and pollution loading from agricultural practices. Livestock operations, vineyards and other agricultural businesses are currently implementing long and short-term initiatives to reduce greenhouse gas emissions that contribute to climate change and are adapting measures to protect field crops, grapes, orchards and livestock that serve as the foundation of the local economy.

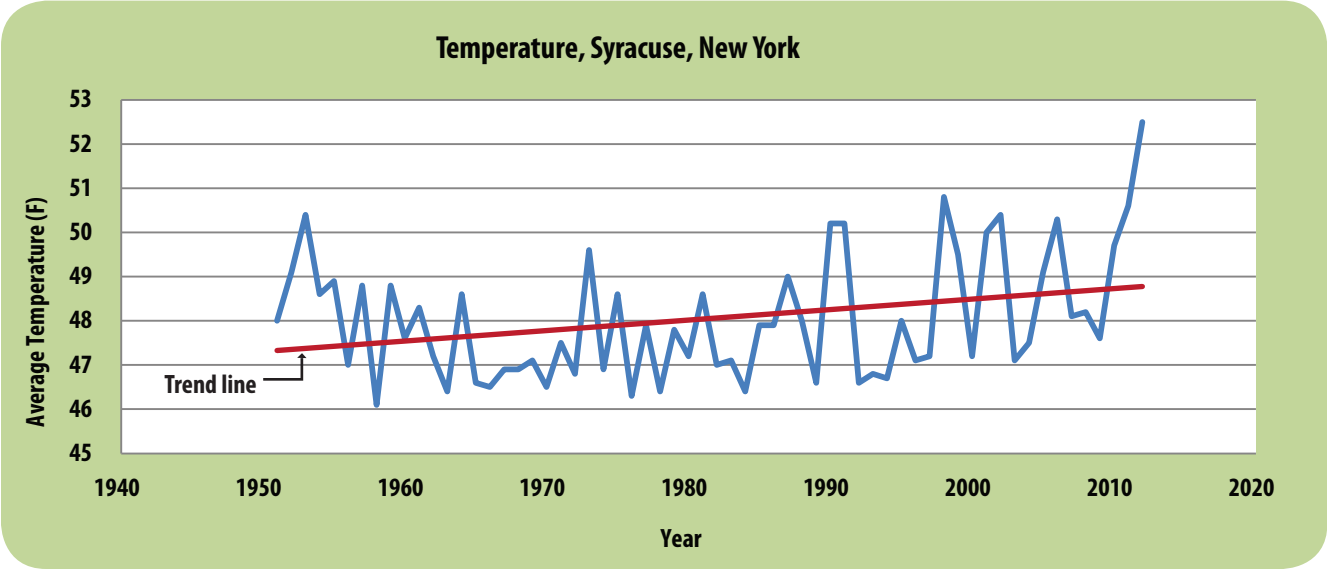


FIGURE 1- ANNUAL AVERAGE TEMPERATURE, SYRACUSE, NEW YORK.
SOURCE: NOAA NATIONAL WEATHER SERVICE FORECAST OFFICE

Temperature and Precipitation

Richland and Pulaski generally experience seasonable weather patterns that are characteristic of the northeastern U.S. cyclonic system. During the summer and parts of spring and autumn, temperatures rise during the daytime and fall rapidly after sunset. The average July temperature in Oswego County (80°F) is lower than the national average of 86.5°F. The average year-round temperature is 48.1°F, which is about the same as the New York State average of 48.2°F, and much lower than the national average of 54.4°F. During the summer and parts of spring and autumn, temperatures rise during the daytime and fall rapidly after sunset. The graph above shows the annual average temperatures in the City of Syracuse since 1951 (Figure 1). The trend line shows a gradual warming trend. This information was recorded at the NOAA weather station at the Hancock International Airport.

The Lake Ontario region provides excellent air and water quality and ranks better than the national average. The county also ranks higher (55) than the national average (44) on the Comfort Index. The Comfort Index is based on humidity during the hot month and is rated on a scale of 1 to 100. Higher numbers reflect a greater degree of comfort.

Central New York experienced exceptionally heavy snowfall, icy roads, and low temperatures during the 2013-14 winter season. Oswego County receives an average of 44.3 inches of rain each year. This is higher than the national average of 36.5 inches. Long-term precipitation trends recorded at the Hancock International Airport weather station in Syracuse New York are displayed below in Figure 2.

Snowfall

The average annual snowfall in Oswego County is 127.8 inches, which is significantly higher than both the New York State average of 57.9 inches and the national average of 25 inches.

The Town of Richland and Village of Pulaski are influenced by lake effect snowfall which is caused by a differential between cold air temperatures and warmer water temperatures found in Lake Ontario. As cold air flows over the warm water, the bottom layer of air over the surface of the water is heated from below. Since warm air is lighter and less dense than cold air, the heated air rises and cools. As it cools, the moisture from the lake condenses and forms clouds. When enough moisture condenses, snow bands develop over the region downwind of Lake Ontario. The greater the temperature contrast between the cold air and the warm water, the heavier the resulting lake effect snow fall will be. Because of the increased water temperature and reduced duration of ice cover on Lake Ontario, Richland and Pulaski and other areas to the east and south of the lake will continue to experience heavier and more frequent lake-effect snowfall events.

Ice Cover

The amount and duration of ice cover on Lake Ontario and other Great Lakes is variable from year to year. Despite the anomaly of winter weather conditions during 2013 and 2014, scientists have documented an overall decrease in ice extent since the early 1970s. From 1973 to 2010, annual ice coverage on the Great Lakes has declined by 71 percent.

Ice characteristics on the Great Lakes are important to monitor because of the influence on hydropower generation, commercial shipping, the fishing industry and other societal impacts. Scientists at the Great Lakes Research Laboratory are observing long-term changes in ice cover as a result of global warming, and their research is helping to determine the impacts on climate patterns, lake water levels, water movement patterns, water temperature structure, and spring plankton blooms. Ice coverage and duration influence lake water temperatures, as incoming solar radiation needs to melt the ice before it warms the lake water. However, weather conditions, lake depth, and heat storage capacity in a lake are also important components that can influence thermal cycles.

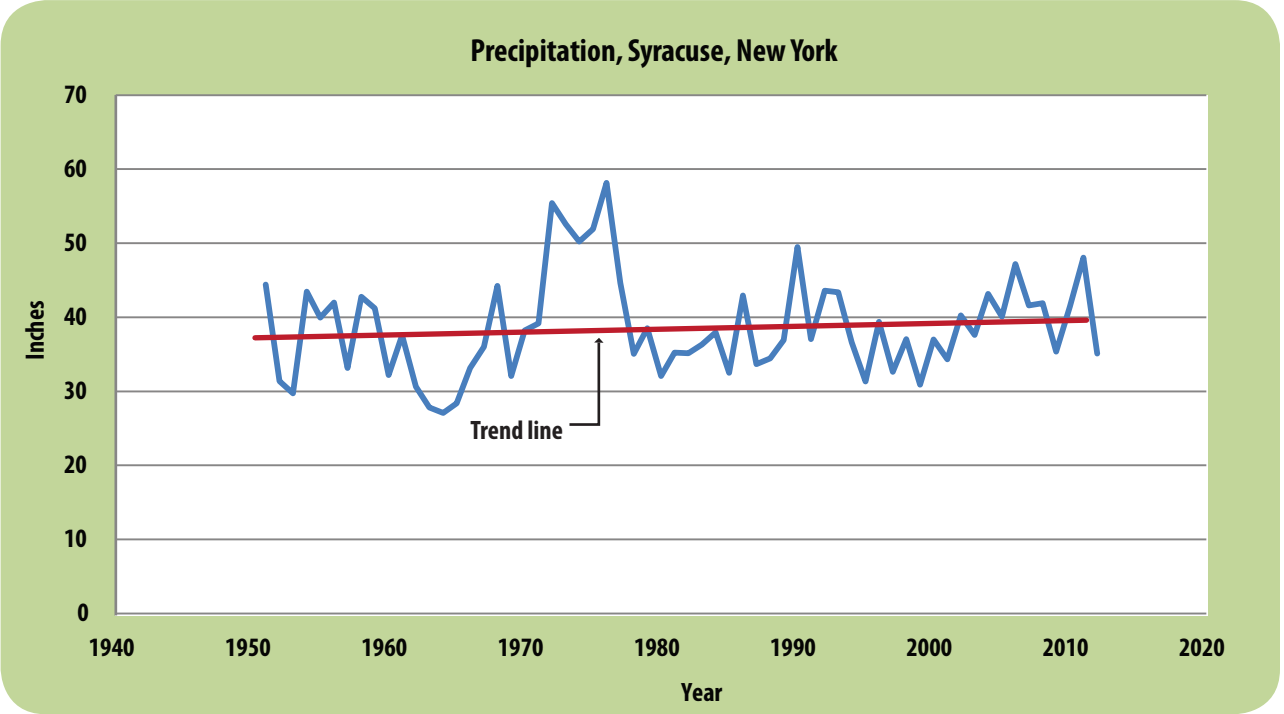


FIGURE 2- ANNUAL AVERAGE PRECIPITATION IN SYRACUSE, NEW YORK 1903-2008
SOURCE: NATIONAL WEATHER SERVICE FORECAST OFFICE

Extreme Weather Events

The relative intensity of local storm events is influenced by air temperature. As the air temperature rises, moisture in the atmosphere increases which contributes to a greater intensity and frequency of precipitation events. Warming air temperatures, as seen throughout New York State, are caused by emissions of heat-trapping gasses in the atmosphere including pollution from fossil fuels. Warming air temperatures cause higher levels of oceanic evaporation which intensifies the water cycle throughout the globe. As a result, storm events in Richland and Pulaski and around the globe are gradually becoming more extreme with stronger wind and higher levels of rainfall.

According to the ClimAID report, New York State experienced a 64% increase in extreme storm frequency between 1948 and 2011. The increased number of severe storms is expected to gradually continue, with 100-year storms likely to occur every 80 years by the end of the century. Meteorologists report that the total annual amount of precipitation is changing, as well as the distribution and intensity of storm events.

Strong storm events in Oswego County contribute to localized flooding, soil erosion, and stormwater runoff. These conditions can cause damage to roads, bridges, and other infrastructure in the Town of Richland and Village of Pulaski. The role of agencies such as the SWCD and the Natural Resource Conservation Service will become increasingly important in the coming years, especially in terms of their work with stream bank stabilization, erosion and sediment control, and stormwater management.

Incorporating green infrastructure and enhancing stormwater management helps to reduce the threat of flooding and improves the water quality in our lakes and tributaries. In addition to improving air and water quality, green Infrastructure is a cost-effective approach that can provide additional community benefits such as reducing energy use and mitigating climate change; improving habitat for wildlife; reducing Richland and Pulaski's infrastructure costs; and promoting economic growth.

Flooding

Flooding is influenced by the intensity and amount of precipitation, spring snowmelt, groundwater levels, and the concentration of impervious surfaces and compacted soils from urban development. These conditions limit groundwater recharge and increase surface runoff and flooding. According to the Federal Emergency Management Agency (FEMA), floods have caused a greater loss of life and property and have disrupted more people in

TABLE 1- TOTAL ASSESSED VALUE (TAV) OF PARCELS INTERSECTING FLOOD PLAINS[1]

Municipality	TAV of Parcels Intersecting Flood Plain	# Acres of Parcels Intersecting Flood Plain	TAV of Municipality	TAV % Floodplain Parcels within the Municipality
T. Richland and V. Pulaski	$123,724,027	3,614	$325,189,389	38.05%

1 Source: 2015 tax parcel data, Oswego County

TABLE 2- PARCELS WITHIN 100-YEAR FLOODPLAIN[1]

Municipality	Parcels	Parcels in 100-Year Floodplain	% of Parcels in 100-Year Floodplain
T. Richland and V. Pulaski	3,299	1,005	30.46%

1 Source: 2015 tax parcel data, Cayuga County

the United States than the impact of all other natural hazards combined. FEMA reports that floods kill more people than any other form of severe weather with damages exceeding $3.5 billion annually. Further, with the exception of fire, floods are the most prevalent and widespread of all natural disasters and approximately 75 percent of all presidentially declared disasters are the result of flooding.

The frequency of localized downpours in Central New York has increased over the past fifty years and this trend is expected to continue. Heavy precipitation events increase the potential for localized flooding and stormwater runoff. Heavy rain events also increase pollution loading to local waterbodies and can decrease the efficiency of wastewater treatment plants in neighboring communities.

Assessed value refers to the dollar value assigned to a home or property by local government in order to calculate property taxes. According to tax parcel data from 2015, the total assessed value of property located within designated FEMA flood zones in Richland and Pulaski represents 38.05% of the total assessed value of parcels throughout town and village, respectively (Table 1). Of the land parcels in the town, 30.46% is located in FEMA flood zones (Table 2).

Tourism and Recreation

Weather has a significant impact on the tourism and recreation sector. Season weather patterns, especially precipitation rates, determine lake water levels for boating, the rate of erosion and pollution loading of nutrients and sediment, snow cover for skiing, and waterfowl

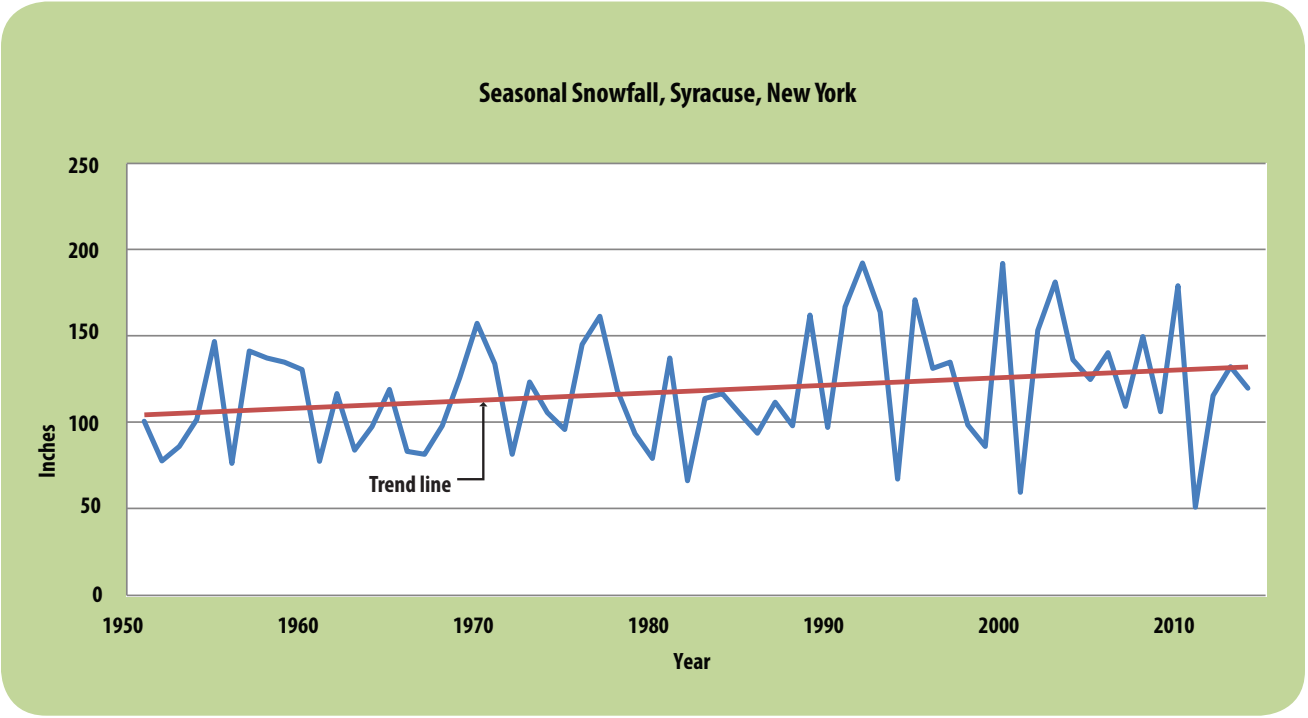


FIGURE 3- SEASONAL SNOWFALL IN SYRACUSE, NY, 1949-50 TO 2014-15
SOURCE: NATIONAL WEATHER SERVICE FORECAST OFFICE

breeding rates for sport hunting. Weather influences the duration and types of outdoor recreation activities that take place and plays a predominant role in determining local economic vitality.

Fishing and boating on Lake Ontario are popular water-based activities. Higher air temperatures and a shorter duration of winter ice cover may increase surface water temperatures, which will likely cause a gradual shift in coldwater fisheries. According to researchers at Cornell University, warming water temperatures may already be contributing to fish species modifications in Oneida Lake. Higher temperature is thought to be causing an increased production 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. 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.

The local warming trend is providing a longer growing season for agricultural crops and backyard gardens and is providing a boost to water-based summer recreation such as boating and swimming. However, the combined effect of warmer air and water temperatures and decreasing ice coverage will likely cause an increase in the growth of nuisance aquatic

plants and algae, including Cyanobacteria, in Lake Ontario which could contribute to recreational impairments.

Public Health

Changes in climate conditions are beginning to affect human health. Several health impacts of warming temperatures have been documented throughout the country such as increased illnesses and deaths from heat events, injuries and deaths from extreme weather events, and respiratory illnesses such as asthma due to changes in air quality. Food, water, and animal-borne diseases affecting humans, livestock, and wildlife are governed by environmental conditions. Projections of warmer winters, hotter summers, and unpredictable precipitation patterns can cause increases in certain types of diseases. For example, climate change in the Northeast is expected to result in the increased population rates of mosquitoes and ticks. As the population of these insect increases, it could result in more frequent outbreaks of West Nile Virus and Lyme disease-causing bacteria.

Invasive and Endangered Species

While insects and diseases are a natural part of the aquatic and terrestrial ecosystems, climate change is gradually shifting pest populations of invasive as well as native species. Some warm-weather species that previously could not survive cold temperatures are now able to establish themselves, threatening populations of native species. This is already occurring with increasing invasive species populations throughout New York State. Early detection and a rapid response of new infestations of invasive species are the most effective ways that Richland and Pulaski can address this problem.

The Hemlock Woolly Adelgid, Asian Longhorn Beetle and Emerald Ash Borer are invasive tree pests that pose a threat to Central New York. They have the potential to damage local tree populations and the communities and industries that rely on them. The destruction of hemlock in New England forests affects recreational activities such as fishing. As pests kill trees adjacent to streams, shade is no longer provided and stream water temperatures increase beyond what is ideal for coldwater fish such as trout.

Asian clams and zebra mussels are invasive water species that are found in Lake Ontario. Zebra mussels have caused reductions in phytoplankton, which allows aquatic vegetation to grow more quickly as light can more easily penetrate the water, while Asian clams clog water intake pipes and cause algae blooms.

Agriculture

14.0% of the land in Richland and Pulaski is classified as agricultural. Farmers participate in numerous conservation activities to avoid surface and groundwater contamination and to reduce pollution runoff to nearby waterbodies. The Oswego County SWCD develops erosion and sediment control plans, assists with stormwater facility permitting, works on streambank restoration to reduce erosion

Oswego County Tourism director, Janet Clerkin, gathers invasive water chestnuts from the Salmon River estuary

Photo Credit: Half-Shire Historical Society

and sedimentation, and provides assistance in the identification of green infrastructure opportunities. Richland is working with the SWCD to identify priority erosion areas in the watershed and to design preventative measures to reduce stormwater runoff.

As with many New York State farming communities, the conversion of land from agricultural to non-agricultural uses is often caused by development pressures and land use conflicts. Farmland protection for Richland and neighboring communities in Oswego County involves laws, policies and programs that support a strong local economy and that protect agricultural land use. Several methods of farmland protection strategies are found at the state, county and local levels. Examples of these tools include the County Agricultural Districts, agricultural value assessments, local and state right-to-farm laws, infrastructure support, economic development, conservation easements and land use planning that is sensitive to the needs of farms and agriculturally based businesses. The Oswego County Farmland Protection Plan is intended to evaluate existing farmland protection policies and laws, and propose ways to strengthen or add to them.

Douglaston Barn

Photo Credit: CNY RPDB

COMMUNITY CHARACTERISTICS

There is a growing recognition by scientists and policy analysts that a substantial part of the global warming challenge could be met through a change in the design of cities and towns. The form and function of municipalities can reduce the demand for energy by influencing how energy is produced, distributed, and used. Urban planning, for example, can reduce the number and distance of vehicle trips by designing compact communities with reliable transportation to and from employment, and by placing services within easy walking distance from home.

Deer Creek Marsh Wildlife Management Area

Photo Credit: Spider Rybaak

National studies show that a GHG reduction of up to ten percent may result from a change in land use approach alone, and additional reductions will result from employing other strategies such as investments in transit, encouraging development around transit stops, and parking charges. By one estimate, approximately two-thirds of all development in the nation by 2050 will be new or will have been redeveloped since 2007, suggesting that combined land use and transportation strategies could be quite influential in mitigating the increases in GHGs.

Transportation

Research has shown that miles driven are reduced by between 20 and 40 percent in compact urban development compared to miles driven in the auto-dependent suburbs that have prevailed in North America since the Second World War. Transportation contributes about 33 percent of energy-related greenhouse gas (GHG) production in the United States, and single-occupant automobile travel makes up about half of that activity.

The vast majority of vehicles burn carbon fuels and this is expected to continue for some time, even with aggressive fuel substitution and efficiency measures. Strategies that reduce travel by limiting low-density development and encouraging compact, walkable, full-spectrum living and working communities therefore have the potential to make a significant contribution to overall climate change mitigation.

Commuting to Work: The way that land uses and transportation infrastructure are developed within a community influences whether residents choose to walk, bike, drive, or use public transit. These travel choices directly affect the amount of transportation-related GHG emissions that are produced.

According to data from the 2014 American Community Survey, 95% of the residents in Richland and Pulaski work outside of the home. The highest percentage of Richland and Pulaski residents (15.5%) work within the Town of Richland and commute less than 15 minutes. Additional transportation destinations are found in Table 4, and additional travel times are found in Table 6.

According to 2014 data from the American Community Survey, the majority of residents (21.3%) were employed in educational services and health care and social assistance. The second most significant employment industry

Research has shown that per capita energy consumption and GHG emissions are 2 to 2.5 times higher in low-density developments than in high-density areas.

for Richland residents is retail trade, with 13.7% of residents employed in this industry. The majority of workers (95%) commuted to work. Of the total number of employed residents, approximately 1,681 (79.7%) drove alone, 254 (12.0%) carpooled, and 102 (4.8%) worked from home. Single-passenger automobile trips to and from Richland generate substantially more GHG emissions per mile than public transit and carpooling. Unfortunately, there are very few opportunities for public transit in Richland. Preparation of a commuting analysis would help determine the need for organized carpooling opportunities. Carpooling, ridesharing, and similar efforts to reduce vehicle traffic will help to reduce greenhouse gas emissions. Commute times to work and methods of transportation are summarized in Table 5.

Land Use

Additional carbon reductions could come from applying other types of land use planning and redevelopment. Using the critical mass of buildings and activities at the district scale, it is possible to develop practical and efficient heating and cooling systems (district energy systems). This approach shows great promise in reducing the carbon footprint of urban development in large municipalities. Other energy conservation benefits may result from

TABLE 4- COMMUTING DESTINATIONS FROM RICHLAND, NY[1]

Municipality	Estimated percentage of Residents Commuting to Destination
Richland Town	15.5%
Syracuse City	5.7%
Manhattan Borough	5.1%
Oswego City	3.6%
Albany City	3.5%
DeWitt Town	3.5%
Amherst Town	2%
Cicero Town	1.9%
Mexico Town	1.8%
Clay Town	1.8%
All Other Locations	55.6%

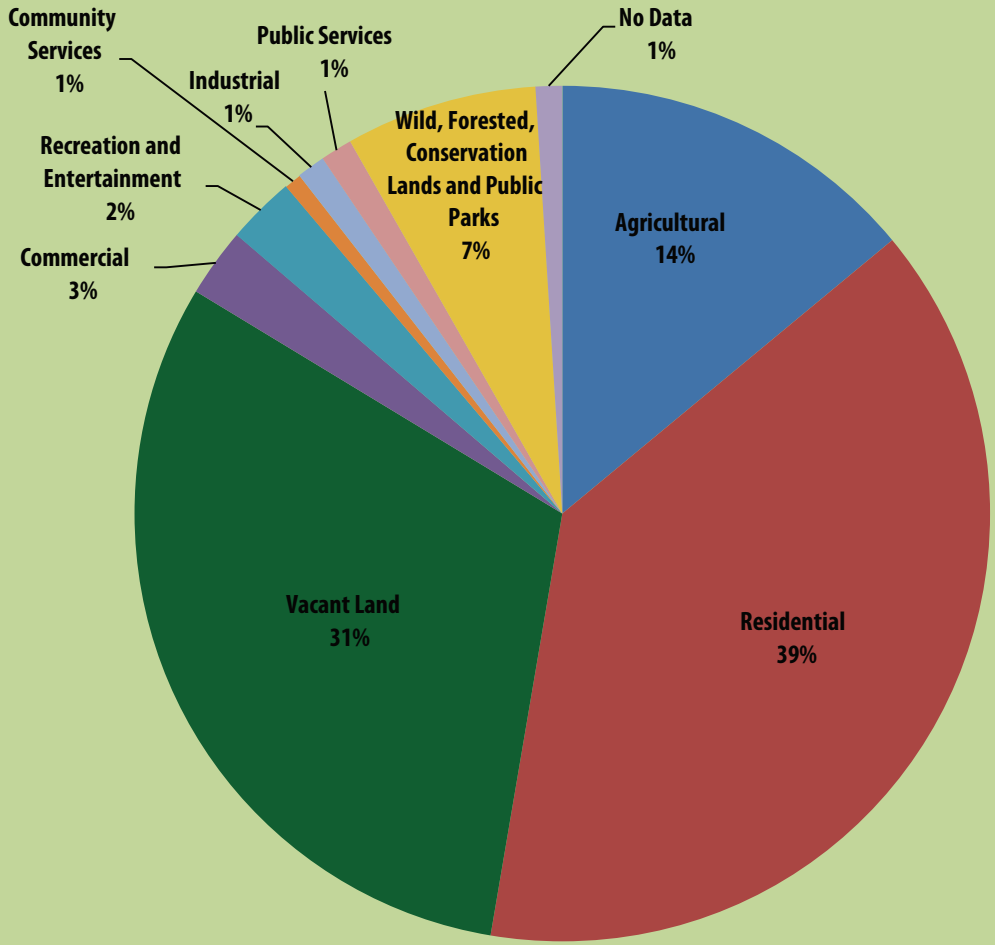
1 Source: U.S. Census Bureau, Center for Economic Studies, 2013

TABLE 5- TRANSPORTATION TO WORK IN RICHLAND[1]

Transportation to Work	Number of Workers	Percentage
Car, truck, van - drove alone	1,681	79.7%
Car, truck, van - carpooled	254	12.0%
Public transportation (excluding taxicab)	0	0.0%
Walk to work	52	2.5%
Worked from home	102	4.8%
Taxicab, motorcycle, bicycle, or other means	21	1.0%
TOTAL	2,110	100%

1 Source: American Community Survey, 2010-2014

FIGURE 4- RICHLAND LAND USE TYPES



common-wall and vertical living structures found in multifamily city locations. Recommendations for urban design in smaller communities such as Richland and Pulaski include the installation of green infrastructure to reduce stormwater runoff near homes and businesses. Support of localized food production and reliance on farmers markets will reduce shipping, storage, and packaging needs. These and other strategies that make use of land use and transportation alternatives could contribute to overall GHG mitigation.

Land use categories for the Town of Richland and Village of Pulaski are summarized in Figures 4 and 5. The category called 'wild, forested, conservation lands and public parks' includes land tracts with merchantable timber, state-owned forest land, county-owned reforested land, public parks, and wetlands. The category called 'Vacant' includes non-productive and abandoned agricultural land, and residential vacant land.

Examining existing land use patterns and transportation infrastructure provides insight into ways a community can reduce GHG emissions. Factors most directly influencing travel behavior include diversity of uses, proximity of uses, and density. Each of these topics is discussed on the following pages.

Diversity of Use: Diversity of use refers to the degree to which residential, commercial, industrial, institutional, and recreational uses are located together. Increasing the diversity

FIGURE 5- RICHLAND AND PULASKI LAND USE

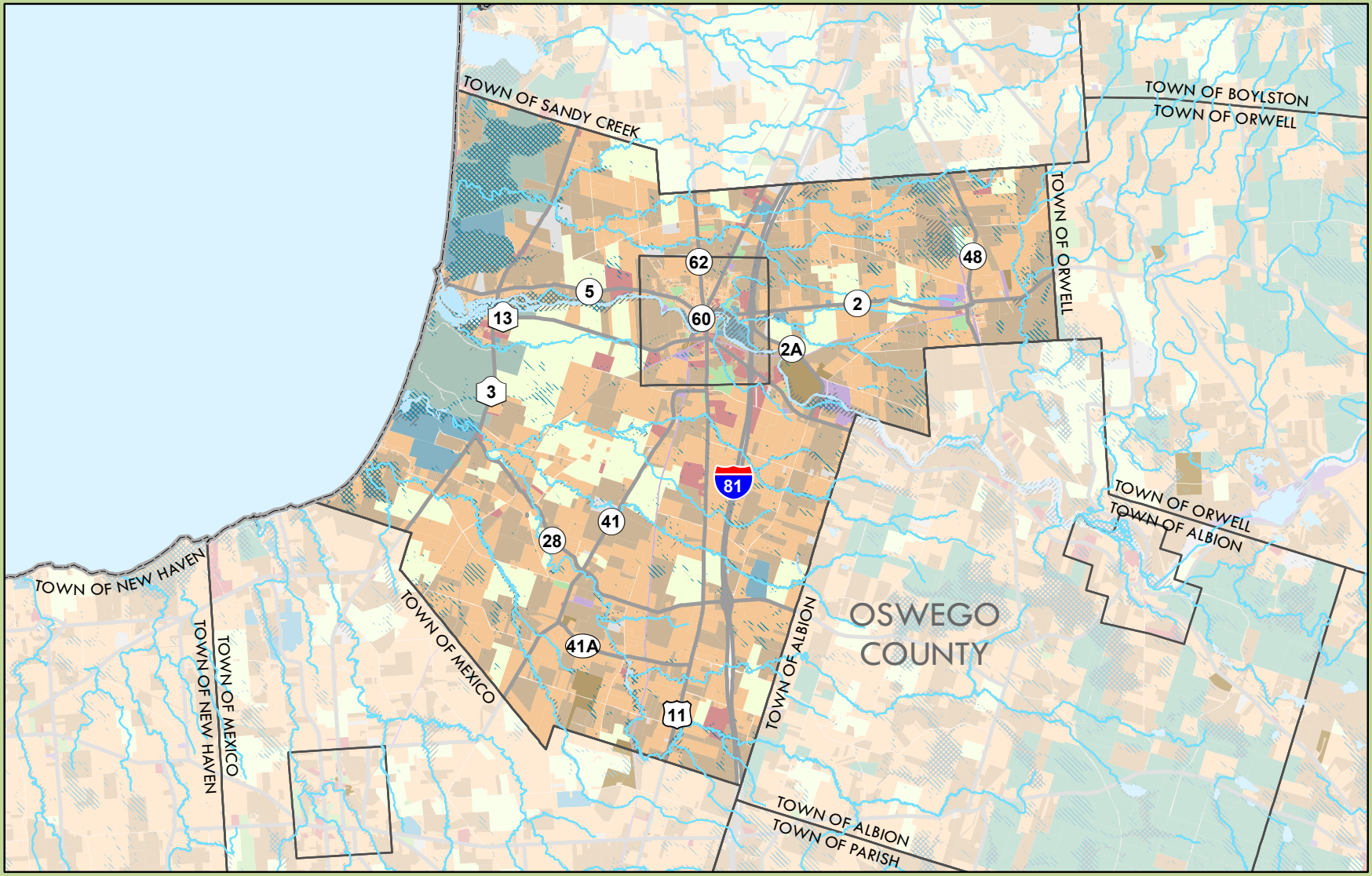
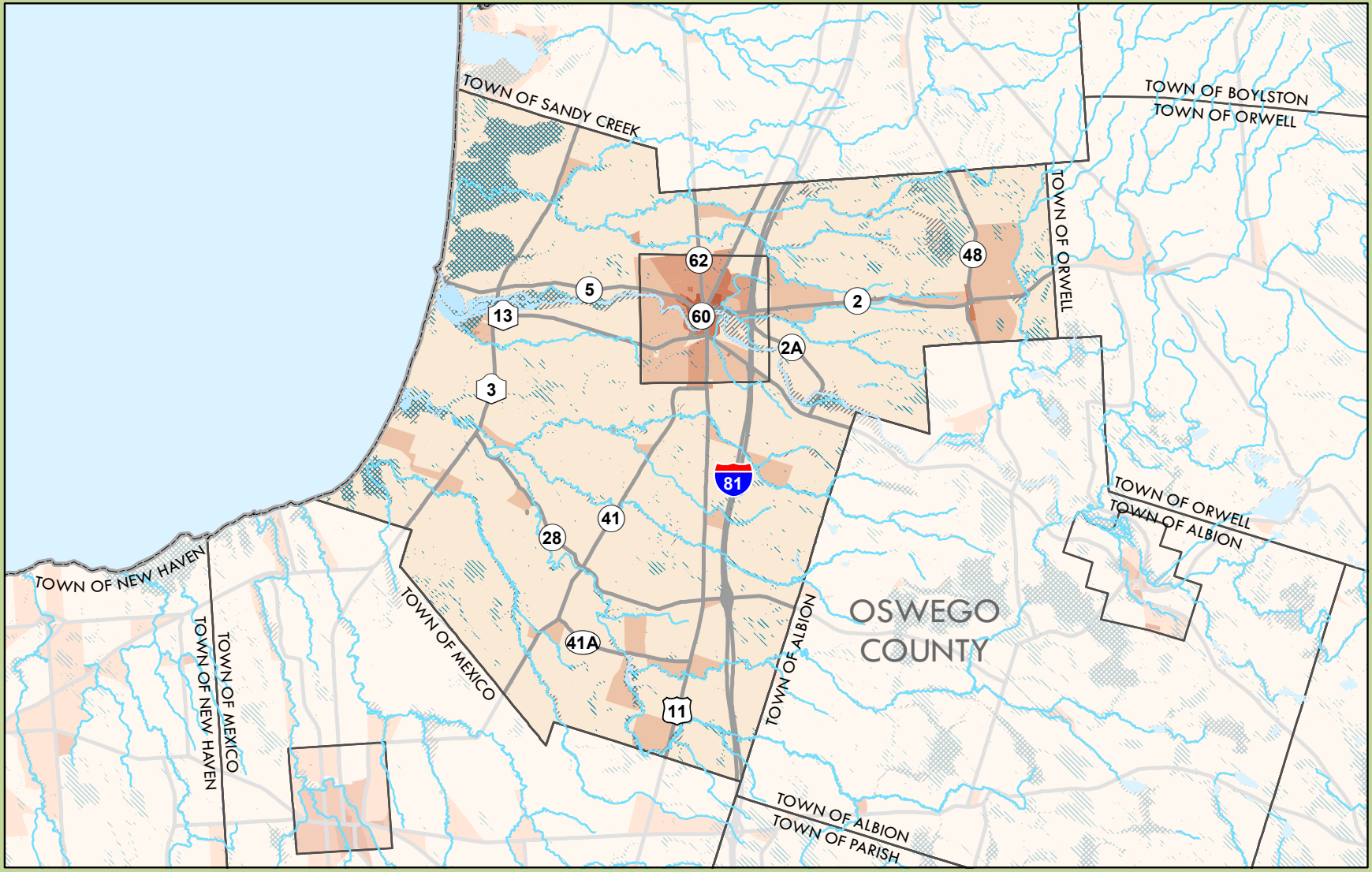


FIGURE 6- RICHLAND AND PULASKI POPULATION DENSITY



Population Density

Town of Richland and Village of Pulaski

0 0.375 0.75 1.5 2.25 3 Miles

Central New York Regional Planning & Development Board

Prepared by CNY RPDB, September 2015

Legend

- FEMA Floodplains
- Wetlands
- County, State, and Federal Roads

- <=150
- 151 - 500
- 501 - 1,500
- 1,501 - 5,000
- 5,001 - 15,000
- >15,000

of neighborhood-serving, and specifically job-rich, uses within a community could help reduce transportation-related GHG emissions. Increased diversity reduces travel distances and facilitates more walking and cycling trips. Improving the mix of uses within a community can also reduce commute distances, particularly if affordably priced housing is located in areas with a high number of jobs and employees can commute to work using alternative modes.

A jobs/housing ratio is commonly used to evaluate the diversity of land uses within a community by describing the relationship between employment opportunities and housing supply. A ratio of 1.0 describes a balance between jobs and housing. A ratio above 1.0 indicates that there are more jobs than housing, while a ratio below 1.0 describes an undersupply of jobs relative to housing. There are approximately 2,239 jobs in Richland and Pulaski and 2,788 households and the jobs/housing ratio is approximately 0.8 . This demonstrates that there were slightly more houses than job opportunities in the community.

Proximity of Uses: Proximity of uses refers to the distance between neighborhood commercial services and residents' homes. The number of residential homes that are located within ¼ mile of commercial properties in Richland was calculated and then used as a basis for the development of CAP recommendations. This provided insight into the effectiveness of the community's existing zoning and land use pattern from the pedestrian perspective. Of the 2,109 residential parcels in Richland and Pulaski, 1,209 (38.64%) are located within ¼ mile of a commercial parcel. Although some residential areas are distant from commercial services, overall, the existing land use pattern creates some opportunities for pedestrian and bicycle travel.

Density: Density refers to the number of housing units, people, or jobs in a given area. Higher densities refer to an increased number of services, shops, schools, and public buildings located within a neighborhood which increases the availability of transit and pedestrian infrastructure. These conditions tend to reduce the need for vehicle ownership and increase the use of alternative modes. Residential density is normally measured in terms of households per acre. According to the U.S. Census, Richland and Pulaski have a relatively low residential density of 0.08 households per acre.

Urban design research demonstrates that most people will walk to destinations that are within ¼ mile or a 5-minute leisurely walk. Neighborhoods are considered to be pedestrian-friendly if residents' homes are within ¼ mile of a diverse array of commercial and civic uses.

TABLE 6- COMMUTE TIMES TO WORK FROM THE TOWN OF RICHLAND[1]

Commute Times	Workers	Percentage
Less than 15 minutes	817	40.7%
15-29 minutes	304	15.1%
30-59 minutes	777	38.7%
60-89 minutes	71	3.5%
90+ minutes	39	1.9%
TOTAL	2,008	100%

1 Source: American Community Survey, 2010-2014

Greenhouse Gas Inventory Summary: Town of Richland

As part of the Climate Change Innovation Program, an inventory of the town's municipal and community Greenhouse Gas (GHG) emissions was conducted in 2015 with the assistance by CNY RPDB staff. The 2015 inventory report examined emissions generated in the Town of Richland in 2011, which serves as the baseline year for the Climate Action Plan.

The inventory report found that in the 2011 base year, town municipal operations generated a total of 216 metric tons of carbon dioxide equivalent ($MTCO_2e$), which were broken up into 4 sectors: buildings and facilities (75 $MTCO_2e$, 35%), streetlights and traffic signals (8 $MTCO_2e$, 4%), vehicle fleet (105 $MTCO_2e$, 49%), and water delivery facilities (28 $MTCO_2e$, 13%).

Community emissions totaled 57,366 $MTCO_2e$, which were broken up into 5 sectors: residential energy (5,164 $MTCO_2e$, 9%), commercial energy (5,519 $MTCO_2e$, 10%), industrial energy (1,324 $MTCO_2e$, 2%), transportation (43,190 $MTCO_2e$, 75%), and waste (2,169 $MTCO_2e$, 4%).

This Climate Action Plan uses the data gathered in the 2015 GHG inventory report as a baseline for analyses to determine which energy efficiency strategies will be most effective. The strategies presented in this document are based on goals that will help Richland to reduce emissions, energy use, and dollars spent on municipal and community operations by the year 2025.

FIGURE 7- TOWN OF RICHLAND MUNICIPAL EMISSIONS BY SECTOR $MTCO_2E$ (2010 BASELINE)

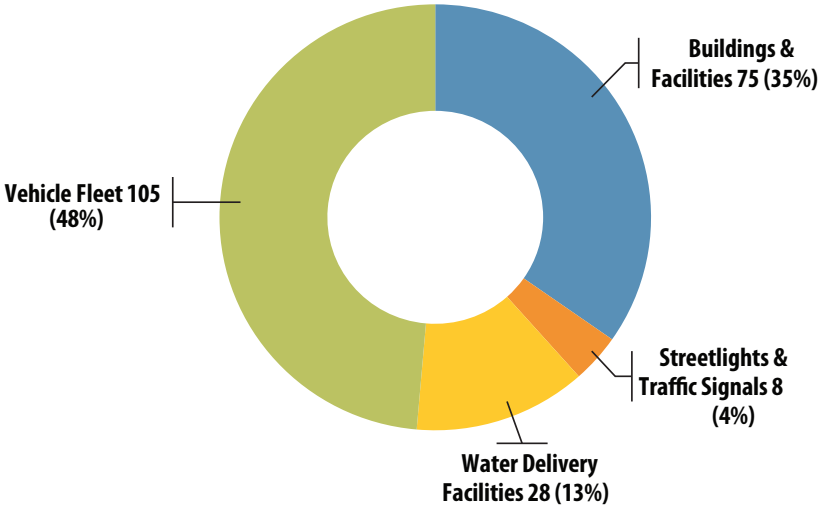
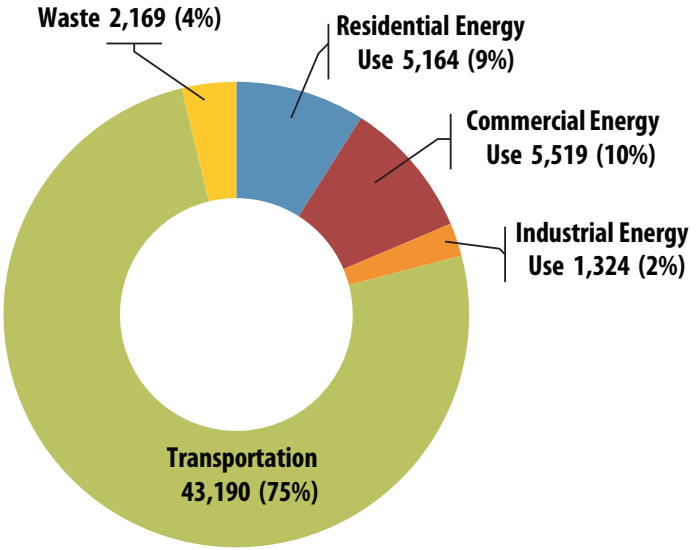


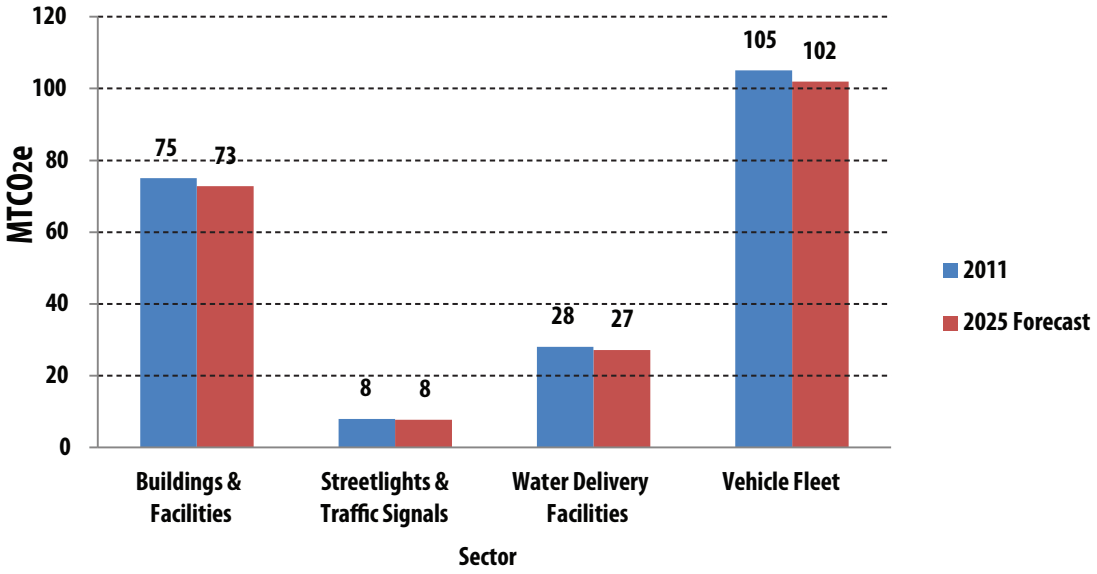
FIGURE 8- TOWN OF RICHLAND COMMUNITY EMISSIONS BY SECTOR $MTCO_2E$ (2010 BASELINE)



1 MTCO2e =

- CO2 emissions from 112 gallons of gasoline consumed
- CO2 emissions from 2.3 barrels of oil consumed
- CO2 emissions from 41.7 propane cylinders used for home barbeques
- Carbon sequestered by almost 1 acre of U.S. forests in one year

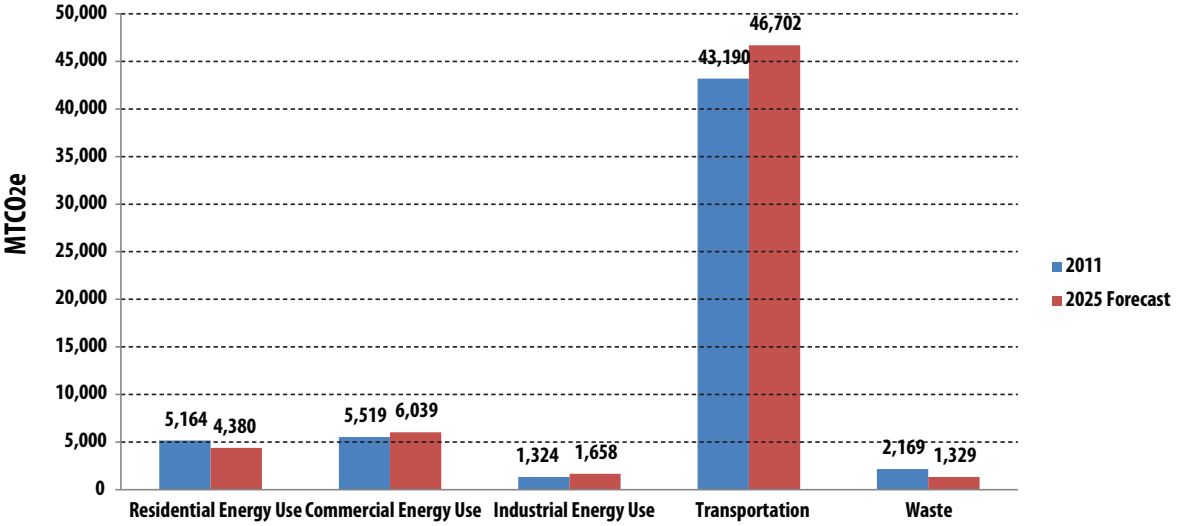
FIGURE 9- EMISSION FORECAST:
MUNICIPAL OPERATIONS



The GHG inventory report also forecasted emissions for the Town of Richland in 2025. The report explained that town municipal emissions are expected to total 210 $MTCO_2e$ in 2025, with a 2 $MTCO_2e$ decrease in buildings and facilities emissions, no change in streetlights and traffic signals, a 1 $MTCO_2e$ decrease in water delivery facilities, and a 3 $MTCO_2e$ decrease in vehicle fleet.

FIGURE 10- EMISSION FORECAST:
COMMUNITY

Community emissions are expected to total 60,108 $MTCO_2e$ in 2025, with a 784 $MTCO_2e$ decrease in the residential sector, a 520 $MTCO_2e$ increase in the commercial sector, a 334 $MTCO_2e$ increase in the industrial sector, a 3,512 $MTCO_2e$ increase in the transportation sector, and a 840 $MTCO_2e$ decrease in the waste sector.



Greenhouse Gas Inventory Summary: Village of Pulaski

As part of the Climate Change Innovation Program, an inventory of the village's municipal and community Greenhouse Gas (GHG) emissions was conducted in 2015 with the assistance by CNY RPDB staff. The 2015 inventory report examined emissions generated in the Village of Pulaski in 2011, which serves as the baseline year for the Climate Action Plan.

The inventory report found that in the 2011 base year, village municipal operations generated a total of 252 metric tons of carbon dioxide equivalent ($MTCO_2e$), which were broken up into 4 sectors: buildings and facilities (54 $MTCO_2e$, 21%), streetlights and traffic signals (34 $MTCO_2e$, 14%), vehicle fleet (71 $MTCO_2e$, 28%), and water/sewer facilities (93 $MTCO_2e$, 37%).

Community emissions totaled 24,593 $MTCO_2e$, which were broken up into 5 sectors: residential energy (5,590 $MTCO_2e$, 23%), commercial energy (7,160 $MTCO_2e$, 29%), industrial energy (223 $MTCO_2e$, 1%), transportation (10,090 $MTCO_2e$, 41%), and waste (1,530 $MTCO_2e$, 6%).

This Climate Action Plan uses the data gathered in the 2015 GHG inventory report as a baseline for analyses to determine which energy efficiency strategies will be most effective. The strategies presented in this document are based on goals that will help Pulaski to reduce emissions, energy use, and dollars spent on municipal and community operations by the year 2025.

1 $MTCO_2e$ =

- CO_2 emissions from 112 gallons of gasoline consumed
- CO_2 emissions from 2.3 barrels of oil consumed
- CO_2 emissions from 41.7 propane cylinders used for home barbeques
- Carbon sequestered by almost 1 acre of U.S. forests in one year

FIGURE 7- VILLAGE OF PULASKI MUNICIPAL EMISSIONS BY SECTOR $MTCO_2E$ (2010 BASELINE)

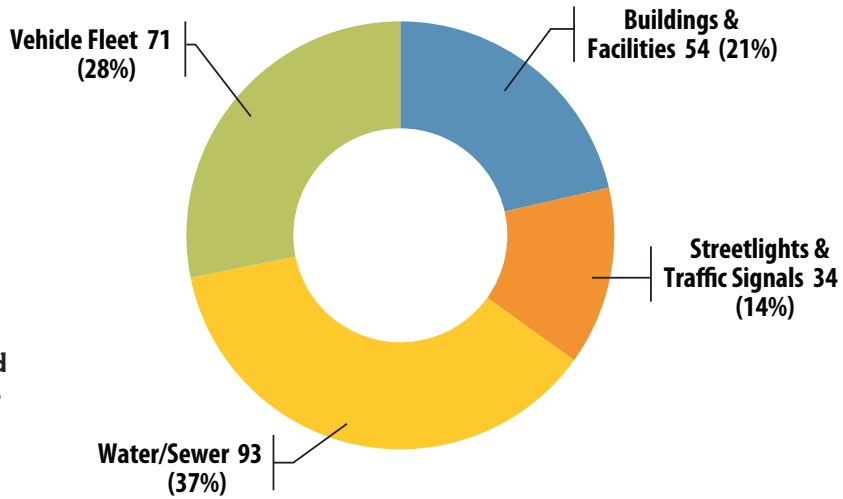


FIGURE 8- VILLAGE OF PULASKI COMMUNITY EMISSIONS BY SECTOR $MTCO_2E$ (2010 BASELINE)

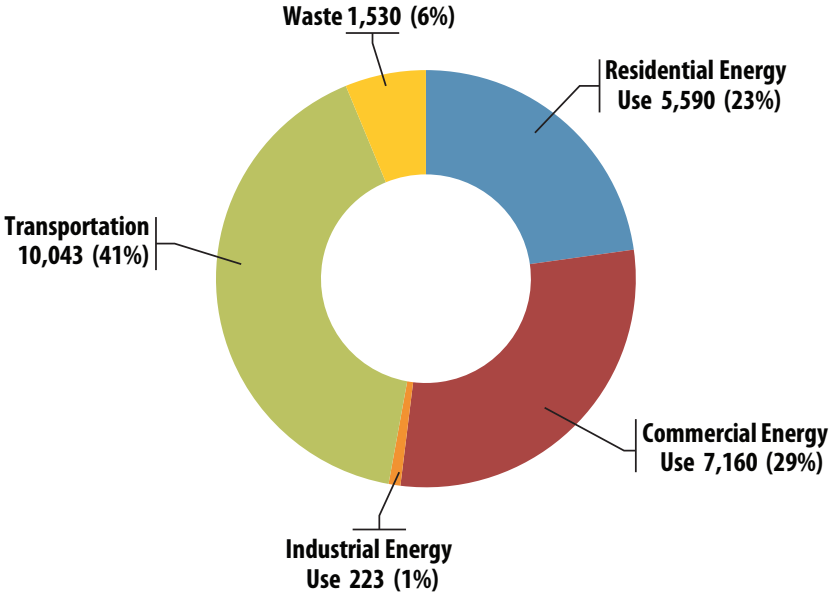
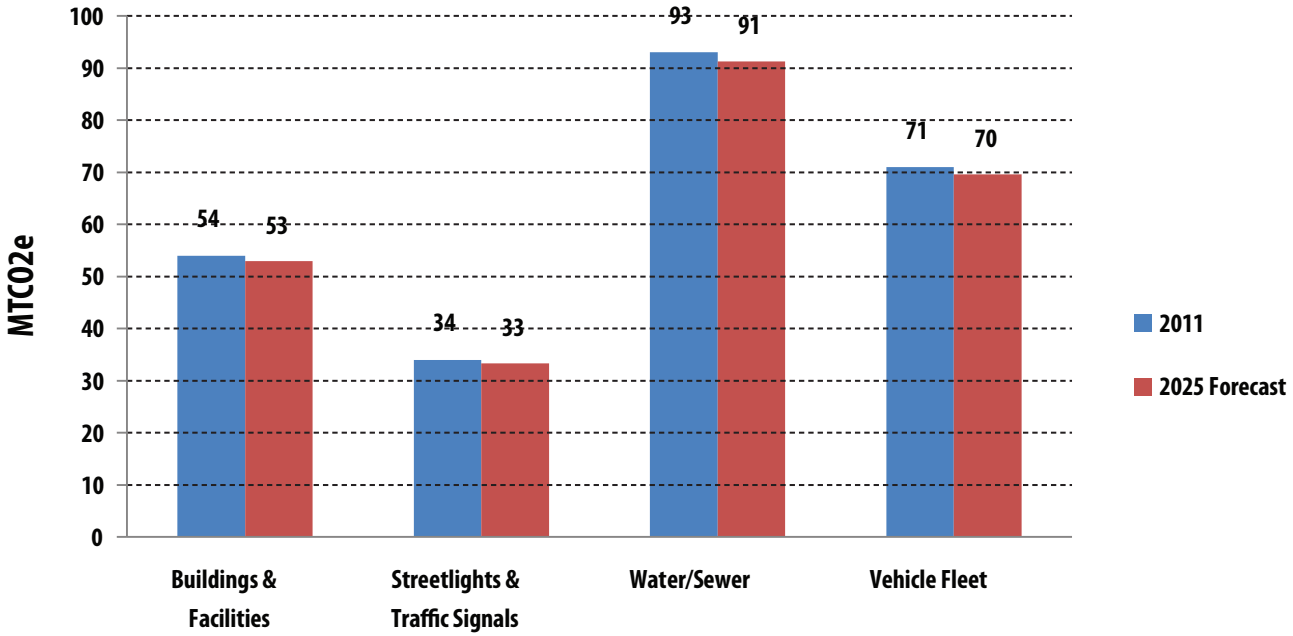


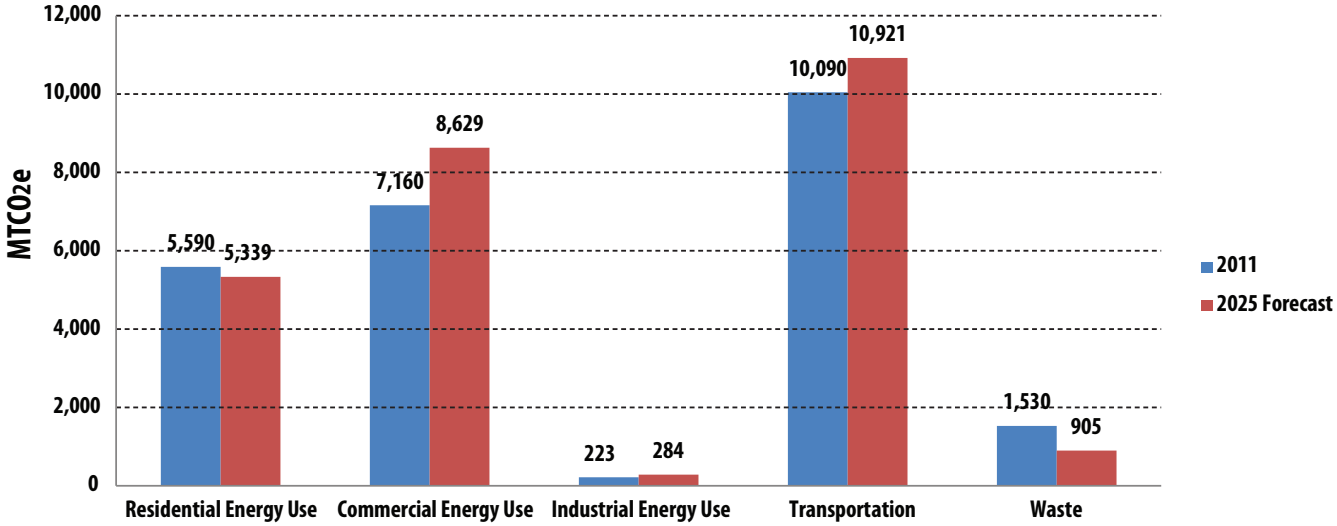
FIGURE 9- EMISSION FORECAST:
MUNICIPAL OPERATIONS



The GHG inventory report also forecasted emissions for the Village of Pulaski in 2025. The report explained that village municipal emissions are expected to total 247 $MTCO_2e$ in 2025, with a 1 $MTCO_2e$ decrease in buildings and facilities emissions, a 1 $MTCO_2e$ decrease in streetlights and traffic signals, a 2 $MTCO_2e$ decrease in water/sewer facilities, and a 1 $MTCO_2e$ decrease in vehicle fleet.

Community emissions are expected to total 26,129 $MTCO_2e$ in 2025, with a 251 $MTCO_2e$ decrease in the residential sector, a 1,469 $MTCO_2e$ increase in the commercial sector, a 61 $MTCO_2e$ increase in the industrial sector, a 882 $MTCO_2e$ increase in the transportation sector, and a 625 $MTCO_2e$ decrease in the waste sector.

FIGURE 10- EMISSION FORECAST:
COMMUNITY



Climate Action Accomplishments

The Richland/Pulaski community and county planners have been pro-active in adapting to climate change and have taken steps to reduce greenhouse gas emissions. The town and village, along with 170 other municipalities in New York State, signed a municipal resolution to become a Climate Smart Community. The town and village worked with the CNY Regional Planning and Development Board to complete greenhouse gas inventories in 2015. The following narrative provides a brief summary of several additional initiatives that protect Richland and Pulaski against storm events, pollution runoff to the lake, and other climate influences.

In 2011, the Town of Richland installed a 100 kW wind turbine at the Richland well site that generates approximately 65,000 kWh per year, offsetting about 64% of electricity used on site and reducing emissions annually by about 15 $MTCO_2e$. The installation was made possible thanks to the New York State Green Innovation Grant Program (GIGP), which covered about 90% of the installation costs of the turbine.

The town has also upgraded lights and fixtures to LED at the Haldane Ice Arena and the Town Highway Garage with assistance from National Grid.

Both the town and village have compiled a greenhouse gas inventory of emissions to get a better sense for how energy is being used and which sectors generate the most greenhouse gas emissions. This Climate Action Plan uses the inventories as a basis for the actions recommended within.

StormReady Status

In 2007, NOAA'S National Weather Service renewed Oswego County's StormReady status. StormReady is a national preparedness program that supports municipalities that take a proactive approach to improving local hazardous weather operations and public awareness and provides improved communication and safety skills that can be utilized before and during severe weather and flooding events.

The program provides communities with guidance from a partnership between local National Weather Service forecast offices and state and local emergency managers. To be recognized as StormReady, a community must:

+ Establish a 24-hour warning point and emergency operations center;
+ Have more than one way to receive severe weather forecasts and warnings and to alert the public;
+ Create a system that monitors local weather conditions;
+ Promote the importance of public readiness through community seminars;
+ Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

The Oswego County Emergency Management Office facilitated Oswego County's designation as a National Weather Service StormReady Community.

County Operations

Richland and Pulaski benefit from several emergency management programs that are administered by Oswego County. These services include the following:

+ Disaster education programs for school children and community groups focus on family disaster planning, weather emergencies and hazardous chemical awareness
+ Disaster planning assistance for community organizations and businesses including how to develop a comprehensive emergency management plan

Pulaski Farmer's Market

Photo Credit: Half-Shire Historical Society

+ The Oswego County Sheriff's Department offers emergency planning training on boater safety and snowmobile safety courses
+ Suspicious package recognition training provides school personnel and others with information and skills to safely respond to threats of suspicious packages.
+ An opportunity is available to have fingerprints taken and identification information gathered on family members which can be used for the identification of people in emergency situations

Oswego County Emergency Management Office

The Oswego County Emergency Management Office (EMO) serves as the disaster services and emergency preparedness center for the County. It maintains and administers an integrated emergency management program designed to ensure life safety, property and environmental protection from all natural, human-caused, and technological hazards through preparedness, prevention/mitigation, response and recovery. The EMO provides planning and training resources, response and warning coordination, and information distribution through communications to the public, local government officials, and public safety agencies to assist them in emergency management. It coordinates plans for emergency response, including county-wide and local comprehensive emergency management and hazard-specific plans such as radiological, hazardous materials, or multiple-casualty.

The Emergency Management Office manages the Emergency Medical Services course sponsorship program through the New York State Department of Health/Emergency Medical Services Bureau. In addition, during disaster response, the Emergency Management Office facilitates the County Emergency Operations Center, which coordinates and allocates resources, planning, public warning and information, and recovery with agencies involved in emergency response.

Fishing on the Salmon River

Photo Credit: CNY RPDB

National Incident Management System (NIMS)

NIMS is a federal program that was developed so that emergency responders from different jurisdictions and disciplines can better respond to natural disasters and emergencies. NIMS establishes a command and management structure with emphasis on preparedness, mutual aid and resource management. NIMS provides training for emergency responders and others that work with response agencies during emergencies and disasters. These include fire, emergency medical services, and law enforcement personnel, as well as municipality chief elected officials, schools, hospitals, volunteer agencies and others. The Director of the Oswego County Emergency Management Office is the point-of-contact for NIMS compliance for local governments and emergency response agencies.

Oswego County Soil and Water Conservation District

The Oswego County Soil and Water Conservation District (SWCD) develops erosion and sediment control plans, assists with stormwater facility permitting, works on streambank restoration to reduce erosion and sedimentation, and provides assistance in the identification of green infrastructure opportunities.

Climate Adaptation vs. Mitigation

According to climate researchers, continued emissions of greenhouse gases will cause further warming with changes anticipated in all components of the global ecosystem. Reducing the rate of climate change will require substantial and sustained decrease of greenhouse gas emissions. These are the key conclusions from an assessment by the Intergovernmental Panel on Climate Change (IPCC) that was released in January 2014. 259 scientists from 39 countries around the world further stated that, "Warming of the climate system is unequivocal and since the 1950s, many of the observed changes are unprecedented over decades to millennia." Their findings are based on numerous independent scientific analyses and observations of the climate system, paleoclimate archives, theoretical studies of climate processes and simulations using climate models. The Summary for Policymakers of the IPCC Working Group I assessment report was approved in September 2013 by the member governments of the IPCC meeting in Stockholm, Sweden.

Fernwood Dam, Autumn 2015

Photo Credit: Dawn Holynski

Unprecedented human intervention will be required in the coming decades to reduce the extent of climate change. This can be done by avoiding the potential consequences (referred to as **mitigation**), or making changes to accommodate those effects that are unavoidable (referred to as **adaptation**). Much of the mitigation policy information in this report has centered on reducing greenhouse gas (GHG) emissions through fuel substitution and fuel efficiency for vehicles and on energy efficiency for buildings and industries.

The scale of intervention required to reduce and adapt to the effects of climate change will require action at all levels of government and society. International accords to limit overall carbon emissions will involve national governments. Setting carbon emission targets and standards by industry or sector, or fuel efficiency standards for vehicles, falls within the traditional purview of federal and state governments. New York State, for example, has set aggressive energy and climate goals, including meeting 30% of the state's electric needs with renewable energy sources by 2030, and reducing greenhouse gas (GHG) emission by 80% (below 1990 levels) by 2050.

The U.S. Environmental Protection Agency refers to the term "adaptation" as the adjustment or preparation of natural or human systems to a changing environment which moderates harm or exploits beneficial opportunities. Examples of community adaptation to extreme weather include

development of early storm warning systems, air-conditioned cooling shelters, and policies that discourage people from building in flood prone areas. This type of initiative will require comprehensive, community-wide planning that addresses all climate risk factors that may be associated with storm events, flooding, snowfall, and wind damage.

A primary goal for Central New York, as presented in *Vision CNY: Central New York Regional Sustainability Plan*, is to reduce CO_2 emissions, maintain the amount of electric power production in the region that is derived from carbon-free sources such as solar, wind, and nuclear, and adapt to a changing climate by improving community resilience, protecting infrastructure, and protecting natural systems. A gradual increase in high and low temperature extremes, coinciding with an increase in the frequency and intensity of storm events are expected to impact transportation infrastructure, human health, agricultural practices, forest diversity, and migratory patterns of invasive species. Adapting to climate change will provide opportunities for Richland and Pulaski to improve the health and resilience of the community and will provide long-term protection of natural resources. The local government is leading by example by reviewing options to reduce energy usage in municipal facilities through alternative fuels for transportation fleets and renewable energy sources. Local officials and the CNY RPDB are meeting with community leaders to review building codes and standards and to explore options to educate the public about adaptation measures and alternative energy choices.

Assemblyman Will Barclay and Legislator Shawn Doyle at Arbor Day Tree Planting

Photo Credit: Half-Shire Historical Society

Several policy recommendations for climate mitigation and adaptation are presented in the pages that follow. They are designed to help Richland and Pulaski prepare for current and anticipated changes in climate conditions and to assist decision-makers in identifying opportunities to improve community resilience. The recommendations provide actions that Richland and Pulaski can take to protect people, homes, buildings and natural systems by reducing risks from environmental hazards such as extreme heat and storm events. They are designed to reduce community emissions, promote energy efficiency, vehicle fuel efficiency, alternative transportation, land use planning, and other strategies. The community is encouraged to update these recommendations each year as additional data becomes available.

TRANSPORTATION

According to the town and village's GHG Inventory Reports, transportation accounted for 38% of government emissions and 65% of community emissions in 2011. This Climate Action Plan addresses two main transportation emissions reduction goals: utilize efficient methods of transportation and increase use of alternative fuels in transportation.

Pedestrian crosswalk by Springbrook Apartments

Photo Credit: CNY RPDB

Mitigation Strategy Goals for 2020

Utilize Efficient Methods of Transportation

Carpooling: 1,900 $MTCO_2e$ annual reductions.

This strategy assumes that 5% of vehicle trips are reduced through carpooling.

Increase telecommuting: 1,527 $MTCO_2e$ annual reductions.

This strategy assumes that 5% of people with primary jobs in Richland/Pulaski telecommute.

Expand bicycling infrastructure: 929 $MTCO_2e$ annual reductions.

This strategy assumes that 10% of weekly trips less than 2 mile are converted to bicycling.

Expand pedestrian infrastructure: 393 $MTCO_2e$ annual reductions.

This strategy assumes that 5% of weekly trips less than 1 mile are converted to walking.

Easy on/off I-81 ramps: 222 $MTCO_2e$ annual reductions.

This strategy assumes that 30% of vehicles exiting I-81 in the village get back on I-81 in the same direction and have to travel the additional 2 miles between off and on-ramps.

Reduce municipal fleet mileage: 2 $MTCO_2e$ annual reductions.

This strategy assumes 2,000 miles are reduced.

Utilizing efficient methods of transportation would reduce the amount of vehicle miles traveled (VMT) and the amount of gasoline and diesel use which would therefore reduce emissions, fuel costs, and reliance on foreign fossil fuels. Encouraging community members to walk or bike instead of driving will allow municipalities to reduce VMT. E-mail, video conferencing, and telephones can replace face-to-face meetings, eliminating the need to travel and saving valuable work time. Carpooling is another way community members can reduce emissions and save money.

High quality low-carbon forms of transportation provide multiple co-benefits besides energy savings and emission reductions, including congestion reductions, road and parking facility cost savings, consumer savings and affordability, improved mobility for non-drivers, support for strategic land development objectives (i.e. reducing sprawl), and improved public fitness and health.

It is recommended that the Village of Pulaski builds out sidewalk infrastructure, specifically building a wide sidewalk to the High School on Route 11 south of the railroad tracks on Route 11/Salina Street. This will encourage safe walking to and from the High School. Also, sidewalks could be encouraged from Pine Street along Delano Street to the Pulaski Health Center, and thence to the Deerfield Apartments. This will provide ease of walking to and from the Health Center.

It is also recommended that sidewalks are added in the Hamlet of Richland to support the growing population and to encourage better health. This should also include building out recreational trails

into the town-owned well fields for low-impact non-vehicular four-season use.

The town and village should also support the continuance of the Salmon River Greenway Trail with paths from the end of the current walkway on River Street west along the River to the top of Forest Drive, through Forest Glen Park; thence along Bridge Street down to the Black Hole and back, as well as out to Lake Road to meet a proposed recreational trail system to be built along Lake Road/County Route 5 on the south side of the road to Port Ontario. This trail system should have interpretive historic signage for Browns Landing and Bethel Church as well. Another trail system linking Selkirk Shores State Park with the Village of Pulaski could be constructed as well utilizing the existing abandoned rail right of way.

Easy off/on access to I-81 in the Village of Pulaski does not currently exist. This means that vehicles traveling both north and south-bound that exit I-81 in the Village of Pulaski for a quick rest stop do not have the ability to immediately enter back into I-81 in the direction in which they were traveling. Instead, vehicles heading north on I-81 that exit to visit the Byrne Dairy, for example, are then required to travel through the village via Rome Rode to Route 11 to Richland Road in order to again enter I-81 traveling north, adding an extra 2 miles to their trip in Pulaski. This route also requires passing through four stop lights where vehicles idle as they wait for a green light. Accidents are prevalent along this route with large trucks navigating the narrow village roads. The same is true for vehicles traveling south. Adding easy off/on access to I-81 in the Village of Pulaski would reduce vehicle miles traveled through the Village of Pulaski, reducing fuel usage, costs, and emissions while improving air quality through the historic district.

It is also recommended that when the aging I-81 overpass bridges are torn down and replaced, they are replaced with updated and larger bridges with sidewalks to encourage walking and biking.

Jefferson Street, Pulaski

Photo Credit: Half-Shire Historical Society

Increased truck traffic through Richland and Pulaski due to trucking of milk from the Alfred farm in neighboring Sandy Creek has also affected the area. Upgrades along Route 48 to widen shoulders would make it safer for pedestrians and Amish traveling along the road in horse and buggies. Route 81 crossing bridges should also be maintained on Miller Road and Canning Factory Road and upgraded with wider shoulders to accomodate pedestrians and Amish traffic as well.

Adaptation Strategies

The town and village can encourage a reduction in the amount of transportation-related greenhouse gas emissions by bolstering existing local carpooling and ridesharing initiatives, such as the carpool opportunities provided by the Tinker Tavern carpool parking lot. Municipal leaders could encourage an expansion of this lot or encourage additional use of this lot by implementing LED lighting and/or electric vehicle charging facilities. They can also encourage local commercial businesses to designate a certain number of parking spaces in existing or future lots to carpooling. Municipal leaders can also encourage residents to buy smaller cars by providing a cost benefit analysis to show financial savings and emission reduction comparisons. Community members can reduce the number of student drop-off and pick-up trips to and from school, and the town and school district can consider providing education and incentive programs to encourage carpooling and bus ridership.

Mitigation Strategy Goals for 2020

Increase use of Alternative Fuels

Conversion of community vehicles to electric vehicles: 2,329 $MTCO_2e$ annual reductions.

This strategy assumes 10% of community vehicles convert to electric.

Conversion of community vehicles to hybrid: 1,124 $MTCO_2e$ annual reductions.

This strategy assumes 10% of community vehicles convert to hybrid.

Install electric vehicle charging facilities: 24 $MTCO_2e$ annual reductions.

This strategy assumes 5 charging facilities are installed in Richland and Pulaski.

Electric ice cleaner at hockey rink

Lura M. Sharp Elementary School, Pulaski

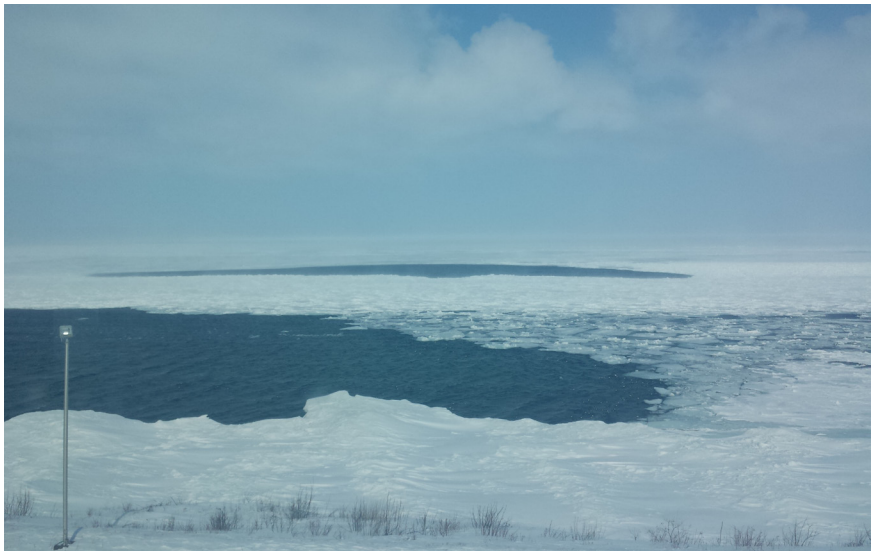
Photo Credit: Half-Shire Historical Society

Governor Cuomo announced on April 11, 2013 that more than 360 electric vehicle and plug-in hybrid charging stations will be installed across the state in support of his Charge NY initiative, which is an initiative to create a statewide network of up to 3,000 public and workplace charging stations over the next five years and to put up to 40,000 plug-in vehicles on the road during that period.

Hybrid and electric vehicles are less expensive to operate than regular vehicles, and while certain issues related to battery life still remain, maintenance and fuel cost savings are expected to outweigh the price of battery replacement.

Not only will using alternative fuels reduce greenhouse gas emissions, it will also reduce US dependence on imported fuels and reliance on fossil fuels in general. Increasing the use of alternative fuels would greatly reduce Richland and Pulaski's emissions and provide other benefits to community members as well.

The Zamboni at the Haldane Memorial Arena currently is fueled by propane. As the Zamboni reaches the end of its useful life, the town should consider purchasing an electric replacement ice cleaner to reduce emissions.



Left: The Palisades, sheer rock walls along the Salmon River

Top Right: Lake Ontario Ice Cover

Bottom Right: Relaxing in the Salmon River

Photo Credits: Half-Shire Historical Society

ENERGY EFFICIENCY

According to the GHG Inventory Reports, buildings/facilities accounted for 28% of total municipal emissions, water and sewer facilities accounted for 26%, and streetlights and traffic signals accounted for 9%, while residential energy use accounted for 13% of the community's emissions, commercial energy use accounted for 15% of the community's emissions, and industrial energy use accounted for 2% of total GHG emissions in Richland and Pulaski in 2011. This Climate Action Plan addresses two main energy/efficiency emissions reduction goals: increase energy efficiency in buildings; and increase use of renewable energy.

Snow Memorial Building
Photo Credit: Half-Shire Historical Society

Mitigation Strategy Goals for 2020

Increase energy efficiency and reduce emissions from buildings

Home weatherization: 363 $MTCO_2e$ annual reductions.

This strategy assumes 10% of households weatherize their homes.

Energy efficiency education for residents: 270 $MTCO_2e$ annual reductions.

This strategy assumes 10% of households participate in an educational program.

Promote loans/incentives for energy efficiency: 155 $MTCO_2e$ annual reductions.

This strategy assumes 10% of households undergo a retrofit with the assistance of loans/incentives.

Energy efficiency education for businesses: 47 $MTCO_2e$ annual reductions.

This strategy assumes 10 businesses participate.

Lighting occupancy sensors at municipal facilities: 37 $MTCO_2e$ annual reductions.

This strategy assumes occupancy sensors are installed at the hockey rink, town central water works, town and village highway garages, and Snow Memorial Building.

Retrofits/behavior changes at municipal facilities: 35 $MTCO_2e$ annual reductions.

This strategy assumes a 25% energy savings.

LED streetlights: 16 $MTCO_2e$ annual reductions.

This strategy assumes all 414 streetlights are converted to LED.

Lighting occupancy sensors: 11 $MTCO_2e$ annual reductions.

This strategy assumes 20,000 square feet of commercial buildings install sensors.

Power-down at night policy: 11 $MTCO_2e$ annual reductions.

This strategy assumes 20,000 square feet of commercial buildings power-down.

Energy efficiency education can be crucial in working to reduce emissions from buildings and facilities. Being familiar with actions that can be taken to increase building efficiency and reduce emissions, such as the ones listed, is the first step in carrying out those actions. Participating in the Central New York Energy Challenge Team Program and Classroom Energy Challenge can be implemented to educate community members on actions they can take at home and at school to reduce energy use and emissions. Businesses can be targeted in a similar educational program and/or energy challenge competition, possibly with the assistance of Operation Oswego County.

The Lura M. Sharp Elementary School could be a prime location for implementation of some of the reduction strategies noted, such as lighting occupancy sensors and powering-down at night.

Buildings in Richland and Pulaski may also not be equipped with the most recent energy efficient technologies, causing the town, village, and community members to use more energy than is necessary. Retrofitting existing facilities through measures like replacing appliances and light bulbs with more efficient ones, increasing insulation, and upgrading HVAC systems can greatly improve

energy efficiency and therefore reduce emissions from the municipal buildings and facilities. The town is planning to build a new, energy efficient highway garage that could incorporate many of the strategies noted.

Behavior changes such as turning down the heat and air conditioning or using programmable thermostats to reduce heating and cooling when buildings are not occupied can also significantly reduce energy use and emissions.

The initial cost of retrofitting heating units may seem daunting; however, the local government, NYSERDA, and the CNY RPDB can offer assistance and support to make retrofits easier by providing educational materials, low-interest loans, and guidance on where to find potential grants or incentives to help cover costs. Improving energy efficiency can help to reduce criteria air pollutants as well as greenhouse gas emissions and increases energy and water cost savings.

Adaptation Strategies

Richland and Pulaski can modify local laws to incorporate measures for adaptation to climate change, such as revaluating the use of PACE as a way for commercial property owners to pay for energy upgrades, on-site renewable projects, and water conservation measures, and establishing/maintaining strong building codes regarding energy use.

Richland Town Hall/Courthouse

Photo Credit: Half-Shire Historical Society

National DSIRE Database

Incentives available for renewable energies are constantly changing. The Database of State Incentives for Renewables & Efficiency, or DSIRE, is a website that offers comprehensive information on incentives and policies that support renewables and energy efficiency in the United States. Established in 1995, DSIRE is currently operated by the N.C. Solar Center at N.C. State University, with support from the Interstate Renewable Energy Council, Inc. DSIRE is funded by the U.S. Department of Energy. Visit dsireusa.org to learn more about current incentive opportunities.

Mitigation Strategy Goals for 2020

Increase use of renewable energy

Commercial solar: 870 $MTCO_2e$ annual reductions.

This strategy assumes 3,500 kW of solar PV is installed.

Residential solar: 478 $MTCO_2e$ annual reductions.

This strategy assumes 1,925 kW of solar PV is installed.

Municipal solar: 200 $MTCO_2e$ annual reductions.

This strategy assumes 805 kW of solar PV is installed.

Geothermal: 88 $MTCO_2e$ annual reductions.

This strategy assumes 5% of homes currently using fuel oil convert to geothermal.

Wind energy: 15 $MTCO_2e$ annual reductions.

This strategy takes into account the municipal wind turbine that was installed at the town's well site.

St. James Episcopal Church

Photo Credit: Maureen Anderson

By installing renewable energies like solar, Richland and Pulaski can ensure that their energy is provided by clean and local renewable energy sources, therefore reducing greenhouse gas emissions, energy cost, and reliance on fossil fuels.

Many residents or businesses would like to use renewable energies, but the large up-front cost is an obstacle. The local government can help overcome this barrier by offering low-interest loans or organizing group buying programs to negotiate lower prices, such as the Solarize Madison program offered in Madison County in 2012-2013, the Solarize Syracuse program offered in Syracuse in 2014, and the Solarize CNY program offered in Cayuga, Cortland, Madison, Onondaga, and Oswego Counties in 2015. These programs are an effective way of combining public and private funds for renewable energy. Solarize CNY hopes to offer another round of reduced solar options for the same 5-county region in 2016.

The New York State Energy Research and Development Authority (NYSERDA) provides incentives for the installation of solar PV based on system size. Additionally, there are renewable energy tax credits for residential and commercial solar PV, wind, and geothermal installations. Educational and technical assistance programs can also promote renewable energies. Local governments can offer information clearinghouses and connect consumers with renewable energy installers.

NYSERDA, New York Power Authority (NYPA) and City University of New York (CUNY) developed a NYS Unified Solar Permit that helps to reduce costs for solar projects by streamlining municipal permitting processes and supports the growth of clean energy jobs across the state. The unified solar permit is part of Governor Cuomo's NY-Sun initiative to quadruple in 2013 the amount of solar capacity in New York that was added during 2011.

Adoption of a standardized residential/small business solar permit is a key element to help New York municipalities remove barriers to local economic development in the growing solar industry. The standardized permit cuts costs by creating a uniform permitting process in municipalities across the state. Installers in New York State have had to work with different permits and permitting processes in each of the State's 1,550 municipalities, which increased the complexity of permitting and have caused project delays and added costs. The Town of Richland and Village of Pulaski have adopted the unified solar permit to reduce soft costs associated with solar installations.

An increasingly popular way for a local government to overcome the financial hurdles of installing a photovoltaic system is through the "solar services model" also known as a Power Purchase Agreement (PPA). Through this type of arrangement, the owner of a property can provide the space for a power producer to install the system. The property owner then agrees to buy the power produced from that system at a set rate that is competitive with grid electricity. Since the power producer retains ownership of the equipment, there are no installation and maintenance costs to the consumer of the electricity produced. This is particularly attractive to government entities that are unable to take advantage of tax-based incentives for renewable energy.

The elementary school is a prime location for implementation of commercial solar PV. NYPA is currently offering school districts free, no-obligation site assessments to make it easier for schools to go solar.

Kallet Theater

Photo Credit: kallettheater.com

"WE ARE LIKE TENANT FARMERS CHOPPING DOWN THE FENCE AROUND OUR HOUSE FOR FUEL WHEN WE SHOULD BE USING NATURE'S INEXHAUSTIBLE SOURCES OF ENERGY – SUN, WIND AND TIDE…I'D PUT MY MONEY ON THE SUN AND SOLAR ENERGY. WHAT A SOURCE OF POWER! I HOPE WE DON'T HAVE TO WAIT UNTIL OIL AND COAL RUN OUT BEFORE WE TACKLE THAT." – Thomas Edison in conversation with Henry Ford and Harvey Firestone (1931)

WASTE

In 2011, 5% of the community's GHG emissions came from waste. Waste from the town is disposed of at the Auburn Landfill. As the waste decomposes, it releases greenhouse gases that can be reduced by reducing the waste stream through composting.

Monday Night Clean Up Volunteer

Photo Credit: Half-Shire Historical Society

Mitigation Strategy Goals for 2020

Decrease the waste stream

Kitchen composting: 2 $MTCO_2e$ annual reductions.

This strategy assumes that food waste is reduced by 25%.

Waste generated in the Town of Richland and Village of Pulaski is sent to the Bristol Hill Landfill and/or the Oswego County Energy Recovery Facility for disposal. The decomposition and combustion of this waste creates GHG emissions and other pollutants that can be reduced by decreasing the waste stream through composting.

Composting produces fertilizer that can be used for farms or gardens, returning nutrients to the soil that were removed with food production and reducing the need for synthetic fertilizers. Composting also reduces the volume of material sent to the landfill and energy recovery facility, reducing disposal costs.

Composting is something that can be done at individual households or at the community scale.

New York State's "Beyond Waste" Plan advances food scrap recycling as a key environmental strategy to help communities increase their waste diversion rates, and community composting sites, such as the Amboy Compost Site in Camillus, New York, have effectively composted yard and food waste for years. Composting food waste at schools is another popular option that has been implemented successfully in various Central New York school districts, such as Marcellus, Fayetteville Manlius, and East Syracuse Minoa.

The community already has a Monday Night Clean Up effort that runs spring to fall with the goal of combatting litter and beautifying the town. This effort should be strengthened and continued.

NATURAL RESOURCES

Planting trees in strategic ways to shade buildings can reduce energy used to cool buildings. Trees that are properly planted with energy savings in mind can reduce the amount of energy (electricity, natural gas, or other fuel) used to cool and heat buildings. This not only reduces associated emissions, but also saves money.

Deer Creek Wildlife Management Area

Photo Credit: CNY RPDB

Mitigation Strategy Goals for 2020

Plant trees for carbon storage and energy savings

Tree planting: 99 $MTCO_2e$ annual reductions.

This strategy assumes 20% of households plant 1 tree (440 trees).

The shade from a single well-placed mature tree reduces annual air conditioning use from two to eight percent (in the range of 40-300 kWh), and peak cooling demand from two to ten percent (as much as 0.15-0.5 kW), therefore reducing GHG emissions. The Arbor Day Foundation provides information on its website explaining how to plant trees to conserve energy most effectively.

Tree planting can also reduce storm water runoff, decreasing the amount of water that needs to be treated at wastewater treatment facilities. Finally, tree planting increases the aesthetic appeal of homes, increasing property values.

New York State has a wealth of forest resources, including on public land in the Adirondack and Catskill Parks and on private land in the Tug Hill region. These forest resources help to sequester carbon and combat climate change, and additional trees planted throughout the state can contribute to the effort.

Adaptation Strategies

To adapt to a changing environment, Richland and Pulaski can plant living snow fences (evergreens planted at distances of at least 100 feet upwind of problem stretches of road) to reduce snow drifts and travel hazards for drivers. Richland and Pulaski can also plant and maintain trees and other vegetative buffers along the Lake Ontario shoreline in order to reduce the flow rate of sediments and nutrients from entering the lake and tributaries, to reduce shoreline erosion, and to maintain cooler water temperatures through shading.

Richland and Pulaski can also encourage the US Forest Service and Oswego County Cooperative Extension to monitor changes in tree composition and health. The town and village can plant low pollen tree species in recreation areas in order to minimize human health issues, and manage tree density throughout the town to reduce overcrowding and susceptibility to stress and disease. The town and village can remove tree and vegetative growth along power lines and remove dead and dying trees and replace them with heat and invasive tolerant species.

Richland and Pulaski can also ensure the resilience of natural systems and resources through open space conservation and smart growth strategies, such as maintaining hiking trails and protecting open space through conservation land grants, landowner incentives, regulation, fee acquisition, the purchase of conservation easements, and promotion of smart growth principals. Farmers can continue to implement agricultural practices that protect surface and ground water quality. Installation of agricultural Best Management Practices (BMPs) will reduce nutrient and sediment loading from agriculturally-rich watersheds. The SWCD, Cornell Cooperative

Extension and the Natural Resources Conservation Service are available to provide assistance to Richland and Pulaski farming community in developing and implementing BMPs.

The town and village should also continue routine water quality sampling on Lake Ontario. Water quality is influenced by storm events, streambank erosion, and nutrient runoff from agricultural and other land uses within the watershed. Detailed sampling (called segment analysis) should continue in order to help identify non-point sources of pollution in the lake tributaries.

Richland and Pulaski can update local maps that display low elevation areas in the town and village that may be susceptible to flooding and display this information on the town and village websites, along with preparedness guidelines. The town and village can remove branches, ice jams, and other debris from local tributaries to reduce the potential for flooding.

To overcome invasive species issues, Richland and Pulaski can educate the public and elected officials on the value of prevention and early detection of invasive species. The town and village can work with the Oswego County Soil and Water Conservation District and the Natural Resource Conservation Service to monitor the introduction and spread of invasive species. Richland and Pulaski can also participate in Cornell Cooperative Extension's Emerald Ash Borer control strategy and in the New York State Invasive Species Task Force.

Salmon River

Photo Credit: Half-Shire Historical Society

ADDITIONAL ADAPTATION STRATEGIES

These strategies are additional actions Richland and Pulaski can take to become more resilient in the face of a changing climate. Four key strategy areas are explained here, including infrastructure, public health, education, and emergency operations.

Lake Ontario Shores

Photo Credit: CNY RPDB

Infrastructure

One of Richland and Pulaski's adaptation goals is to protect and upgrade local infrastructure to achieve cost savings, as well as stormwater and flood control. There are various actions the town and village can take to address this goal, such as assessing the condition of local infrastructure and documenting climate vulnerabilities in the areas of energy, water, transportation, and telecommunications. Richland and Pulaski can also reduce the threat of flooding by working with the Oswego County Soil and Water Conservation District (SWCD) to improve the capacity of stormwater collection systems and maximize soil infiltration and groundwater recharge.

Richland and Pulaski can inventory and prioritize road culvert and shoulder ditch repairs, install green infrastructure measures (i.e. rain gardens, porous pavement, and rain barrels), and encourage downspout disconnection, bioinfiltration, and rainwater harvesting in residential and business communities to reduce stormwater runoff.

The town and village can modify local laws to incorporate measure for adaptation to climate change, such as re-evaluating building and zoning codes to discourage/prevent new development in flood-prone and high hazard area.

Public Health

Richland and Pulaski should also establish ways to reduce or eliminate the negative effects of climate change on public health. Adaptation strategies the town and village can pursue in this area include: working with the Oswego County Health Department to document trends in asthma, Lyme disease, and heat-related illnesses that may be influenced by a warming climate; improving local capacity for health preparedness, response, and recovery programs, such as the development of an extreme-heat response plan and designation of a community location with air conditioning during heat events; and notifying the community regarding heat events, air quality, and other climate related health risks. Richland and Pulaski should also work to reduce phosphorus loading to Lake Ontario caused by run-off from fertilizers, septic tanks, and animal manure by implementing agricultural Best Management Practices, such as vegetative buffer strips. This will reduce instances of bluegreen algae and its associated health issues, such as skin and eye irritation and inflammation in the respiratory tract.

Education

Education is an important part of climate adaptation as well. Richland and Pulaski should train local building officials, planning boards, and elected official on flood hazards, risk reduction strategies, implementation of floodplain development regulations, post-flood reconstruction, and how to address flood hazards during planning board reviews.

The town can train local building officials and the construction industry on flood proofing techniques for retrofitting existing flood prone development, encourage homeowners to sign up for NYSERDA energy audits, and encourage local schools to develop and implement climate education programs or implement the CNY Classroom Energy Challenge. Schools can also partner with the community on educational opportunities related to local issues such as invasive species, littler, and dune and riverbank erosion. For example, the annual Arbor Day liaison between the community and the Global Awareness group at school should be strengthened and continued.

The town and village can also provide emergency

preparedness guidelines on the town and village websites, including regional topographic maps and information about flood preparedness. The town and village can also distribute brochures, fact sheets, and posters that show ways in which businesses and residents can prepare for and adapt to climate change and incorporate climate adaptation principals on town and village and agency websites in order to increase the awareness of severe weather risks, storm preparedness, and safety practices for homes and businesses.

The town and village can also sponsor workshops to teach homeowners, local planning boards, elected officials, code enforcement officers, county agencies, businesses, citizen associations and real estate agents about Emerald Ash Borer and other invasives, storm preparedness, watershed land use influences, and floodplain management. Monitoring of invasive species, such as water chestnuts, Japanese knotweed, and hogweed, should continue and be strengthened where necessary.

The Monday Improvement Group, Richland Recreation Association, Ramona Beach Association, Pine Grove Association, Selkirk Cottage Association, and Selkirk Shores State Park staff all currently have a loose relationship through email about invasive species collection in July and community clean-up projects. These relationships should be strengthened and continued.

Emergency Operations

Ensuring that emergency operations are current and maintaining open lines of communications between local agencies is also a significant part of successfully adapting to climate change.

Richland and Pulaski should also review and update the town and village's inventory of emergency operations and public notification lists and collaborate with national, state, and local agencies to facilitate data collection, sharing, and synthesis of flood and storm event preparedness information. The town and village can work with Oswego County officials to update the County's Hazard Mitigation Plan every five years and provide public access to the Plan by adding it to municipal and agency websites.

Bella Deer

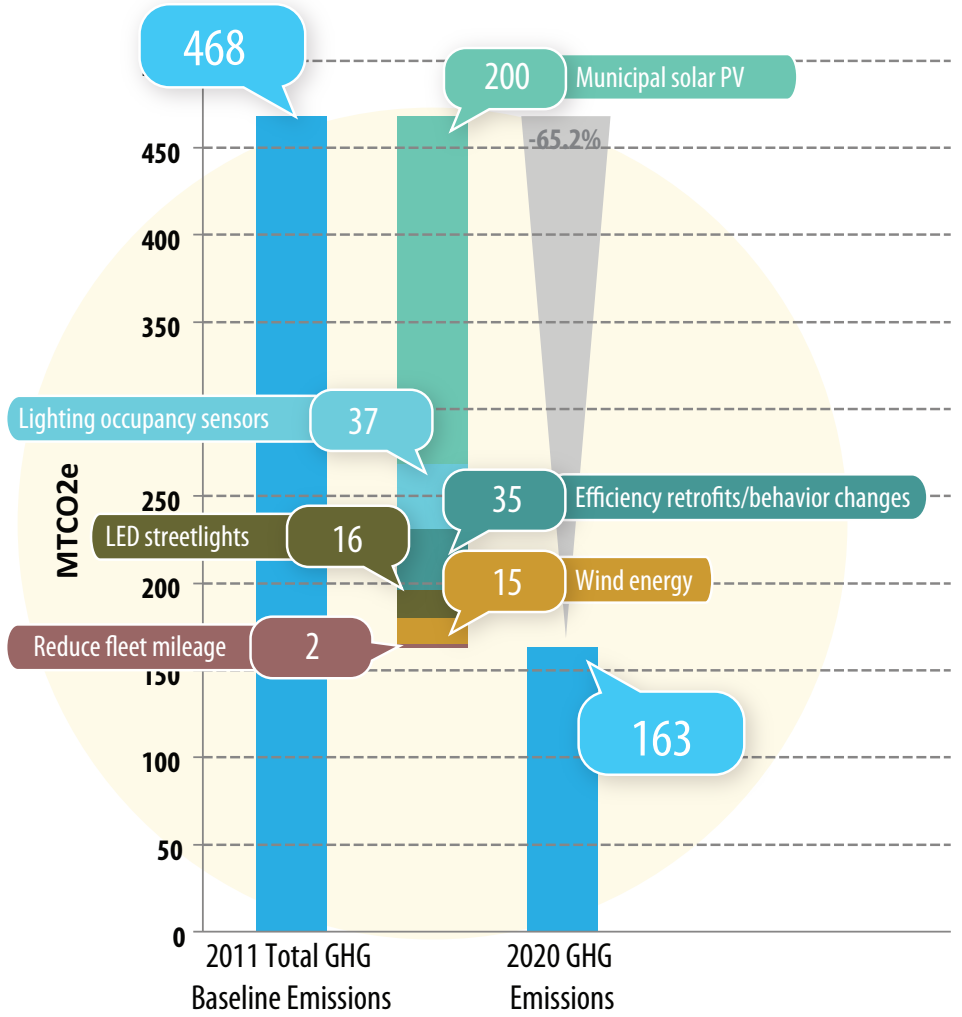
Photo Credit: Half-Shire Historical Society

Richland and Pulaski should reconfirm channels of communication with local police and fire departments, the local power utility, and media outlets and re-establish local protocols for sharing equipment during emergencies. The town and village should also update land hazard maps and inventories of infrastructure and at-risk communities and establish a road watch program to alert the public of flooded areas and tree damage during storm events.

Finally, Richland and Pulaski should establish a road watch program to alert the public of flooded areas and tree damage during storm events.

All of these additional adaptation strategies will allow Richland and Pulaski to be a resilient and sustainable community in the long-term, despite the effects of climate change.

Total possible municipal reductions from mitigation strategies = 305 $MTCO_2e$



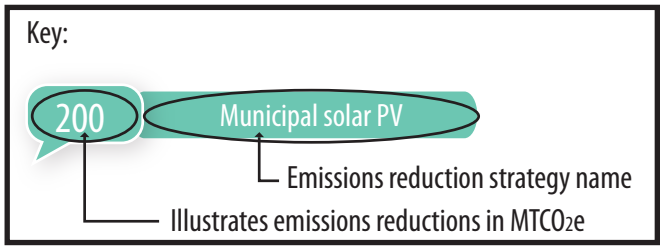


FIGURE 11- POTENTIAL MUNICIPAL REDUCTIONS FROM STRATEGY IMPLEMENTATION

Richland and Pulaski's 2011 baseline municipal emissions as recorded by the GHG inventory report, potential reductions due to suggested strategies, and potential emissions in 2020 should each of the suggested strategies be implemented. It is estimated that there will be a 65.2% reduction in municipal emissions if all suggested strategies are implemented.

Total possible community reductions from mitigation strategies = 10,842 $MTCO_2e$

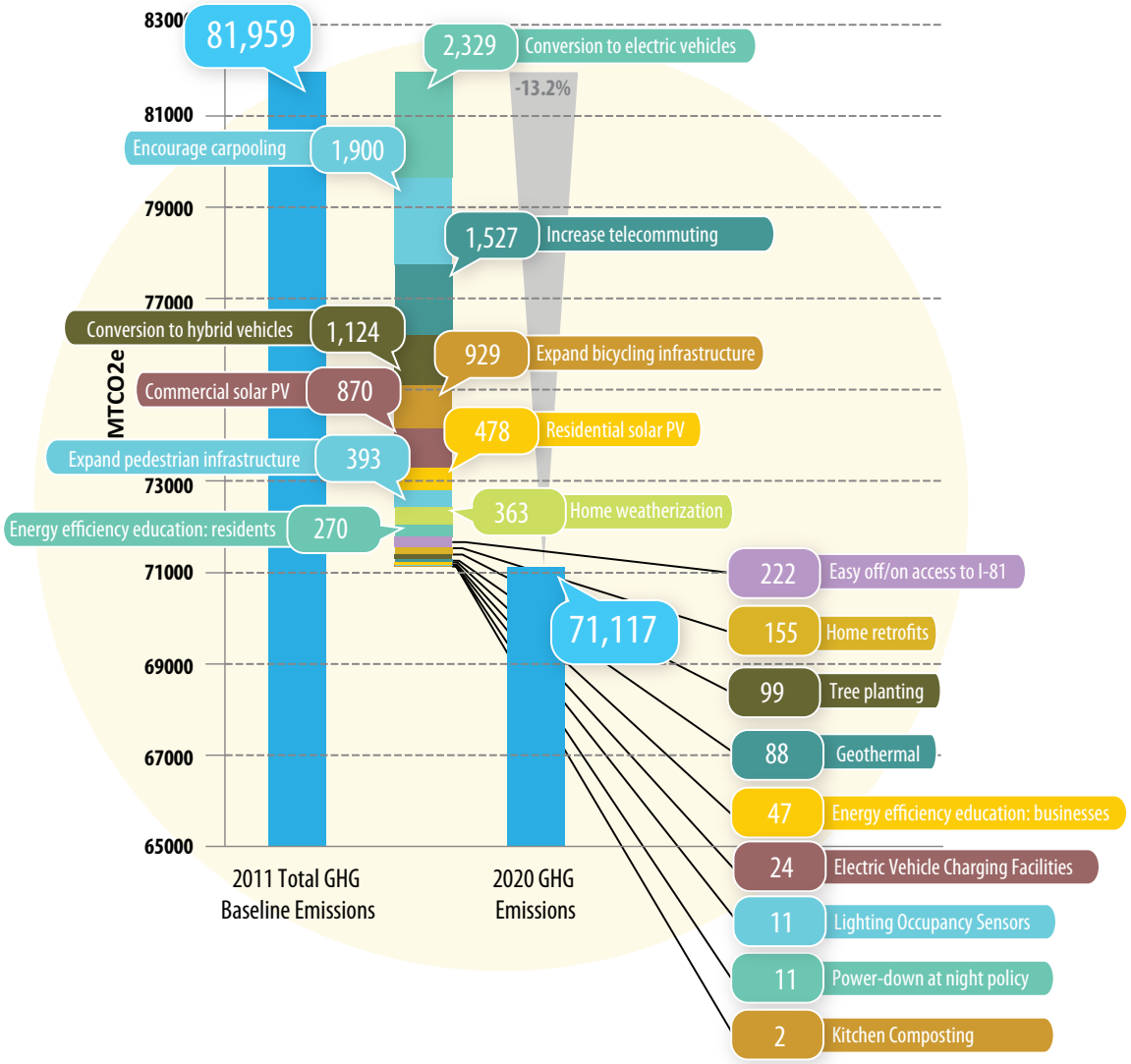


FIGURE 12A- POTENTIAL COMMUNITY REDUCTIONS FROM STRATEGY IMPLEMENTATION

Richland and Pulaski's 2011 baseline community emissions as recorded by the GHG inventory report, potential reductions due to suggested strategies, and potential emissions in 2020 should each of the suggested strategies be implemented. It is estimated that there will be a 13.2% reduction in community emissions if all suggested community reduction strategies are implemented.

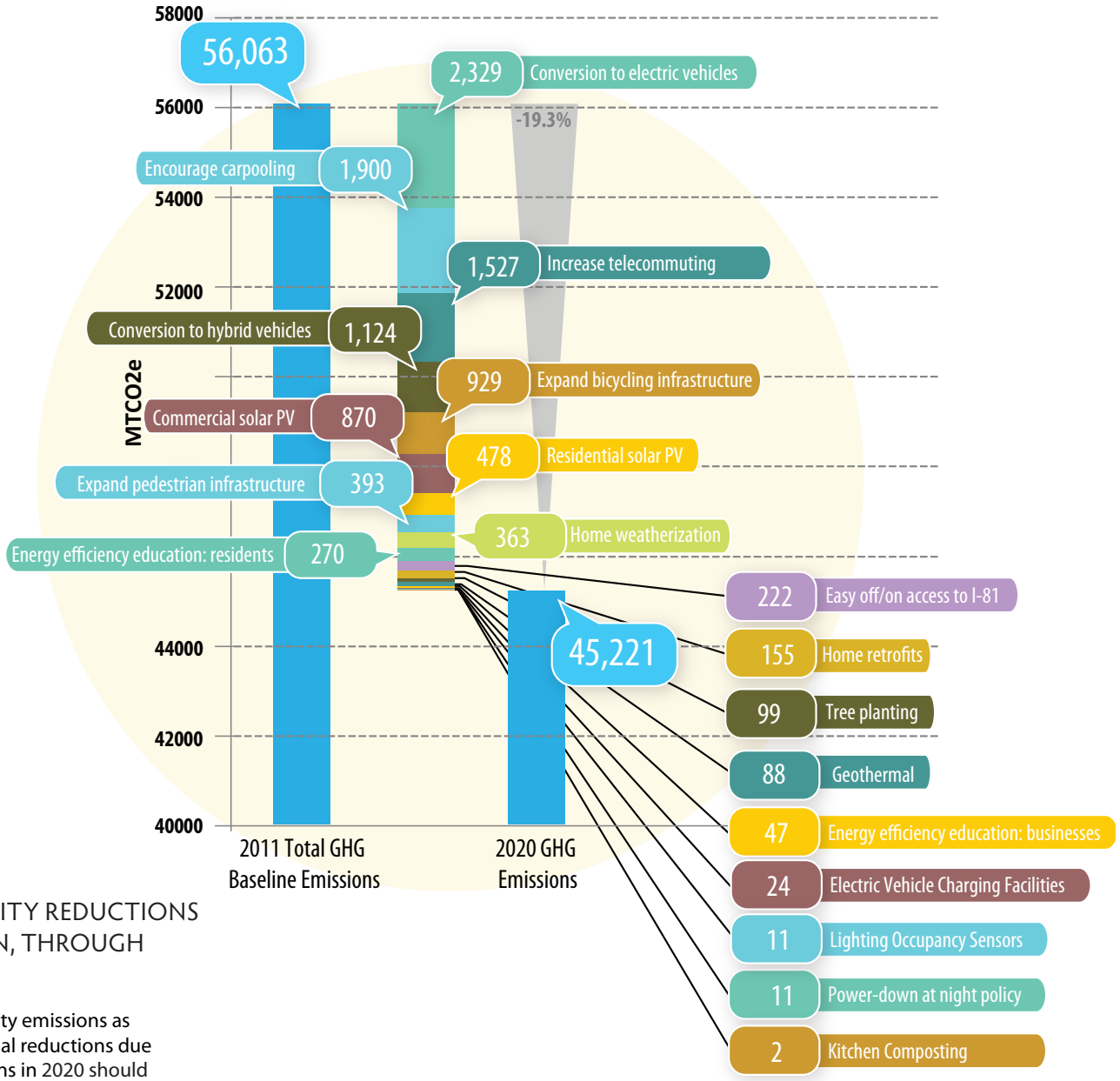


FIGURE 12B- POTENTIAL COMMUNITY REDUCTIONS FROM STRATEGY IMPLEMENTATION, THROUGH TRAFFIC REMOVED

Richland and Pulaski's 2011 baseline community emissions as recorded by the GHG inventory report, potential reductions due to suggested strategies, and potential emissions in 2020 should each of the suggested strategies be implemented. This graph has removed emissions from assumed through traffic since the town and village do not have control over vehicles passing through. It is estimated that there will be a 19.3% reduction in community emissions if all suggested community reduction strategies are implemented.

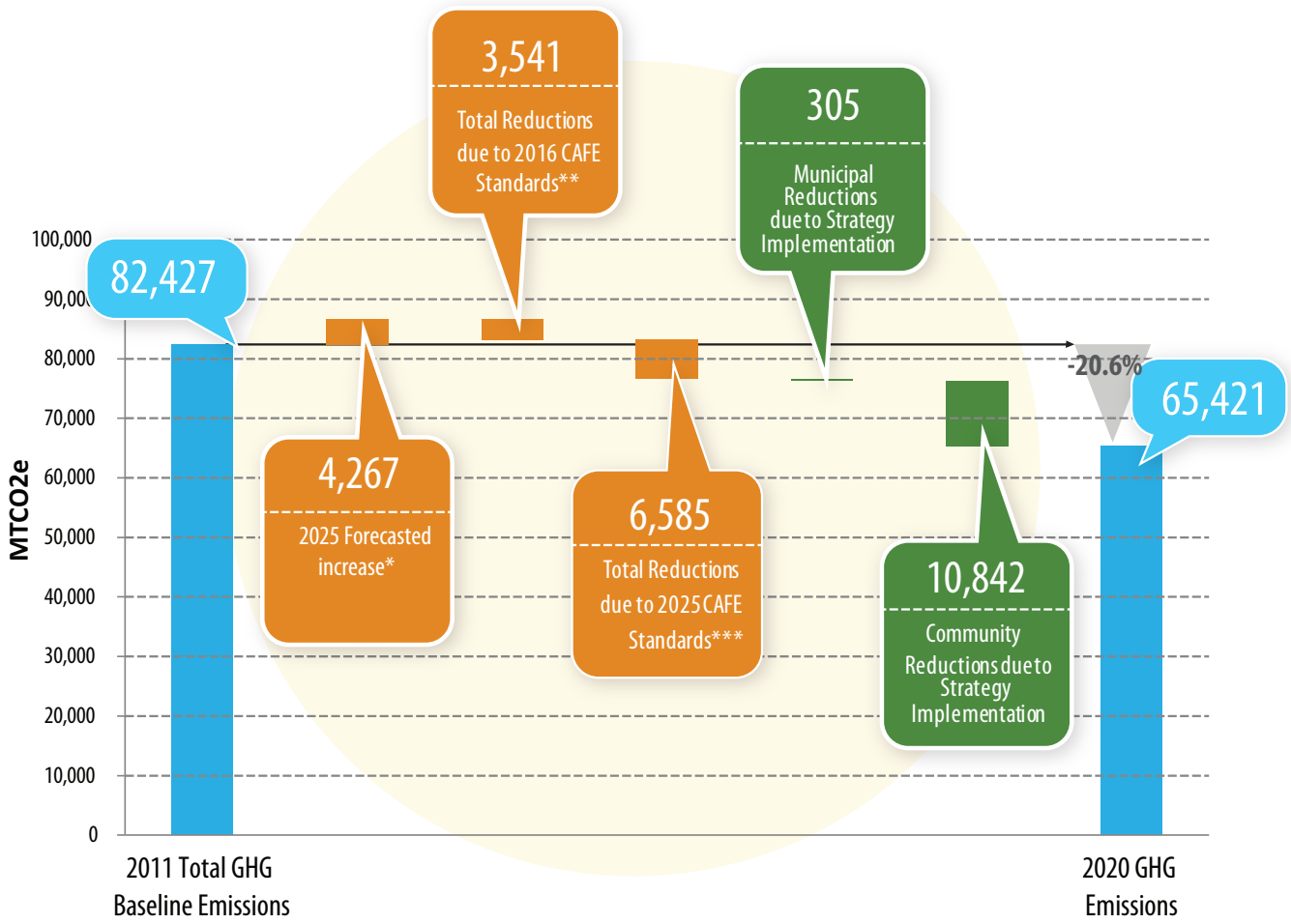


FIGURE 13A- TOTAL POSSIBLE REDUCTIONS BY 2020

Figure 13a summarizes the results of the Richland and Pulaski GHG inventories, a 2025 emissions forecast based on current trends, impacts from the strengthening of Federal CAFE standards, as well as the reductions associated with the Climate Action Strategies that were analyzed separated into community-wide measures as well as municipal operations measures. Reductions due to Richland/ Pulaski actions are shown in green while changes in emissions that will occur regardless of this Plan are shown in orange. It is projected that total GHG emissions in 2020 could be reduced by 20.6% if the town and village implement all of the recommended community-wide and municipal operations measures.

*2015 GHG inventory reported a forecasted an increase of 4,267 $MTCO_2e$ from the 2011 baseline to 2025 due to increases in emissions from transportation, commercial energy use, and waste,
**2010 Federal CAFE (Corporate Average Fuel Economy) standards have been set at 34.1 miles per gallon by 2016.
***2012 Federal CAFE standards raises average fuel economy to up to 54.5 mpg for the model year 2025.

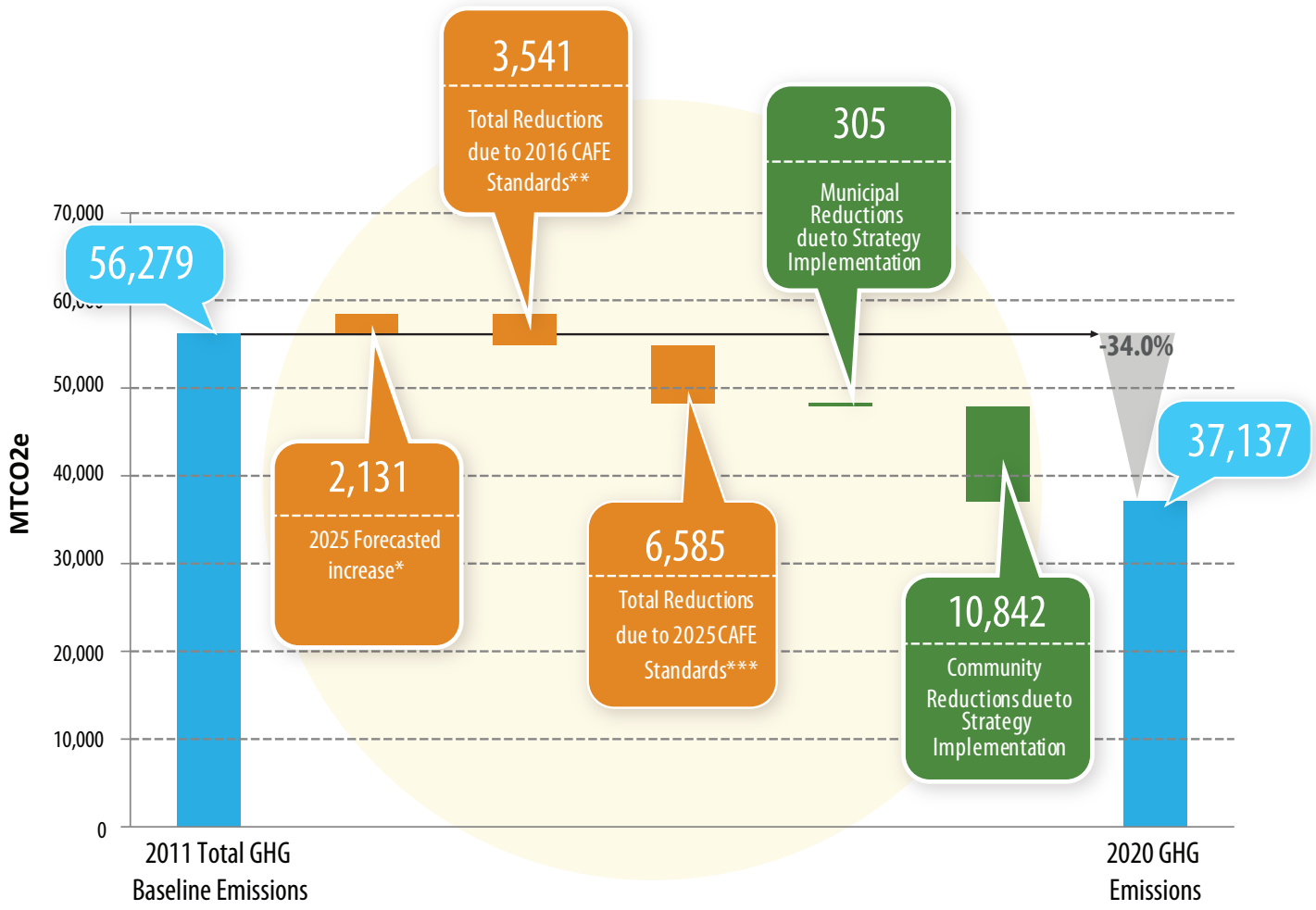


FIGURE 13B- TOTAL POSSIBLE REDUCTIONS BY 2020

Figure 13b summarizes the results of the Richland and Pulaski GHG inventories, a 2025 emissions forecast based on current trends, impacts from the strengthening of Federal CAFE standards, as well as the reductions associated with the Climate Action Strategies that were analyzed separated into community-wide measures as well as municipal operations measures. Reductions due to Richland/ Pulaski actions are shown in green while changes in emissions that will occur regardless of this Plan are shown in orange. This graph has removed emissions from assumed through traffic since the town and village have no control over these emissions. It is projected that total GHG emissions in 2020 could be reduced by 34% if the town and village implement all of the recommended community-wide and municipal operations measures.

*2015 GHG inventory reported a forecasted an increase of 2,131 $MTCO_2e$ from the 2011 baseline to 2025 due to increases in emissions from transportation, commercial energy use, and waste, These figures do not include the emissions from assumed through traffic.
**2010 Federal CAFE (Corporate Average Fuel Economy) standards have been set at 34.1 miles per gallon by 2016.
***2012 Federal CAFE standards raises average fuel economy to up to 54.5 mpg for the model year 2025.

Concluding Remarks

The Richland and Pulaski Greenhouse Gas Inventories and Climate Action Plan provided an opportunity for the town and village to develop energy efficiency and emission reductions strategies. The planning effort encouraged local participation and brought together representatives from local government, citizens, and other key stakeholders to evaluate regional strengths and goals. The process provided a chance to gather information on sustainable community and economic development projects, to give community leaders support to advance sustainable projects, and to identify goals for new sustainable programs and initiatives.

Participants in the planning process worked for about 6 months to identify goals and strategies to improve the environment and address climate change through energy management, infrastructure, land use, and transportation. As a blueprint for the future, the Climate Action Plan efficiently summarizes an action-oriented guide containing strategies to ensure that Richland and Pulaski meet the needs of current and future generations. In addition, the document will now provide state and local officials with the information needed for long-term commitments and investments in economic, social, and environmental resilience.

Our thanks go to the local leaders and community members for a job well-done. Town and village officials are encouraged to now focus on implementation of these recommendations, to review the progress made on an annual basis, and to re-evaluate emission reduction goals. In this way, Richland and Pulaski will continue to protect natural resources, reduce emissions, become more resilient to climate change, and serve as a prominent showcase for energy efficiency and environmental stewardship.

Selkirk Lighthouse

Photo Credit: CNY RPDB

APPENDIX A: ACRONYMS EXPLAINED

Btu and MMBtu: British Thermal Units and Millions of British Thermal Units. A Btu is the amount of energy needed to cool or heat one pound of water by one degree Fahrenheit, and MMBtu represents 1 million Btu.

CAFE: Corporate Average Fuel Economy. CAFE standards have been set by the federal government for the years 2016 and 2025.

CAPPA: Climate and Air Pollution Planning Assistant. CAPPA is a tool provided by ICLEI – Local Governments for Sustainability to help local communities assess the effectiveness of certain emissions reduction strategies in their communities. CAPPA is the tool that was used for all of the calculations in this document.

CNY RPDB: Central New York Regional Planning and Development Board. The CNY RPDB is a public agency that provides a range of services associated with the growth and development of communities in Cayuga, Cortland, Madison, Onondaga, and Oswego Counties.

GHG: Greenhouse Gas. Greenhouse Gases are gases in the Earth's atmosphere, such as water vapor, methane, carbon dioxide, and nitrous oxide, that allow sunlight to enter the atmosphere but also trap heat in the atmosphere, causing rises in Earth's atmospheric temperatures.

ICLEI: ICLEI-Local Governments for Sustainability is a non-profit organization that provides tools to local governments to assist with greenhouse gas inventories and climate action planning.

kW: Kilowatt. kW is a unit of power equal to 1,000 watts.

kWh: Kilowatt hour. A kilowatt-hour (symbolized kWh) is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour (1 h) of time.

$MTCO_2e$: Metric Tons of Carbon Dioxide Equivalent. $MTCO_2e$ converts the warming potential of each greenhouse gas (i.e. carbon dioxide, nitrous oxide, methane, etc.) into one measurement.

NYSERDA: New York State Energy Research and Development Authority. NYSERDA is a public benefit corporation created in 1975. Its goal is to help New York meet its energy goals of reducing energy consumption, promoting the use of renewable energy sources, and protecting the environment. NYSERDA offers a variety of incentive programs to help New York residents achieve these goals.

PV: Photovoltaic. Solar PV systems convert sunlight directly into electricity.

VMT and DVMT: Vehicle Miles Traveled and Daily Vehicle Miles Traveled. Vehicle Miles Traveled (VMT) is the total number of miles driven by all vehicles within a given time period and geographic area. It is used by regional transportation and environmental agencies for planning purposes. VMT is influenced by factors such as population, age distribution, and the number of vehicles per household. However, the greatest factor by far is how land uses are arranged. Daily Vehicle Miles Traveled (DVMT) is the total number of miles driven by all vehicles within a geographic area in one day.

APPENDIX B: STRATEGY IMPLEMENTATION CHART

Issue	Strategy	Ballpark Rankings (see key below)			Implementation Methods				Additional Benefits			
		Costs (1-5)	GHG Reductions (1-5)	Payback (1-5)	Policy	Program	Capital Projects	Education/ Outreach	Green Job creation	Quality of Life	Water Conservation	Other
Transportation: Municipal	1. Reduction in fleet mileage	1	1	1	x	x		x		x		x
Transportation: Community	1. Conversion to electric vehicles	3	2	2			x	x	x	x		x
	2. Promote carpooling	1	2	1		x		x		x		x
	3. Increase telecommuting	1	2	1		x		x		x		x
	4. Conversion to hybrid vehicles	2	1	2			x	x	x	x		x
	5. Expand bicycling infrastructure	1	1	1			x	x		x		x
	6. Expand pedestrian infrastructure	1	1	2			x	x		x		x
	7. Easy off/on access to I-81	*	1	*			x			x		x
	8. Construct electric vehicle charging facilities	1	1	2			x	x	x	x		x
Energy/Efficiency: Municipal	1. Solar PV	2	4	3		x	x	x	x	x		x
	2. Lighting occupancy sensors	1	2	1			x			x		x
	3. Energy efficiency retrofits to existing facilities	2	2	5			x		x	x	x	x
	4. LED streetlights	*	1	*		x	x		x	x		x
	5. Wind energy	1	1	2								

*Values are uncertain at present

Key to Ballpark Rankings

Est. Total Costs	Est. Total GHG Impact	Est. Payback
1 = Less than $250,000	1 = 0-9.9% of goal	1 = Less than 1 year
2 = $250,000-$999,999	2 = 10-24.9% of goal	2 = 1-4.9 years
3 = $1 million-$24,999,999	3 = 25-49.9% of goal	3 = 5-9.9 years
4 = $25 million-$99,999,999	4 = 50-74.9% of goal	4 = 10-19.9 years
5 = $100 million or more	5 = 75-100% of goal	5 = 20 years or more

Issue	Strategy	Ballpark Rankings (see key below)			Implementation Methods				Additional Benefits			
		Costs (1-5)	GHG Reductions (1-5)	Payback (1-5)	Policy	Program	Capital Projects	Education/ Outreach	Green Job creation	Quality of Life	Water Conservation	Other
Energy/Efficiency: Residential	1. Residential solar PV	3	1	3		x	x	x	x	x		x
	2. Home weatherization	3	1	3		x	x	x	x	x		x
	3. Energy efficiency education: residents	*	1	*		x		x		x	x	x
	4. Promote loans for energy efficiency improvements	3	1	4			x	x	x	x	x	x
	5. Geothermal	2	1	4			x		x	x		x
Energy/Efficiency: Commercial	1. Commercial solar PV	3	1	3		x	x	x	x	x		x
	2. Energy efficiency education: businesses	1	1	1		x		x		x	x	x
	3. Lighting occupancy sensors	1	1	1			x			x		x
	4. Power-down at night policy	1	1	1	x	x		x		x		x
Waste	1. Kitchen composting	*	1	*				x				x
Natural Resources	1. Tree planting	1	1	3		x	x	x		x		x

*Values are uncertain at present

Key to Ballpark Rankings		
Est. Total Costs	Est. Total GHG Impact	Est. Payback
1 = Less than $250,000	1 = 0-9.9% of goal	1 = Less than 1 year
2 = $250,000-$999,999	2 = 10-24.9% of goal	2 = 1-4.9 years
3 = $1 million-$24,999,999	3 = 25-49.9% of goal	3 = 5-9.9 years
4 = $25 million-$99,999,999	4 = 50-74.9% of goal	4 = 10-19.9 years
5 = $100 million or more	5 = 75-100% of goal	5 = 20 years or more

Central New York Regional Planning & Development Board

Central New York climate change innovation program

NEW YORK STATE OF OPPORTUNITY. Climate Smart Communities

CNY Energy Challenge ...a program of the Central New York Regional Planning & Development Board

TOWN OF RICHLAND
1 BRIDGE ST.
PULASKI, NY 13142

VILLAGE OF PULASKI
4917 JEFFERSON ST.
PULASKI, NY 13142