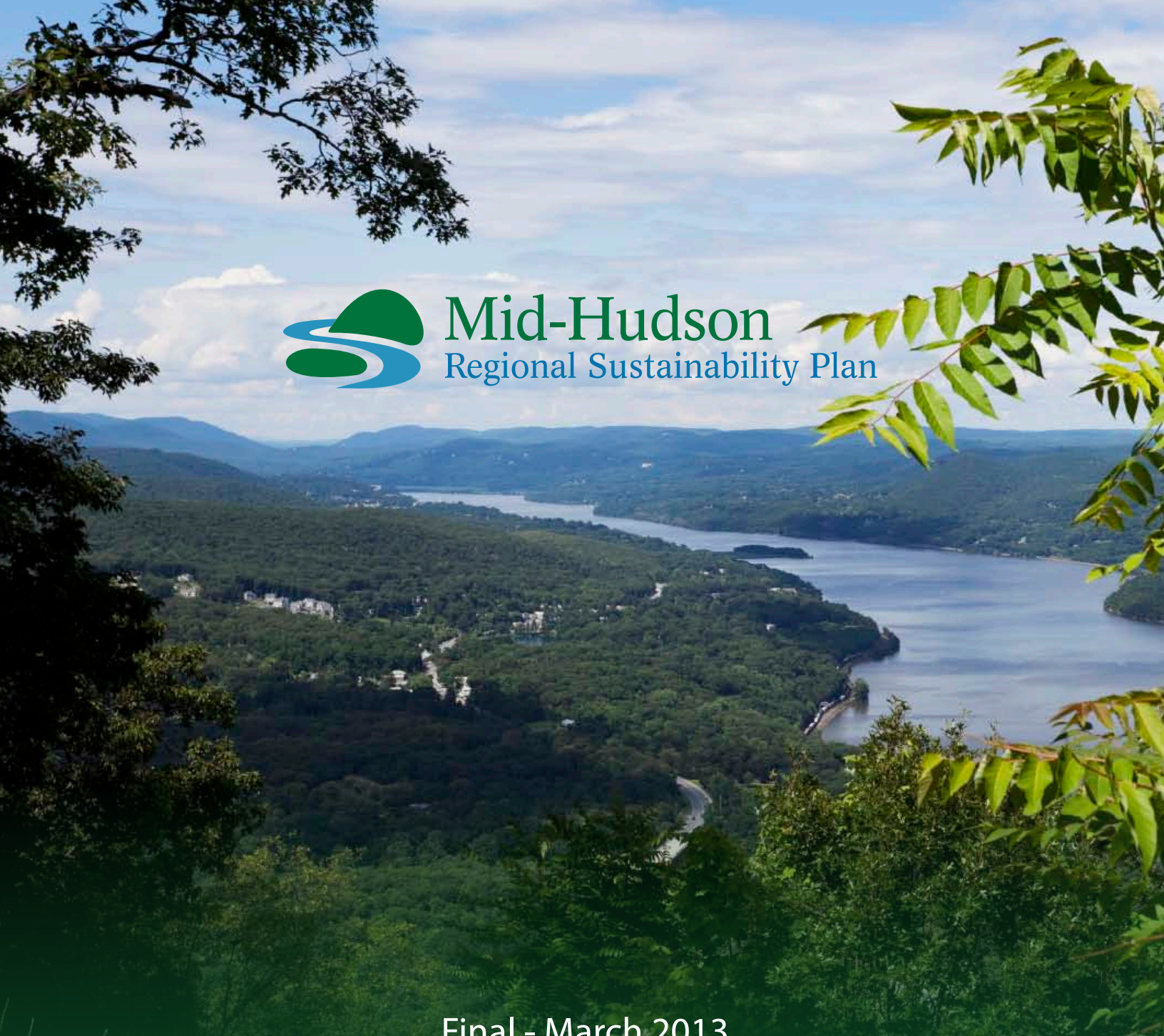


Mid-Hudson
Regional Sustainability Plan

Final - March 2013

Prepared for:

Mid-Hudson Planning Consortium
County of Orange, Co-Chair
Town of Greenburgh, Co-Chair

Prepared by:

ecology and environment, inc.
Global Environmental Specialists

This Plan is funded through the Cleaner Greener Communities Program,
New York State Energy Research and Development Authority

CLEANER GREENER COMMUNITIES
NY WORKS

DISCLAIMER

This planning effort was funded as part of the New York State Energy Research and Development Authority's (NYSERDA) Cleaner Greener Cities program. This plan is in accordance with Orange County Agreement No. 26206 with NYSERDA. The opinions expressed in this report do not necessarily reflect those of NYSERDA or the State of New York.

All questions can be addressed to:

David Church, AICP
Commissioner of Planning

Orange County
124 Main Street
Goshen, NY 10924

845.615.3840

dchurch@orangcountygov.com

www.orangecountygov.com

Thomas Madden, AICP
Commissioner of Community Development & Conservation

Town of Greenburgh
177 Hillside Avenue
Greenburgh, NY 10607

914.995.1505

tmadden@greenburghny.com

www.greenburghny.com

Contents

9 Strategic Priorities for the Mid-Hudson Region

10 Implementation Framework

Tables, Figures, Acronyms, and Acknowledgements

A Public Engagement Summary

B Indicator Data Sources and Calculations

C List of Project Ideas

D Additional Resources

E Selection of Watershed Management Plans

F

List of Appendices

List of Attachments

Letter from the Consortium Chairs

March 15, 2012

We are proud to present the Mid-Hudson Regional Sustainability Plan. The Mid-Hudson Region has a long tradition of stewardship of our natural environment. This nationally unique document summarizes a wealth of research, discussion, debate and activity centered on defining what "sustainability" means for our Region. The Mid-Hudson Regional Sustainability Plan is an important step and will help guide the Region towards a sustainable future that will dramatically reduce greenhouse gas emissions from current levels. This Plan promotes innovative solutions to real world problems and challenges residents, businesses, municipalities and organizations to take action to improve our Region. We hope in these pages to help define what those of us that live and work in this Region can do to act - first and foremost as members of the resident municipalities, organizations, and businesses that make the Mid-Hudson Region special.

Our Regional Sustainability Plan is published with the support of the Cleaner Greener Communities program administered by NYSERDA. Thanks also go to Governor Andrew Cuomo and NYSERDA leadership for their vision in providing us the guidance and support to pursue this effort. Most important, we want to thank the hundreds of volunteers and professionals who actively participated in bringing their diverse needs, concerns, ideas, and projects that so enrich this Plan.

On behalf of the Mid-Hudson Planning Consortium, including representatives from seven counties and numerous governmental and non-governmental leaders, we hope when you read this Plan that you consider something you can do to make our Region sustainable today and for future generations. By working together to take on this challenge our collective actions can and will make a difference in solving a large global problem on a regional scale.

Mid-Hudson Planning Consortium Co-Chairs

David E. Church, AICP
Commissioner of Planning
Orange County

Thomas Madden, AICP
Commissioner of the Department of
Community Development & Conservation
Town of Greenburgh

The Mid-Hudson Regional Sustainability Plan was developed through extensive research and a consensus building process open to stakeholders from throughout the Region. This process was overseen by a planning Consortium consisting of senior representatives of the Region's seven counties as well as government and non-governmental organizations.

The Consortium was led by the following partners who, as of March 14, 2013, have endorsed this Plan[1]:

- Dutchess County
- Orange County, co-Chair
- Putnam County
- Sullivan County
- Town of Greenburgh, co-Chair
- Ulster County
- Westchester County
- Center for Research Regional Education and Outreach (CRREO)
- Land Use Law Center, Mayors' Redevelopment Roundtable
- New York Council of Nonprofits (NYCON)
- Northern Westchester Energy Action Consortium (NWEAC)
- Southern Westchester Energy Action Consortium (SWEAC)

Non Consortium Member Endorsements:

- Alfandre Architecture
- Bard College
- City of New Rochelle
- City of Peekskill
- City of Yonkers
- Energize New York
- Green Guru Network
- Hudson River Sloop Clearwater, Inc.
- Hudson River Watershed Alliance Inc.
- Hudson Valley AgriBusiness Development Corporation
- Hudson Valley Smart Growth Alliance
- Joule Energy Reduction Assets
- Omega Institute for Holistic Studies
- Putnam County IDA
- Sullivan Alliance for Sustainable Development
- Sullivan County Climate Action Planning Advisory Board
- SUNY New Paltz
- Town of Bedford
- Town of Cortlandt
- Town of North Castle
- Town of Somers
- Village of Ardsley
- Village of Croton-on-Hudson
- Village of Dobbs Ferry
- Village of Elmsford
- Village of Irvington
- Village/Town of Mount Kisco
- Village/Town of New Paltz
- Village of Ossining
- Westchester Green Business Challenge

[1] Other endorsements are pending and will be added as received.

1 Introduction

The Mid-Hudson Regional Sustainability Plan sets out a vision for sustainable development that builds on our Region's unique social, cultural, and natural history, with the goal of promoting economic development, environmental sustainability, and enhancing quality of life for the more than two million residents that call our Region home. By engaging hundreds of stakeholders from each of our Region's seven counties in the development of the Plan, a series of objectives has been established that reflects our Region's diverse landscapes, demographics, economy, culture, and history. These objectives and the corresponding strategies provide a common vision for our Region's sustainable development, as well as a series of priority initiatives to help achieve the vision. While the Plan provides a common framework, each resident, municipality, and organization has the freedom and the responsibility to chart their own course toward achieving the Plan's objectives, either individually or collectively.

1.1 The Mid-Hudson Regional Sustainability Plan

The Mid-Hudson Region of New York State (NYS) consists of the seven counties located immediately north of New York City (NYC): Westchester County, Rockland County, Orange County, Putnam County, Dutchess County, Ulster County, and Sullivan County (see Figure 1.1).

The Mid-Hudson Regional Sustainability Plan ('the Plan') was developed through extensive research and a consensus building process that included a series of stakeholder meetings held throughout the Region. The eight-month process began with the formation of a planning Consortium consisting of senior representatives of each of the Region's seven counties as well as local non-governmental organizations representing business, municipalities, and engaged citizens. Six working groups were formed, comprised of over 300 volunteers. This unprecedented collaborative engagement was used to set realistic yet ambitious objectives for the long term sustainable development of the Region, each of which is supported by initiatives and projects that can be implemented in the short-, medium-, and long-term. The Plan reflects and builds on the Region's unique social, cultural, and natural history, with the goals of promoting economic development, environmental sustainability, and enhancing the quality of life for the Region's residents.

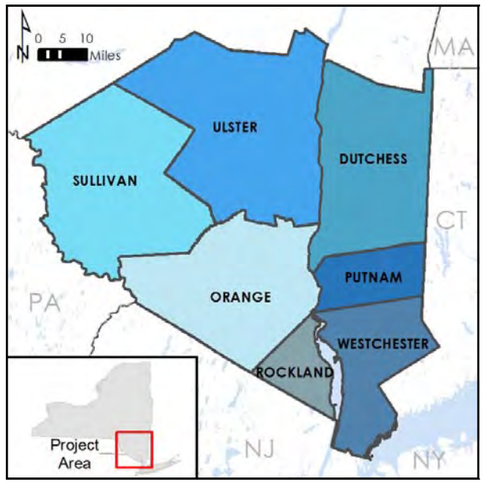


Figure 1.1 The Mid-Hudson Region

> The Plan reflects and builds on the Region's unique social, cultural, and natural history, with the goals of promoting economic development, environmental sustainability, and enhancing the quality of life for the Region's residents.

1.1.1 The Cleaner, Greener Communities Program

The Plan was developed as part of the New York State Energy Research and Development Authority's (NYSERDA) *Cleaner Greener Communities program*, announced by Governor Andrew M. Cuomo in his 2011 State of the State address. This program is intended to empower the ten regions of NYS to take charge of sustainable growth in their communities by identifying and funding smart development practices. It provides a vehicle for planning teams throughout NYS to partner with public and private experts across a wide range of fields, along with community residents, to encourage discussion and lead the development of regional sustainability plans.

The participants in the *Cleaner, Greener Communities* program were asked to think through current conditions, consider various scenarios to optimize growth, and identify, shape and collaborate on projects that, when implemented, would significantly improve the economic and environmental well-being of their respective Region. The results of this effort will guide implementation of integrated solutions—from statewide investments to regional decision making on land use, housing, transportation, infrastructure, energy, and environmental practices—that can maintain and improve local quality of life.

In adapting the over-arching goals of the *Cleaner, Greener Communities* program to the sustainability needs of the Mid-Hudson Region, the Consortium identified five focus areas:

- Land Use, Livable Communities, and Transportation
- Energy
- Materials Management
- Agriculture and Open Space
- Water

Sustainable development integrates concepts, ideas, and activities from many different sectors and disciplines. To highlight some common themes that recur through the five focus areas, the Consortium identified five cross-cutting topics:

- Climate Change Mitigation
- Climate Change Adaptation
- Environmental Justice
- Economic Development
- Governance

A discussion of climate change mitigation and adaptation as well as environmental justice is woven into each focus area chapter. Economic development is discussed with regard to the Region's recent Economic Development Strategy and the Plan's implementation strategy. Potential economic development impacts are noted throughout the document. Governance is discussed as part of the Plan's implementation strategy. Ongoing initiatives at the regional, county and local level were considered and integrated to the extent that information was made available.

1.2 The Mid-Hudson Region

The Mid-Hudson Region covers just over 4,500 square miles, contains 198 municipalities, and is situated immediately north of NYC, sharing a border with the Borough of Bronx. The Region is defined by water, ranging from the coastal areas and tidal flats of Westchester County, to the estuaries of the lower Hudson, through to the Upper Delaware and the mountain streams originating in the Catskills. The Region has a great diversity of human and natural landscapes, including dense, urbanized cities, small towns and villages, rural farms and orchards, and extensive undeveloped forest lands. In many ways, the Region encapsulates aspects of all of NYS' geographic diversity.

1.2.1 Culture and History

The Mid-Hudson Region has a long and storied history with deep roots in the culture of environmental conservation. First settled by the Dutch in 1610, the Region was the site of famed explorer Henry Hudson's attempt at finding the Northwest Passage. The Region was home to the first capital of NYS, in Kingston, which lasted less than a year before the city was burned down by British forces on October 16th 1777. The capital was subsequently moved to another city in the Region, Poughkeepsie, where it remained from 1777 until 1783.

> Sustainable development integrates concepts, ideas, and activities from many different sectors and disciplines.

The Hudson River has been a critical trade and transportation route since the Region was first settled. With the opening of the Erie Canal, the Hudson served as a major corridor connecting NYC and the rest of the eastern seaboard with the western United States (US). As a result of the opening of the canal and the trade that was able to travel along the Hudson, NYC's port experienced significant growth, as did the economy in many other parts of NYS and the US.

In more recent years, the Region has become a leader in the US conservation movement. In the 1960s, a 17-year legal battle over the building of a hydropower plant near Storm King influenced the passage of the National Environmental Policy Act (NEPA) and helped spawn local organizations like Scenic Hudson, Clearwater, and Riverkeeper, which work today to conserve the Hudson River and its watershed.[1]

[1] Marist Environmental History Project, 2012. The Scenic Hudson Decision. http://library.marist.edu/archives/mehp/scenicdecision.html

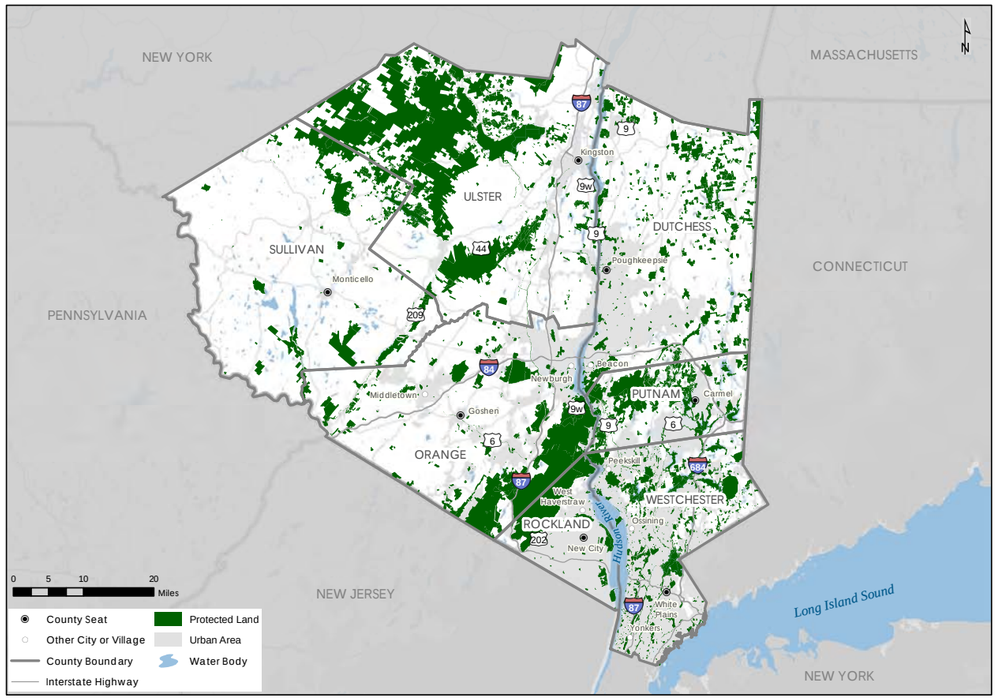


Figure 1.2 Regional Overview, 2010

1.2.2 Land Use and Development

The Mid-Hudson Region includes 10 percent of the land area of NYS[2], containing approximately 11 percent of its population and housing.[3] Over 900 square miles, or 20.6 percent of the Region, is defined by the 2010 US Census as 'urban area', with a minimum population density of at least 500 persons per square mile (see Figure 1.2). This is more than twice the amount of urban area found in NYS as a whole which contains 8.7 percent urban area, or; 8.1 percent excluding NYC. Due to the fact that NYC makes up 42% of the entire population of NYS while occupying less than 1% of the land, it significantly skews state-wide statistics. Hence, many datasets present NYS figures with and without NYC.

> The population density of Westchester County is over 2,200 persons per square mile, more than five times as densely populated as NYS as a whole (including NYC) and nearly 30 times as densely populated as Sullivan County, with only 80 persons per square mile.

Although the Region contains a disproportionate amount of urban area compared with NYS averages, such regional statistics mask considerable localized diversity. For example, the population density of Westchester County is over 2,200 persons per square mile, more than five times as densely populated as NYS as a whole (including NYC) and nearly 30 times as densely populated as Sullivan County, with only 80 persons per square mile.[4] The density of population, housing, and employment within the Region is largely concentrated in urban and suburban areas in the southeast and along the Hudson River (see Figure 1.3).

While the Region has much developed land, it also has significant open space including agricultural fields and pasture, wetlands, and large tracts of forest. According to the US Census, there are 531,200 acres of forestland, covering approximately 18 percent of the total area.[5] These data underrepresent the actual amount of forest cover—depending on the data set used, forests covers 60-90 percent of the Region, although a lot of this is highly fragmented forest interspersed amongst existing areas of development.

In addition to forestland, in 2010, 323,154 acres in the Region were active farmland, representing approximately 11 percent of the Region's land area.[6]

Much of the Region's preserved land and large, natural open spaces are located in a greenbelt through the Hudson Highlands in southeast Orange and northwest Putnam counties, in the Catskill Forest Preserve of northwest Ulster and Sullivan counties, and along the Shawangunk Ridge in Ulster, Sullivan and Orange counties. According to Scenic Hudson, there are 618,100 acres of land protected from development either through public ownership of development rights or land conservation easements (21 percent of the Region's land).[7]

Additionally, the Region contains 463,300 acres of park and recreational areas, making up 16 percent of the Region's total land area.[8] Because of the abundance of park and recreational land, more than 60 percent of the Region's population can access parks and recreational areas within one-half mile of their home.[9] Note that there is considerable overlap among park land, protected land, and forested land.

> Because of the abundance of park and recreational land, more than 60 percent of the Region's population can access parks and recreational areas within one-half mile of their home.

1.2.3 Transportation Connectivity

The Hudson River has been a major corridor for trade, transportation, and cultural exchange since before the founding of the US. Many of the Region's urban communities are built along the banks of the Hudson, connected by an extensive network of bridges, roads, and rail lines. Multiple major highways traverse the Region, connecting it with the Northeast, Midwest, Mid-Atlantic, and Canada.

The presence of the largest city in the US immediately to the Region's south has influenced its development patterns for more than a century. The network of commuter trains and local bus services provides many parts

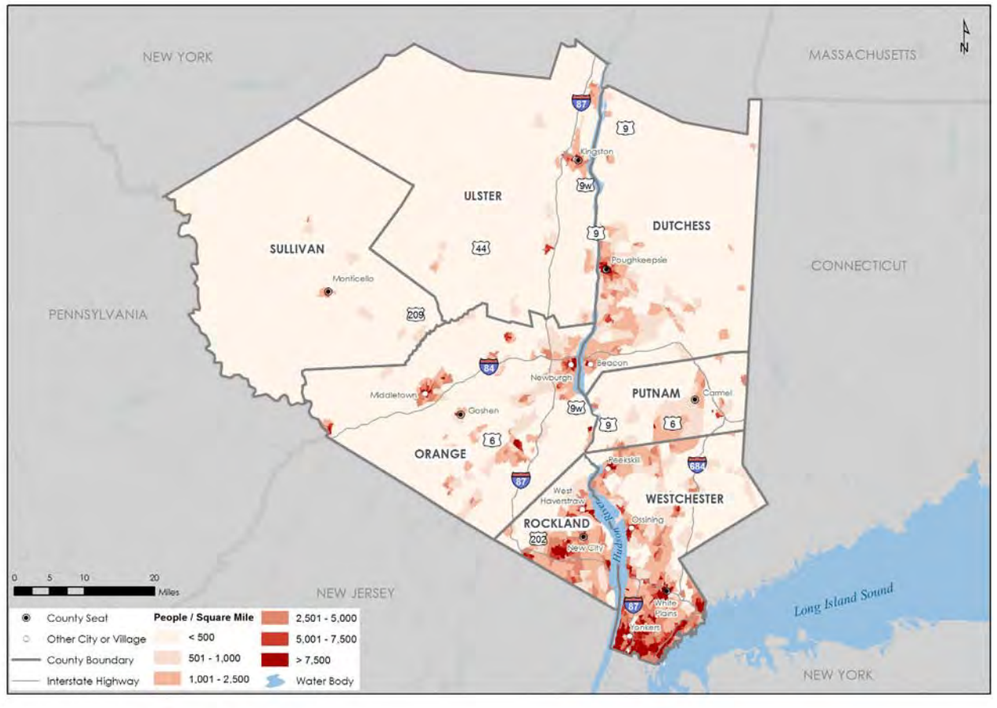


Figure 1.3 Population Density, 2010

[2] US Census Bureau (hereafter 'US Census'), 2010. Urban-Rural Classification. http://www.census.gov/main/www/access.html
[3] Ibid.
[4] Ibid.
[5] NYS Department of Taxation and Finance, 2012. Property Assessment Data. http://www.tax.ny.gov/pit/property/
[6] US Department of Agriculture (USDA), 2007. Census of Agriculture. http://www.agcensus.usda.gov/
[7] Scenic Hudson, 2012. Protected Land.
[8] Scenic Hudson, 2012. Parks and Recreation Data.
[9] US Census, 2010. Census of Population and Housing.

of the Region with a high degree of mass transit service. This allows residents multiple modes of transportation, helping provide access to jobs and services throughout the Region as well as in NYC. In turn five of the Region's counties—Westchester, Rockland, Orange, Putnam, and Dutchess—pay the Metropolitan Commuter Transportation Mobility Tax.[10]

In 2010, 11.7 percent of commuters used mass transit to get to work compared with less than 5 percent of the nation's workers.[11] An estimated 21 percent of the Region's population and 20 percent of jobs are within one mile of a rail station, and approximately 39 percent of the population and 38 percent of jobs are within a half mile of a bus stop.[12] Notably, nearly one third of workers in the Region do no work in their county of residence.[13]

In 2010, travelers in the Region took 50.6 million bus trips totaling over 182 billion miles.[14] That same year, there were nearly 30 million Metro North train boardings.[15] The majority of the Region's mass transit ridership is concentrated in Westchester County, although service is offered in five of the Region's seven counties on both sides of the Hudson River. In 2010, Westchester County had more than twice as many buses in operation as all other counties combined, facilitating ridership. In 2010, there were over 34,000 bus rides taken per 1,000 capita in Westchester compared with 4,100 per 1,000 capita in the rest of the Region.[16] Over 20 percent of Westchester County commuters take mass transit to work; roughly two-thirds of those commuters take the train.[17]

> An estimated 21 percent of the Region's population and 20 percent of jobs are within one mile of a rail station, and approximately 39 percent of the population and 38 percent of jobs are within a half mile of a bus stop.

In 2010, 4.5 percent of the Region's commuters rode a bike or walked to work, compared with 3.3 percent throughout the U.S.[18] There are nearly 700 miles of bike routes and trails in the Region.[19]

Ferries on the Hudson

Historically, ferries and steamships were the predominant mode used to cross the Hudson River and travel north-south throughout the Region. However, their use has dropped off dramatically over the past few decades. For a period of time during the mid- to late-20th century there was no ferry service in the Region as people increasingly chose to utilize the Region's bridges and drive across the river. Service resumed in 2000 with the opening of the Haverstraw-Ossining Ferry and increased with the opening of the Newburgh-Beacon Ferry in 2005.

1.2.4 Socio-Economics

The Mid-Hudson Region is home to approximately 2.3 million people, with tremendous socioeconomic

Table 1.1 Population and Household Characteristics

Location	2000 Population	2010 Population	Percentage of Total Population	Number of Households	Population per Square Mile
Dutchess	280,150	297,488	13	106,952	373.90
Orange	341,367	372,813	16	124,379	459.30
Putnam	95,745	99,710	4	34,907	432.94
Rockland	286,753	311,687	14	97,557	1,795.95
Sullivan	73,966	77,547	3	29,722	80.10
Ulster	177,749	182,493	8	70,691	162.33
Westchester	923,459	949,113	41	345,795	2,204.68
Region	**2,179,189**	**2,290,851**	**100**	**810,003**	**498.12**

Source: US Census, 2010. ACS.

[10] NYS Department of Taxation and Finance, 2012. Metropolitan Commuter Transportation Mobility Tax. http://www.tax.ny.gov/bus/mctmt/default.htm[11] US Census. 2010.

[11] US Census. 2010. American Community Survey (ACS). http://www.census.gov/acs/www/

[12] US Census. 2010. Census of Population and Housing.

[13] US Census. 2010. ACS.

[14] Federal Transit Administration, 2012. National Transit Database: Buses. http://www.ntdprogram.gov/ntdprogram/

[15] Metropolitan Transportation Authority (MTA), 2012. Metro-North Railroad Boardings. http://www.mta.info

[16] Federal Transit Administration, 2012. National Transit Database: Buses.

[17] US Census, 2010. ACS.

[18] Ibid.

[19] Bosch, A., 2011. More homes stay vacant. http://www.recordonline.com/apps/pbcs.dll/article?AID=/20110417/NEWS/104170336

Table 1.2 Household Income and Poverty Rate

Location	Average Household Income	Median Household Income	Percentage of Families in Poverty
Dutchess	$85,739	$69,838	5.7
Orange	$83,948	$69,523	7.5
Putnam	$108,365	$89,218	2.5
Rockland	$105,450	$82,534	7.2
Sullivan	$60,596	$48,103	10.7
Ulster	$73,407	$57,584	6.9
Westchester	$128,127	$79,619	5.8
Region	**$92,233**	**$60,751**	**8.19**

Source: US Census, 2010. ACS.

diversity (see Table 1.1). Putnam and Sullivan counties both have populations under 100,000 whereas Westchester County has nearly one million residents, which underscores the significant differences in population between counties. These demographic differences are reflected in the unique income, housing and employment profiles of each county. The average household size is 2.71 persons.

The Region has a fairly typical rental vacancy rate of 9.3 percent, and most county rental vacancy rates lie within five points of the national average.[20] Vacant housing units in the Region vary widely from county to county from a low of 5.5 percent in Rockland County to a high of 38.9 percent in Sullivan County.[21] The reasons for the discrepancy vary.[22] For example, second homes (vacation homes) are counted as vacant, skewing the numbers in places with a significant stock of second homes. The varying impacts of the subprime mortgage crisis as well as trends in unemployment also have a concomitant impact on vacancy rates.

> In 2009, 8.2 percent of the Region's families lived below the poverty line, roughly 6 percent lower than both the national and the NYS average.

Median household income was $60,751 in 2010 (see Table 1.2), 15 percent higher than the national average and nearly ten percent higher than the state average. Income differences likely reflect the Region's concentration of highly educated workers and the effects of labor market spillover from NYC. In 2009, 8.2 percent of the Region's families lived below the poverty line, roughly 6 percent lower than both the national and the NYS average. As measured by the Gini coefficient, an index of inequality, Westchester and Rockland counties have the highest degree of income inequality in the Region.[23] Nonetheless, the Region has lower income inequality than NYS or the US as a whole.

As shown in Table 1.3, in the Mid-Hudson Region, 87.8 percent of residents have a high school degree or higher and 37.5 percent of the population has a Bachelor's degree or higher; this exceeds the average level of education attainment in NYS, which is

> Strikingly, adults in Westchester and Rockland counties are roughly twice as likely to have a Bachelor's degree as adults in Sullivan County.

Table 1.3 Educational Attainment

Location	Percentage High School Degree or Higher	Percentage Bachelor's Degree or Higher
Dutchess	89.2	32.0
Orange	87.1	28.7
Putnam	93.0	38.1
Rockland	87.9	40.8
Sullivan	84.5	20.7
Ulster	87.9	29.3
Westchester	87.3	44.5
Region	**87.8**	**37.5**

Source: US Census, 2010. ACS.

[20] US Census. 2010. Census of Population and Housing.
[21] Ibid.
[22] Bosch, A., 2011. More homes stay vacant. http://www.recordonline.com/apps/pbcs.dll/article?AID=/20110417/NEWS/104170336
[23] US Census, 2010. ACS.

Table 1.4 Industries with the Most Employees Throughout theRegion

Rank	Industry	Number of Employees
1	Health care and social assistance	152,527
2	Retail trade	109,907
3	Accommodation and food services	57,619
4	Professional, scientific, and technical services	41,607
5	Other services (except public administration)	40,056

Source: County Business Patterns, 2010.

84.6 percent and 32.5 percent, respectively. Strikingly, adults in Westchester and Rockland counties are roughly twice as likely to have a Bachelor's degree as adults in Sullivan County. Westchester and Rockland Counties also have the highest percentages of non-English speaking adults in the Region, with 12.3 and 15.5 percent of adults speaking English less than 'very well,' respectively.[24]

The number of jobs in the Region has held steady at around 864,000 over the past decade. Wages have increased by almost 50 percent in the service and public sectors, but have not experienced the same growth in goods-producing industries.[25]

Table 1.5 Industries with the Most Businesses throughout the Region

Rank	Industry	Number of Businesses
1	Retail trade	8,996
2	Professional, scientific, and technical services	8,126
3	Construction	7,807
4	Health care and social assistance	7,748
5	Other services (except public administration)	6,718

Source: County Business Patterns, 2010.

[24] US Census, 2010. ACS.
[25] Ibid.
[26] Ibid.

The service industry is the main employer, most notably in Westchester County.[26] Service producing industries in Westchester County account for 76 percent of county employment, compared with an average of 68 percent in the Region's six other counties. The top five employing industries in the Region include healthcare, retail trade, hospitality and food services and professional services (see Tables 1.4 and 1.5).

Consistent with national trends, the Region has seen an increase in unemployment rates during the recent economic downturn. According to the latest projections (see Table 1.6), the regional unemployment rate is 7.5 percent, with Sullivan County the highest at 9.1 percent.

Table 1.6 Labor Force and Unemployment Rate

Location	Population Over 16 in Labor Force	Unemployment Rate (%)
Dutchess	153,872	7.4
Orange	189,079	7.8
Putnam	52,259	6.6
Rockland	149,048	6.5
Sullivan	37,623	9.1
Ulster	96,182	8.2
Westchester	483,490	6.8
Region	**1,161,553**	**7.5**

Source: NYS Department of Labor (NYSDOL), 2012.

Bridge at Black Creek

2 Central Themes

Our Region faces serious challenges that may impact our economy, environment, and quality of life. By starting to address these challenges today, we can create opportunities that position us at the forefront of the economy of the future. By working to limit our contribution to climate change while at the same time preparing for its impacts, we can spawn new industries, create innovative new technologies, and ensure our Region's resilience in the face of transformative change.

At the same time, we need to protect the cultural, social, and natural assets that underpin our Region's exceptional quality of life. In doing so, we must take care to ensure the well-being of all of our Region's residents. By working together as a Region, we can share resources and ideas to create meaningful change. These themes—regional collaboration, preparing for climate change and reducing our Region's carbon footprint, fostering economic development, and ensuring environmental justice—underpin every part of this Plan.

2.1 Sustainable Development Built on the Region's Strengths

Sustainable development is defined in the Plan as the ongoing effort to enhance well-being without degrading current or future natural, economic and social resources. Sustainable development results when human and economic activity occurs without depleting nonrenewable resources, releasing pollution including greenhouse gases (GHGs), or damaging ecosystems. In light of climate change, the *Cleaner, Greener Communities* approach to sustainability focuses on sharply reducing the Region's GHG emissions and protecting resources through effective adaptation practices, connecting both these outcomes to specific economic revitalization strategies.

The Mid-Hudson Region's vision for sustainable development is to embrace its historic strengths (see Figure 2.1), which include all the building blocks for a sustainable Region, namely:

- A **diverse natural environment**, containing the Hudson and Upper Delaware rivers, the Catskills, the Hudson Highlands, Long Island Sound, and much more
- A **vibrant economy**, home to global brands as well as thousands of small businesses and farms
- **Strong transportation accessibility and connectivity** within the Region and beyond
- **Exceptional quality of life**, due to the Region's setting, a long history of social and cultural innovation, and unique historical assets
- **Numerous existing cities, villages, and denser hamlet centers** that provide engines of economic growth, containing existing assets around which human settlements can be clustered to provide cost effective job centers, reduce car dependency, and reduce pressure on the environment

These five building blocks for sustainable development cannot be treated in isolation. As businesses seek to compete in an increasingly globalized marketplace, quality of life becomes an important factor in attracting and retaining the best employees. If the environment is allowed to degrade, quality of life may decline. By increasing energy efficiency and switching to renewable sources of energy, the Region helps protect the environment while retaining money in the local economy and providing a local test bed for new green enterprises. A strong economy relies on good connectivity both within the Region and with the outside world. Existing centers provide platforms for development that concentrate people, jobs, and infrastructure in more land and resource efficient patterns, while enhancing the vibrant cultural fabric of the Region. A strategy for sustainable development that ignores the close relationship between these elements risks failure. For this reason, one of the key variables determining how much priority is given to an initiative in the Plan is whether or not it impacts multiple Plan objectives.

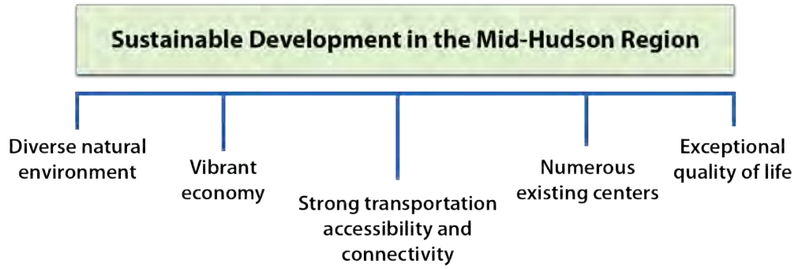


Figure 2.1 The Region's Foundation for Sustainable Development

2.2 Regional Collaboration to Achieve Sustainable Development

The Mid-Hudson Regional Sustainability Plan is intended to guide sustainable development activities at the regional and local scale. Regional-scale planning, coordination, and action:

- Provide a platform for addressing inter-municipal issues, such as water management, economic development, revitalization of aging and historic infrastructure, biodiversity conservation, environmental remediation, and other issues that transcend individual municipal or county borders
- Facilitate sharing of resources that help local governments achieve economies of scale, saving money and potentially allowing for coordination of educational programs and technical assistance to localities within the Region that have similar assets and issues
- Position the Region for more funding opportunities, many of which require grantees to demonstrate regional-scale impacts
- Enable knowledge networking and collaboration so that individuals, organizations, and local governments can share ideas and best practices and identify opportunities for collaboration
- Assist in creating consistent regional definitions and data sets that can help identify larger-scale trends and targets for investment

The broad-based discussion that has taken place within the Region to help shape the Plan is an important initial step to gaining commitment from individuals, local governments, and non-governmental organizations to take action in a bold and sustained manner. Collaboration across groups can ensure that limited resources achieve maximum impact and that the best ideas are shared widely. Achieving regional impact is easier with careful coordination; hence a central focus of the Plan's implementation strategy is to develop the governance infrastructure needed to facilitate collaboration.

Inter-Municipal Compacts

In the early 1990s, changes to NYS land use law enabled inter-municipal compacts that allow coordination of planning and zoning, the ability to form joint planning boards, and enforce land use laws on an inter-municipal basis. Inter-municipal compacts have played an important role in facilitating regional collaboration.

2.2.1 A Long History of Regional Collaboration

Collaboration for regional planning and sustainability is already ongoing in the Mid-Hudson Region, as evidenced by the work of the planning Consortium in developing this Plan and the recent work of the Regional Economic Development Council (REDC). These are recent manifestations of a long and rich history of collaboration.

In 1991, the NYS legislature created the Hudson River Greenway Communities Council, a voluntary planning process through which individual communities adopt a set of smart growth planning principles, and in return become eligible for capital grants that support related projects as well as favored scoring in the competitive application process for other

state programs. Of 179 eligible municipalities in the six eligible counties (Sullivan County is excluded), 166 have signed on as Greenway Members in one of the Region's more successful efforts in regionalism.

Similarly, Sullivan and Orange counties participate—with their neighbors in Pennsylvania—in several Upper Delaware Valley cooperative efforts including the intermunicipal Upper Delaware Council.

Public libraries provide a great example of local institutions working collaboratively to provide regional services. Most are linked through the Mid-Hudson Library Association, a state-supported, regional, multi-county entity.[27]

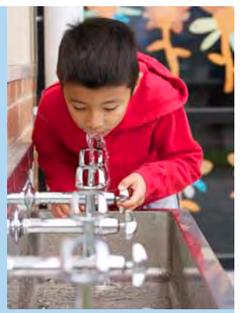
Although covering only a portion of the Mid-Hudson Region, the New York Metropolitan Transportation Council (NYMTC) provides another example of intergovernmental coordination at the regional level. NYMTC is a coalition of county and local governments that serves as the Metropolitan Planning Organization (MPO) for transportation-related issues for NYC, Long Island, and the lower Hudson Valley. County executives from Putnam, Rockland and Westchester counties, along with government representatives from the rest of its service region, serve as principal council members and vote on key planning, policy and funding decisions. The recent endorsement by NYMTC for the Tappan Zee Bridge replacement proposal is one significant regional transportation issue considered and acted upon through this regional framework.

Orange, Dutchess and Ulster counties each have their own Transportation Council with similar government and interagency cooperation at the county level. Yet these three counties also work cooperatively under a unified Transportation Management Area process, coordinating planning, funding and capital project investments north of the NYMTC area.

A variety of civic, planning, and environmental organizations also provide a range of leadership on regional planning and land use. Examples include the Hudson Valley Regional Council, Pattern for Progress, Common Waters (in the Upper Delaware Valley), the Center for Research Regional Education and Outreach (CRREO) at SUNY New Paltz, Scenic Hudson, and the Land Use Law Center at Pace University. Additionally, municipal Planning Federations, staffed by county planning departments, exist in four of the seven counties. And all the counties along with non-governmental organizations sponsor recurring educational programs for municipal officials, staff and others.

Counties in the Region also provide leadership on cross-jurisdiction coordination. For example, recognizing that the housing market extends beyond political boundary lines and that the counties faced similar pressures and housing affordability challenges, Ulster, Orange, and Dutchess counties joined together to prepare the Three-County Regional Housing Needs Assessment: 2006-2020. This represented a collective effort to analyze housing costs, supply, and future housing needs across the broader three-county area.

The NYC Watershed Memorandum of Agreement



In 1989, the US Environmental Protection Agency (EPA) issued new criteria governing filtration for public surface water supplies as a result of amendments to the Safe Drinking Water Act. Facing potentially large capital costs to provide filtration for its water supply system and believing that the high quality water from the Delaware/Catskill system could meet EPA criteria for obtaining a waiver (i.e., filtration avoidance determination), the City of New York successfully negotiated the landmark NYC Watershed Memorandum of Agreement with other stakeholders in the watershed area. The memorandum, which involved numerous local and county governments, environmental groups, and other federal, state, and city agencies, established a cooperative framework for protecting NYC's water supply, enhancing the economic vitality of upstate watershed communities, and implementing a variety of watershed protection programs. It also created a Watershed Protection and Partnership Council, which consists of representatives from the various watershed stakeholders, to serve as a regional forum for the ongoing exchange of ideas and information related to watershed protection and economic development for the watershed communities.

[27] Ulster County, 2010. Ulster County Intergovernmental Summary Report. http://www.co.ulster.ny.us/municipalities/FINAL%20Ulster%20Intergovernmental%20Summary%20Report%207-15.pdf

Despite this long and rich history of collaboration, some challenges to regional partnerships remain, such as the primacy of 'home rule' in local government, the inconsistent geographic definition of the Region in many planning efforts, and the wide disparity in resources and capacity of local government and organizations throughout the Region.

2.3 Climate Change—A Cross-Cutting Challenge

Climate change is a major planning consideration in the Mid-Hudson Region, because the Region is both vulnerable to the effects of climate change and contributes significantly to global GHG emissions.

Transportation and the built environment account for more than 80 percent of the Region's emissions, as shown in Section 2.3.1. Land use change, solid waste management, wastewater treatment, and industrial activities produce most of the Region's remaining GHG emissions. In turn, each of these activities stands to be directly or indirectly impacted by the effects of climate change. As such, the Plan has two major goals concerning climate change:

1. Reduce the Region's overall contribution to climate change
2. Increase the Region's resilience to adapt to a changing climate

2.3.1 GHG Emissions

In 2010, the Mid-Hudson Region's GHG emissions totaled an estimated 27 million metric tons of carbon dioxide equivalent (MTCO2e) (see Table 2.1). This is equivalent to the amount of emissions produced from burning more than 322,000 tanker trucks' worth of gasoline.[28] While the Region only represents 0.5 percent of total US GHG emissions and roughly 13 percent of NYS' emissions[29], it still produces a globally significant amount—equivalent to the annual emissions of the country of Ecuador, a nation with more than six times as many people.[30] For a breakdown of GHG emissions by county and per capita see Table 2.1.

Regional GHG emissions by source are presented in Figure 2.2. The single largest source of GHG emissions in the Region is transportation fuel use, which accounts for 44.9 percent of regional emissions. Eighty-six percent of transportation emissions result from on-road transportation (cars, trucks, buses, motorcycles). The second largest source of emissions is residential

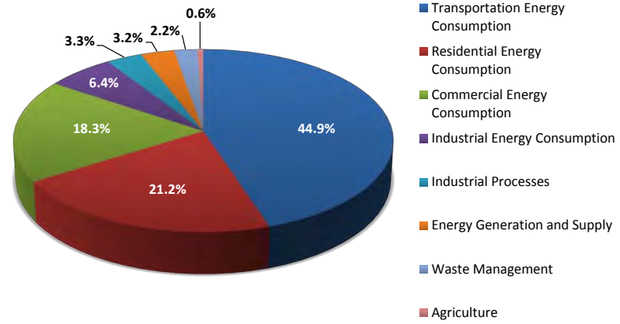


Figure 2.2 Total Emissions by Source

Table 2.1 Regional GHG Emissions

Location	Population	Emissions (MTCO2e)	Per Capita Emissions (MTCO2e/capita)
Dutchess	297,488	3,631,988	12.37
Putnam	99,710	1,598,379	16.10
Rockland	311,687	3,431,985	11.43
Westchester	949,113	10,173,625	10.64
Sullivan	77,547	907,644	11.97
Orange	372,813	4,529,387	11.81
Ulster	182,493	229,988	12.29
Region	**2,290,851**	**26,502,996**	**11.57**

Source: Attachment I: Regional GHG Inventory

[28] US EPA, 2013. Greenhouse gas equivalencies calculator. http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

[29] NYSERDA, 2012. NYS Regional GHG Emissions Summary, Version 1.0.

[30] United Nations Climate Change Secretariat, 2013. Emissions summary for Ecuador. http://unfccc.int/files/ghg_data/ghg_data_unfccc/ghg_profiles/application/pdf/ecu_ghg_profile.pdf

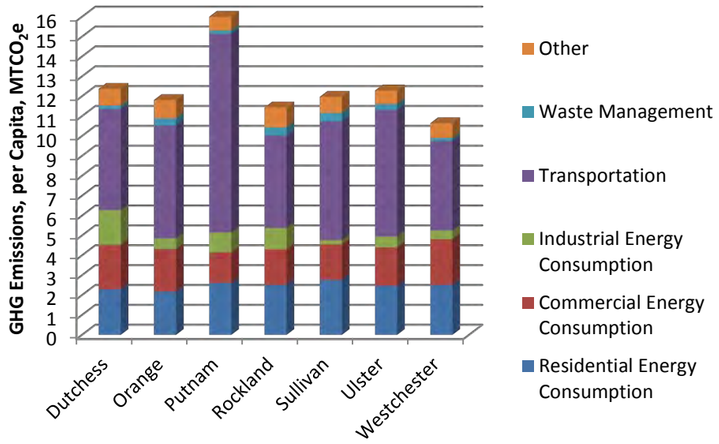


Figure 2.3 Per Capita Emissions by County and Source

energy use, which includes fuels used directly for space and water heating as well as the indirect emissions resulting from the use of electricity. These comprise 18 percent of the Region's total emissions.

Per capita emissions by county and by source are presented in Figure 2.3. Approximately 38 percent of the Region's emissions were generated by Westchester County, the most populous county in the Region. However, Putnam County had the highest per capita emissions rate, due in part to transportation emissions generated by traffic passing through the county. The GHG emissions inventory results, data, and methodologies are discussed in greater detail in Chapters 4 through 8 as well as in *Attachment I: The Mid-Hudson Regional GHG Inventory*.

2.3.2 Climate Change Vulnerability

The effects of climate change are already being felt in the Region, as evidenced in the steady decrease in Heating Degree Days (HDD) over the past three decades, among other indicators.[31] Due to the life-cycle of GHGs in the atmosphere as well as ongoing emissions from both natural and anthropogenic sources, climate change will continue to be felt for many years and, according to climate scientists' models, likely will increase in its impact (see Table 2.2). Recent experience with Hurricanes Irene and Sandy underscore the tremendous economic, environmental, and social impacts that can be caused by severe weather events, which are predicted to increase in frequency and severity as a result of climate change.

Table 2.2 Projected Change in Temperature, Precipitation, and Sea Level in the Mid-Hudson Region due to Climate Change

	1971-2000	2020s	2050s	2080s
Air temperature	48°F	+1.5 to +3.0°F	+3.0 to +5.5°F	+4.0 to +8.0°F
Precipitation	48 in	0 to +5%	0 to +10%	+5 to +10%
Sea level rise (SLR)		Inches	Inches	Inches
SLR Scenario 1: Moderate ice melt	n/a	+1 to +4	+5 to +9	+8 to +18
SLR Scenario 2: Rapid ice-melt	n/a	+4 to +9	+17 to +26	+37 to +50

Source: NYSERDA, 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State.

[31] ClimAID reports that between 1970 and 2007, the number of HDD has declined by 46.3 days per decade

In the Mid-Hudson Region, models show that climate change may have a number of different effects, including everything from increasing property damage to reducing water quality. Each of these effects stems from either a primary or secondary climate impact. Primary climate impacts are those directly associated with radiative forcing[32] due to GHG emissions, such as sea level rise, changes in precipitation, and changes in temperature. Secondary impacts include flooding, drought, and heat waves. Figure 2.4 provides an example of the link between changes to the climate (in blue), the resulting impacts (in yellow), and the effects on human systems (in green). This is not an exhaustive list, but illustrates the chain of impacts and effects.

Critically, climate change can impact the frequency and severity of extreme weather events (see Table 2.3). The Mid-Hudson Region is already challenged by extreme weather events, particularly flooding. From 1997-2010, flooding cost the Region more than an estimated $262 million dollars.[33] These numbers pale in comparison to the costs of Hurricane Irene—estimated at more than $1.5 billion in NYS[34]—and the likely costs of Hurricane Sandy, which have been estimated to be as much as $42 billion in NYS alone.[35]

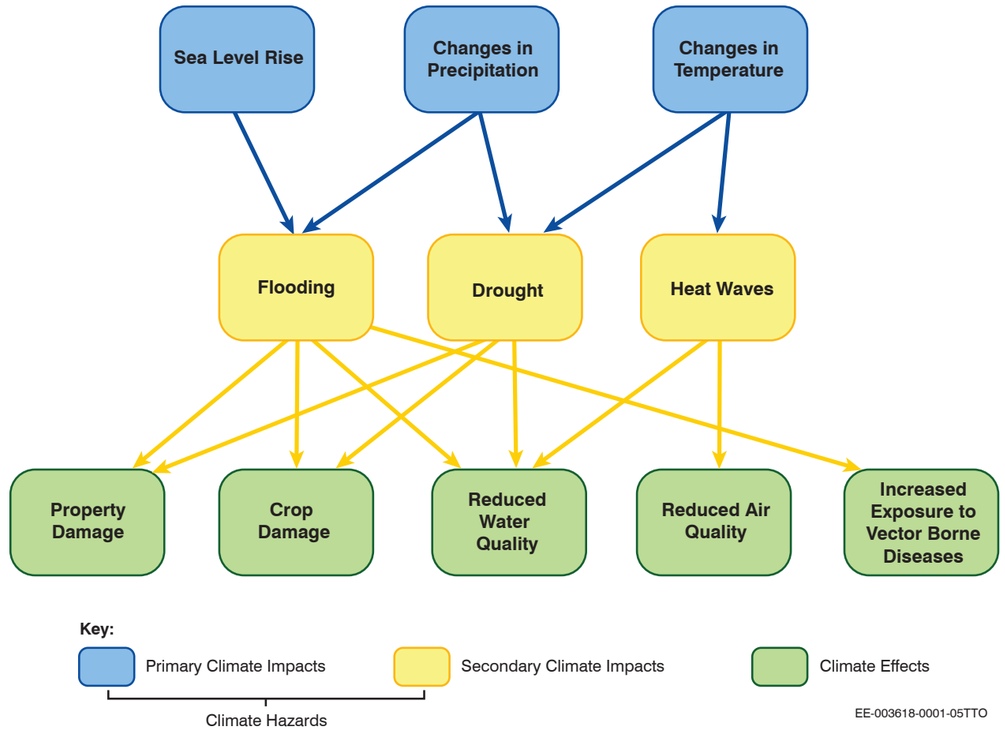


Figure 2.4 Climate Change Impacts and Effects

[32] Chandler, MIT News, 2010. Explained: Radiative Forcing. http://web.mit.edu/newsoffice/2010/explained-radforce-0309.html
[33] SHELDUS, 2011. Spatial Hazard Events and Losses Database for the United States. http://webra.cas.sc.edu/hvri/products/sheldus.aspx
[34] NYS Department of State, 2012. NYS Responds. http://www.governor.ny.gov/assets/documents/Irene-Lee-One-Year-Report.pdf
[35] NY Times, 2012. Hurricane Sandy's rising costs. http://www.nytimes.com/2012/11/28/opinion/hurricane-sandys-rising-costs.html?_r=0

Table 2.3 Impact of Climate Change on Extreme Events

Full range of changes in extreme events: minimum and maximum	1971-2000	2020s	2050s	2080s
Heat Waves and Cold Events		Number of days per year with max. temperature exceeding:		
90°F	12	13 to 34	16 to 53	21 to 75
95°F	2	2 to 10	3 to 20	4 to 39
Number of heat waves per year	2	2 to 5	2 to 7	3 to 10
Average duration	4	4 to 5	5 to 6	5 to 8
Number of days per year with min. temp. ≤ 32°F	138	101 to 128	70 to 115	57 to 112
Intense Precipitation		Number of days per year with rainfall exceeding:		
1 inch	12	10 to 14	10 to 14	10 to 15
2 inches	2	1 to 3	1 to 3	1 to 3

Source: NYSERDA, 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State.

By planning for the effects of climate change, the Region can avoid costly damage to infrastructure, life, and health. In each of the focus area chapters of the Plan, the specific potential impacts of climate change are discussed, and with strategies proposed to mitigate their effects. The complete study can be found in *Attachment II: The Mid-Hudson Region Climate Change Vulnerability Assessment*.

2.4 Capitalizing on the Region's Economic Development Strategy

The Mid-Hudson Regional Sustainability Plan seeks to complement and expand upon the economic development strategy crafted in 2011 by the Mid-Hudson Regional Economic Development Council (REDC), and subsequently updated in 2012. The REDC is a public-private partnership made up of local experts and stakeholders from business, academia, local government, and non-governmental organizations. The REDC takes a community-based, bottom-up approach to job creation and economic growth by distributing funds provided by NYS to support projects in the Region. Representatives of the REDC contributed to the development of this Plan, which has been designed to align with the four Focal Strategies promoted by the REDC (see Figure 2.5).

The four economic development (ED) focal strategies/objectives are:

- **ED1 - INVEST in Tech:** Target job creation investments in identifiable industry 'clusters' such as biotech, biomedical and healthcare; advanced manufacturing; and information technology.
- **ED2 - ATTRACT & RETAIN Mature Industries:** Undertake initiatives to retain and stimulate more mature industries such as distribution, financial and professional services, and corporate food and beverage, as these sectors represent large, vital anchor industries in the Mid-Hudson economy.

Figure 2.5 REDC Focal Strategies[36]

- **ED3 - GROW Natural Resource-Related Sectors:** Leverage the Region's outstanding natural resources, including its unique location between the Hudson River, Delaware River, and Long Island Sound, to sustain and promote waterfront development and industries including agriculture, tourism, artisanal food and beverage, and recreation. Additionally, it is vital that these industries preserve the Region's unique quality of life.
- **ED4 - REVITALIZE:** Support building projects that improve key regional infrastructure to make the Region more business-ready; foster housing investment to create construction jobs and more housing supply; and support the revitalization of our urban centers as engines of regional prosperity.

The Plan's objectives nicely match the focal strategies proposed by the REDC, in that they share a common goal of fostering economic development in a way that contributes to the Region's quality of life and environmental sustainability. The interconnection between the four economic development focal strategies and the different Plan objectives, project priorities, and enabling strategies is explored further in Chapters 4 through 8, and is discussed in detail in Chapter 9.

2.5 Environmental Justice as a Regional Concern

Environmental justice, as defined by the NYSDEC, is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities."[37]

Successful implementation of this Plan will require careful consideration of environmental justice issues to ensure that implementation actions do not unduly impact vulnerable communities and that, where possible, actions help to reduce existing inequalities.

[36] Mid-Hudson Regional Economic Development Council http://regionalcouncils.ny.gov/content/mid-hudson

[37] NYSDEC, 2012. Environmental justice. http://www.dec.ny.gov/public/333.html

2.5.1 History and Background

In 1994, President Clinton issued the Executive Order on Environmental Justice (Executive Order 12898).[38] The Executive Order directs all federal agencies to incorporate, as part of their mission, the goal of achieving environmental justice by ensuring that federally-funded policies and programs do not subject minority and low-income communities to "disproportionately high and adverse human health or environmental effects."[39] While many grassroots organizations had been fighting against environmental injustice for years, President Clinton's Executive Order was the first document with the force of law to address this issue.

More recently, environmental justice (EJ) issues have been tackled through different legislative means. For example the US EPA has put together Plan EJ 2014, which is "a roadmap that will help [the] EPA integrate environmental justice into the Agency's programs, policies, and activities. Plan EJ 2014 identifies Cross-Agency Focus Areas, Tools Development, and Program Initiatives as three essential elements that will advance EJ across the EPA and the federal government."[40]

The NYSDEC has established Commissioner Policy 29 on Environmental Justice and Permitting, which "provides guidance for incorporating environmental justice concerns into the… environmental permit review process and the DEC application of the State Environmental Quality Review Act (SEQRA). The policy also incorporates environmental justice concerns into some aspects of the DEC's enforcement program, grants program and public participation provisions."[41]

Regionally, the Mid-Hudson Valley Transportation Management Area has addressed EJ concerns in their 2010 Certification Review of the Transportation Planning Process.[42] Also, many non-profits (see the NYSDEC's website for a list[43]) have worked in the Region to raise awareness of EJ issues and advocate for different impacted communities.

[38] Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations

[39] US Department of Transportation (US DOT), 2010. Mid-Hudson Valley, NY Transportation Management Area. http://www.co.ulster.ny.us/planning/uctc/documents/mhv_cert.pdf

[40] US EPA, 2013. Environmental justice. http://www.epa.gov/environmentaljustice/plan-ej/

[41] NYSDEC, 2003. Commissioner Policy 29. http://www.dec.ny.gov/regulations/36951.html

[42] US DOT, 2010. Mid-Hudson Valley, NY Transportation Management Area. http://www.co.ulster.ny.us/planning/uctc/documents/mhv_cert.pdf

[43] NYSDEC, 2012. Local and regional environmental advocacy organizations in DEC Region 3. http://www.dec.ny.gov/public/991.html

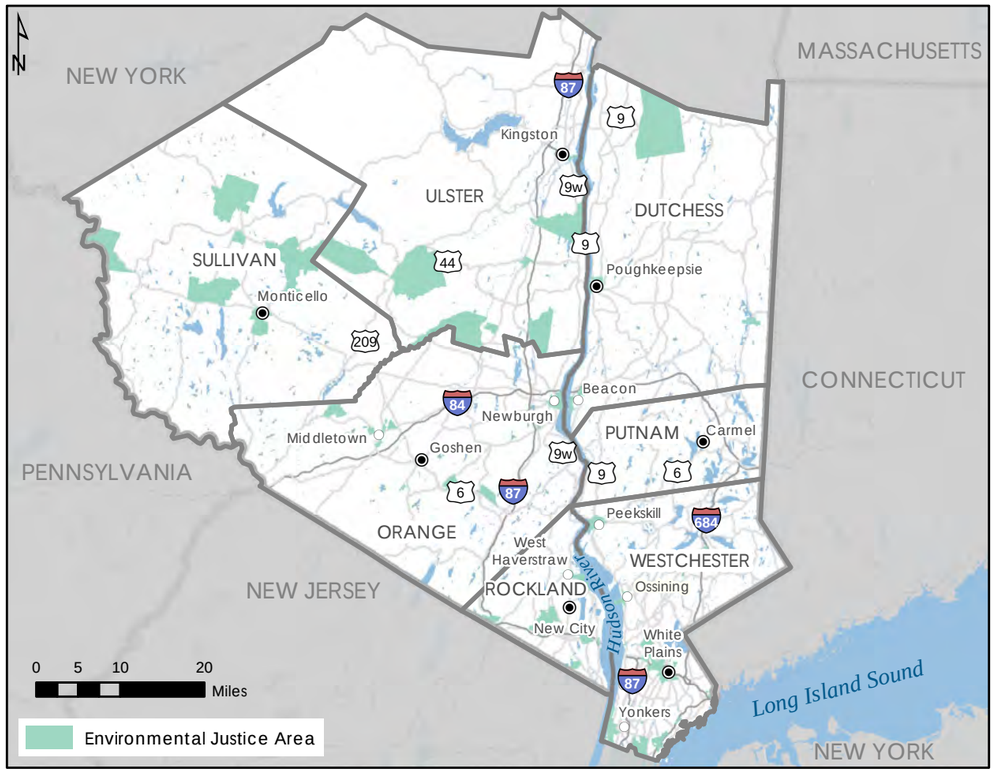


Figure 2.6 Mid-Hudson Region Environmental Justice Tracts

2.5.2 NYSDEC EJ Areas

As established in DEC Commissioner Policy 29, potential EJ areas are U.S. Census block groups of 250 to 500 households each that, in the 2000 Census, had populations that met or exceeded at least one of the following statistical thresholds:

- At least 51.1 percent of the population in an urban area reported themselves to be members of minority groups
- At least 33.8 percent of the population in a rural area reported themselves to be members of minority groups
- At least 23.59 percent of the population in an urban or rural area had household incomes below the federal poverty level[44]

Census tracts meeting these criteria are shown in Figure 2.6. As evidenced by the map, every county, except Putnam, has at least one EJ tract. These areas represent places in the Region where particular attention should be given to EJ issues in planning and implementation. By no means are these the only areas in the Region of concern; they are simply a subset with particular socio-economic and demographic characteristics.

It is important to note that the potential EJ areas delineated on this map include the areas around several of the Region's correctional facilities. Because the Census Bureau assigns inmates to their facilities during enumeration, these areas typically have a higher-than-usual proportion of minorities and a lower-than-usual median household income. Critically, the data used to identify the EJ tracts is derived from the 2000 Census; when updated with 2010 Census data, the results will be different. Dutchess County, among others, has noted certain distortions resulting from use of 2000 Census data.

[44] NYSDEC, 2012. County maps showing potential EJ areas. http://www.dec.ny.gov/public/899.html

3 The Approach and Structure of the Plan

The Mid-Hudson Regional Sustainability Plan was developed through a fast-paced and intensely collaborative planning process. Hundreds of volunteers representing dozens of organizations participated in developing the Plan. The entire planning process was designed to be as inclusive as possible, despite a schedule requiring completion of the Plan in a very short period of time.

The resulting Plan seeks to tell a story that builds on the existing conditions in the Region, defines objectives and targets for change, and proposes a series of strategies that can help make the Plan's vision a reality. This structure is echoed throughout each focus area chapter.

3.1 The Planning Process

Upon announcement of the *Cleaner, Greener Communities* program, leaders from the Mid-Hudson Region came together to form a planning Consortium. The Consortium, chaired by commissioners David Church of Orange County and Thomas Madden of the Town of Greenburgh, was led by the following governmental and non-governmental partners:

- Dutchess County
- Orange County
- Putnam County
- Sullivan County
- Ulster County
- Town of Greenburgh
- Center for Research Regional Education and Outreach (CRREO)
- Pace Land Use Law Center - Mayors' Redevelopment Roundtable
- Northern Westchester Energy Action Consortium (NWEAC)
- Southern Westchester Energy Action Consortium (SWEAC)

Additionally, the following governmental and non-governmental partners contributed to the work of the Consortium:

- Rockland County
- Westchester County
- Mid-Hudson REDC
- New York Council of Nonprofits (NYCON)

The **Consortium** was the governance body for the planning process, steering the work of the larger planning team. Consortium decision-making was based on consensus achieved through discussion. The Consortium met monthly for the entire duration of the planning process. In addition, the **project coordination team**—comprising the Consortium chairs, their staff, and the project manager and deputy for the consultant team—held weekly conference calls for the duration of the planning process.

The broader **planning team** included the Consortium members, a team of professional consultants led by Ecology and Environment, Inc., and more than 300 people who came together to form six Working Groups. The **consultant team** was responsible for producing the written deliverables, including the Plan, and for supporting the Consortium and Working Groups with technical expertise and management support.

> In forming the Working Groups, participation was open to all interested parties—at the same time, the Consortium sought to ensure representation from the key players in the private sector, government, and non-profits. Additionally, care was taken to include representatives from the northern and southern counties in the Region as well as rural and urban settings.

The **Working Groups** were made up of stakeholders from throughout the Region who volunteered their time and energy to develop the Plan. In forming the Working Groups, participation was open to all interested parties—at the same time, the Consortium sought to ensure representation from the key players in the private sector, government, and non-profits. Additionally, care was taken to include representatives from the northern and southern counties in the Region as well as rural and urban settings.

The six Working Groups reflected major focus areas for sustainability in the Region:

- Land Use, Livable Communities, and Transportation
- Energy
- Materials Management
- Agriculture and Open Space
- Water
- Economic Development *(cross-cutting theme)*

Each Working Group had at least two co-chairs as well as a representative of the Consortium. Additionally, each Working Group nominated a Climate Change Adaptation Liaison to ensure that this important cross-cutting theme was addressed. The Working Groups were tasked with compiling baseline information, defining planning objectives and targets, and identifying initiatives that could help achieve the objectives. The ideas and material generated by each Working Group were synthesized, reviewed, and compiled by the consultant team. The consultant team also helped fill gaps and facilitate consensus among Working Group members when discussing divisive issues.

The organizational chart for the planning effort is shown in Figure 3.1.

In addition to soliciting volunteers for the Working Groups, efforts were made to provide the public with numerous opportunities to participate in the planning process. These opportunities have included well-advertised public meetings, a 'virtual town hall' website **www.engagemidhudson.com**, and a public review process for the draft Plan. This process helped to engage citizens and foster a sense of regional identity, as well as capitalize on the existing knowledge in the Region. More information on the public outreach efforts can be found in the Public Engagement Summary in Appendix A.

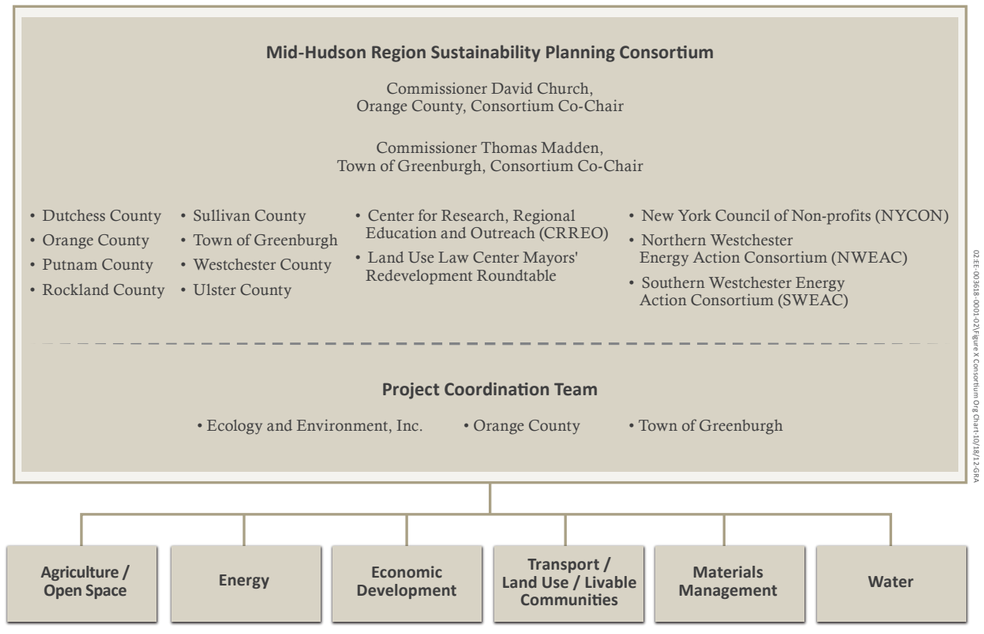


Figure 3.1 Planning Process Organization Chart

3.2 Navigating the Plan

The Plan—and each focus area chapter—is organized to answer three basic questions with regard to the Region's sustainable development:

- **Where are we?**
- **Where do we want to go?**
- **How do we get there?**

The central Plan themes were presented in Chapter 2. The five focus areas are reviewed in detail in Chapters 4 through 8. Chapter 9 includes a regional synthesis that identifies cross-cutting strategies to achieve the Plan's objectives. Chapter 10 outlines governance initiatives needed to sustain regional collaboration and facilitate implementation.

3.2.1 Where Are We?

The first, important step taken in developing the Plan was to gain a clear understanding of the state of the Region's economy, environment, and quality of life. This analysis provided a foundation for each Working Group to build on, allowing the Region to compare itself to other regions and NYS as a whole. This baseline assessment, based on the best available information, was essential to setting realistic targets and planning for transformative change.

The planning team reviewed existing reports, collected data, and completed interviews and research in an attempt to map out and understand current trends in each focus area. The results were used to inform the planning process and were documented in a Baseline Assessment, parts of which have been adapted and included in this Plan.

Key trends and information emerged that helped frame the discussion of the Region's future. As part of this analysis, specific metrics were identified for each focus area to support a quantitative assessment of the Region's sustainability.

3.2.2 Where Do We Want to Go?

For this Plan, sustainable development is defined as the ongoing effort to enhance well-being without degrading current or future natural, economic and social resources. This is similar to the 'triple bottom line' concept often referenced in the context of business. Further discussion of sustainable development is found in Chapter 2.

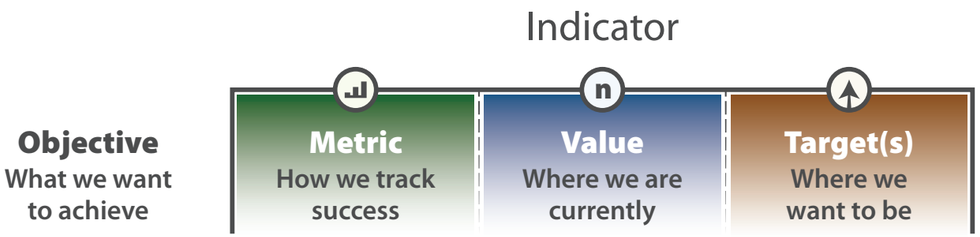


Figure 3.2 Objectives and Indicators

To help make this concept a little more concrete, specific objectives were established for each focus area, as well as for governance. The objectives were proposed by the Working Groups, based on an analysis of the baseline conditions in the Region and each focus area's particular challenges. Each objective is numbered and assigned a two-letter prefix to designate the focus area it applies to. This nomenclature is used to facilitate cross-referencing.

The qualitative objectives have, wherever possible, been matched with quantitative metrics. Targets were then set for each metric, with discrete milestones in the years 2020, 2035, and 2050. Targets were set in an *ad hoc* manner, and should be viewed as preliminary. Where existing NYS targets existed, the Plan's targets were aligned to ensure a degree of consistency. For example, GHG-related targets were largely set with the long-term objective of reducing GHG emissions by 80% by 2050. Interim targets were established based on the potential of existing technologies and legislation (for example the recently revised Corporate Average Fuel Economy standards) to achieve significant change. Targets were discussed by each Working Group, reviewed by the consultant team, and included in draft material subject to review. Future study is needed to evaluate the feasibility and necessary time horizon for meeting each target, and to revise accordingly.

Collectively, each metric and target constitutes an 'indicator' of sustainable development (see Figure 3.2). Progress can be tracked using these indicators, helping provide quantitative evidence of the Region's success in meeting the Plan's objectives.

No series of indicators can perfectly capture the myriad trends and issues that influence economic development, environmental sustainability, and quality of life. This is especially true in such a diverse Region, where data availability and quality limit the metrics that can be quantified at a regional scale. Recognizing this, two tiers of metrics are proposed:

- Tier 1 metrics are those for which relatively good data are available in all seven counties of the Mid-Hudson Region, and thus can be easily calculated
- Tier 2 metrics are those that would be valuable to track, but for which readily-available, high quality data are unavailable region-wide

In the future, as Tier 2 data become available throughout the Region, it will be possible to track a more robust set of sustainability indicators, and further hone initiatives identified through the planning process.

3.2.3 How Do We Get There?

The objectives and targets set in the Plan provide performance goals that can guide sustainable development activities in the Region for decades to come. This Plan is intended to establish a baseline for the future. It will need to be updated periodically to ensure that the objectives and targets continue to reflect the Region's vision and needs, as well as available technologies and best practices.

Many, many projects, programs, policies, and other initiatives will need to be planned, launched, and executed to meet the targets established in the Plan. To help guide these efforts, a series of **initiatives** has been proposed that responds to the particular challenges facing each focus area and the Region's sustainable development objectives more broadly. For each initiative, individual project ideas or examples are highlighted which typify the actions needed to make real change.

Prioritizing Initiatives

Initiatives have been prioritized based on the extent to which they meet the following criteria, which largely align with the Plan's central themes:

1. *Does the initiative positively impact Plan objectives in multiple focus areas?*
2. *Does it result in significant GHG reductions?*
3. *Does it create jobs that preferably remain for many years and, where possible, align with the Mid-Hudson Regional Economic Development Council's goals?*
4. *Does it strengthen the Region's resilience to disasters, including climate change?*
5. *Can it be replicated to have a regional impact?*
6. *Can it leverage investment from the private sector or from other sources beyond state government funding?*

These criteria have been applied to each recommended initiative to establish priority, with the most weight given to the first two criteria. In recognition of the fact that achieving sustainable development is critical for the Region and that achieving this Plan's objectives will require major, sustained change, initiatives have been ranked as high- or medium- priority. The initiatives proposed in this Plan are only a subset of the actions that will be needed to establish the Region as a true leader in sustainability.

This attempt at prioritization is necessarily preliminary. The criteria need to be applied in a more rigorous and quantitative manner by funding bodies to assess the relative merits of specific projects and to determine how to disburse funds.

Regional Synthesis and Implementation Strategy

In addition to individual focus-area initiatives, which constitute the backbone of the Plan's implementation strategy, a series of regional **strategic priorities** *have been identified. These strategic priorities include efforts which will impact multiple focus areas and have transformative potential at the regional scale.*

Finally, the Plan includes recommendations to sustain and strengthen regional-scale planning, coordination, and action. This regional scale governance is intended to help ensure accountability and facilitate Plan implementation at the local, organizational, and individual level.


Katonah

4 Land Use, Livable Communities, and Transportation

The Mid-Hudson Region benefits from its vibrant communities, access to a great mass transit system, as well as a pattern of development that combines truly rural with truly urban landscapes. To preserve this—and help reverse the trend toward inefficient sprawl and auto-dependency—our plan for land use, livable communities, and transportation is to:

- Strengthen centers supported by transit, by concentrating development in areas with existing services, infrastructure, employment opportunities, and multiple transit options. This will help strengthen the Region's communities and use resources more efficiently while protecting open space from development pressure.
- Create 'complete' communities, by ensuring each has:
  - An appropriate balance of housing and jobs
  - A mix of services including access to schools and healthy food
  - Access to parks, recreational facilities, and open space
  - Affordable housing and transportation options
  - A healthy environment
- Reduce transportation fossil fuel consumption and GHG emissions, by creating a safe, efficient, multi-modal transportation system accessible to all users
- Improve the safety, integrity, and resilience of regional infrastructure for all users, by upgrading, repairing, and maintaining infrastructure and ensuring that investments take into consideration all hazards, including those related to climate change

To achieve these objectives, we must:

- Implement Transit-Oriented Development (TOD)
- Promote Land Efficient Development (LED)
- Expand and upgrade mass transit
- Improve streets , sidewalks, and trails to connect communities and promote non-motorized transportation
- Use Transportation Demand and Systems Management to relieve roadway congestion and improve freight efficiency
- Mandate improvements in fleet vehicle fuel efficiency
- Rollout new commuter incentives

The patterns of land use in the Region are directly linked with virtually every aspect of this Plan. For example:

Land use patterns influence how people move:

- Access to mass transit and pedestrian/bicycle networks helps reduce dependence on automobiles
- Proximity to services, schools, and jobs reduces the amount of travel required to go about daily life

Land use patterns influence the health of the Region's residents:[45]

- Walkable and bike-able communities encourage healthy forms of mobility
- Reducing automobile traffic and properly siting and managing industrial facilities can improve air quality and reduce asthma
- Proximity to parks, recreational areas, and trails encourages activity and contributes to quality of life

Land use patterns influence the health of the natural environment and ecosystem services:

- Large tracts of protected land—be it forest, wetland, riparian corridor, meadow, or otherwise—provide good habitat and can often sustain greater biodiversity
- Reducing the development footprint and disconnecting impermeable surfaces can help mitigate stormwater and improve water quality, avoiding costly treatment and/or pollution
- Protecting wetlands—including tidal wetlands—can provide critical habitat, supply natural water filtration, and reduce flooding.

Land use patterns influence the economy:

- Protecting farmland and prime agricultural soils from development helps maintain the viability of the agricultural sector, a major source of jobs and healthy food in more rural parts of the Region
- Denser communities significantly reduce the amount of investment needed to build and maintain infrastructure, while freeing up land for productive use, conservation, and/or recreation
- Compact, transit-accessible development can help reduce a household's expenditure on energy for transportation, heating, cooling, and electricity, and may even allow families to eliminate the need for a personal automobile

The highly interconnected relationships between land use, livability, transportation, the environment, the economy, and other issues mean that some compromises have been required in structuring the Plan.

In Chapter 4, land use, livability (from a human perspective), and transportation are addressed. In Chapter 5, energy—for heating and cooling, electricity, industry, etc.—is addressed. Chapter 6 addresses materials management. Chapter 7 looks at agriculture and open space, touching on environmental issues related to forests and other lands. Chapter 8 addresses water concerns, including water quality, stormwater, wetlands, and watershed management. These chapters inevitably overlap, particularly with regard to land use and development patterns. Wherever possible, cross-references have been made to show the relationship between disparate parts of the Plan. Many of these connections have been further developed in Chapter 9, Strategic Priorities for the Mid-Hudson Region.

4.1 Baseline Conditions

4.1.1 Land Use

Land use and development patterns in the Mid-Hudson Region are reviewed in Chapter 1. To recapitulate:

- More than 20 percent of the Region's land is classified by the US Census Bureau as urban, compared with less than 9 percent in NYS
- From 2000 to 2010, the amount of urban land in the Region grew from 864 to 933 square miles, an 8 percent increase, while the population that lives in urban areas grew by only 7 percent
- On a per capita basis, an average person living in an urban area consumes 0.31 acres of land[46]
- 21 percent of the Region's land is protected from development
- 16 percent of the Region's land is dedicated to parks or recreational use and 60 percent of the population lives within a half mile of a park or recreational area
- Population density varies widely from approximately 2,200 people per square mile in Westchester County to 80 people per square mile in Sullivan County, with the densest areas located to the south and along the Hudson River
- 39 percent of the Region's population lives within a half mile of a bus stop, and 21 percent lives within one mile of a rail station
- There are nearly 700 miles of bike routes and trails within the Region

The Region's land use and development patterns underscore the importance of transitioning to a smart growth paradigm, which would strengthen existing densely populated communities, particularly those with access to multiple modes of transportation, while preserving open space, working landscapes, and sustainably managing the Region's natural resources.

4.1.2 Livable Communities

The Mid-Hudson Region is reputed for the quality of life or 'livability' of its communities. Livability is a difficult, subjective concept to define.[47] Many definitions exist within the different levels of government and residents of the Region would be hard pressed to come to consensus. However, certain key factors contribute to making the Region a desirable place to live. The diversity of land use patterns, giving residents easy access to truly rural and urban landscapes (discussed in Chapter 2 and Section 4.1.1), plays a role, as does the existing transportation infrastructure (discussed in Section 4.1.3), enabling mobility via multiple modes. Additional livability factors include:

- A diverse mix of housing and transportation options so that residents of all ages, abilities, skills, incomes, races, and nationalities have a place to live, work, and prosper
- A balance of jobs and housing, and salaries and home values that allow residents to live and work in the same community and spend less time traveling
- Affordable housing and transit to give residents more choices and greater mobility
- Access to parks, trails, and recreational facilities
- Proximity to schools, retail, health care, and other services so that fewer and shorter trips are required for resident's everyday activities
- A healthy environment to support a healthier population

The success and traditional character of the Region's communities can be revitalized or reinforced by attracting more jobs, retail, schools, multifamily housing, and other activities to existing transit, commercial, and service hubs. This allows residents to link numerous activities in one trip, such as shopping for groceries, mailing a package, and visiting the dentist, thereby saving fuel and reducing GHG emissions while protecting the surrounding natural environment from development.

[45] The Lancet 2012. Shaping Cities for Health: Complexity and the Planning of Urban Environments in the 21st Century. http://www.thelancet.com/commissions/healthy-cities

[46] US Census. 2000 & 2010. Urbanized Area.

[47] Cambridge Systematics 2013. Planning for Sustainable and Livable Communities. http://www.camsys.com/kb_experts_livability.htm

Housing

From 2000 to 2010, the Region's population and housing unit supply grew by 5.1 and 8.5 percent, surpassing NYS' average of 2.1 and 5.6 percent, respectively.[48] Single-family homes predominate, comprising 62 percent of all housing stock in the Region, compared with 69 percent in NYS (excluding NYC).[49] Most of the multi-family housing units (more than two units per structure), which make up 36 percent of the total housing stock, are found in more urbanized Westchester County. With 41 percent of the Region's population, Westchester County has more than 57 percent of the Region's multi-family housing stock.

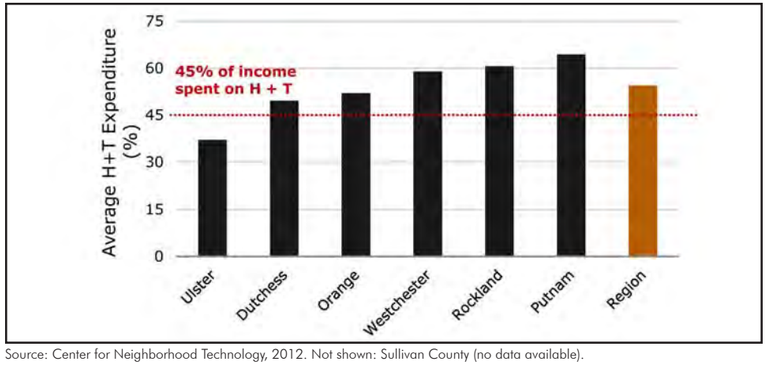
> ...efforts need to be taken to match housing supply with the needs of the market, ensuring an adequate diversity of housing options. It may well be possible to meet the Region's housing needs without expanding the footprint of developed land.

As noted in Chapter 2, vacant housing units in the Region vary widely from county to county from a low of 5.5 percent in Rockland County to a high of 38.9 percent in Sullivan County.[50] The reasons for the discrepancy vary.[51] For example, second homes (vacation homes) are counted as vacant, skewing the numbers in places with a significant stock of second homes. The varying impacts of the subprime mortgage crisis as well as trends in unemployment also have a concomitant impact on vacancy rates. While these statistics suggest that there is surplus housing capacity in parts of the Region, this capacity may not match the needs of the market. For example, the Three-County Regional Housing Needs Assessment completed in 2008 for Orange, Dutchess, and Ulster counties suggests that there is a more than 50,000 unit housing gap for families with incomes less than 120 percent of the median household income level.[52] To address these gaps, efforts need to be taken to match housing supply with the needs of the market, ensuring an adequate diversity of housing options. It may well be possible to meet the Region's housing needs without expanding the footprint of developed land.

> ...the Region spends an average of 54.6 percent of income on housing and transportation. Ulster is the only county in the Region where households spend less than 45 percent of income on housing and transportation, which is considered the threshold for affordability.

Housing and Transportation Affordability

Housing and transportation costs make up a significant portion of the Region's residents' budgets, suggesting that affordability is a challenge for many households. According to the Center for Neighborhood Technology (see Figure 4.1), residents of the Region spends an average of 54.6 percent of income on housing and transportation. Ulster is the only county in the Region where households spend less than 45 percent of income on housing and transportation, which is considered the threshold for affordability.[53] In Putnam and Rockland County, more than 60 percent of household income is spent on housing and transportation.



Source: Center for Neighborhood Technology, 2012. Not shown: Sullivan County (no data available).

Figure 4.1 Housing and Transportation Affordability Index

[48] US Bureau of the Census. 2000 & 2010. Census of Population and Housing.

[49] Ibid.

[50] US Bureau of the Census 2011. American Fact Finder. http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_3YR_DP04&prodType=table

[51] The Times Herald-Record 2011. More Homes Stay Vacant Across the Mid-Hudson Region http://www.recordonline.com/apps/pbcs.dll/article?AID=/20110417/NEWS/104170336

[52] Ulster, Orange, and Dutchess County Planning 2009. A Three-County Regional Housing Needs Assessment. http://www.co.ulster.ny.us/planning/ucpb/house/tricounty/final_report.pdf

[53] Center for Neighborhood Technology. 2012. http://htaindex.cnt.org/

The Ratio of Jobs to Housing and Salary to Home Value

To enable people to live and work in the same place, and in turn reduce transportation demand and its associated impacts, there needs to be:

- A balance of jobs and housing that is appropriate for the location, in terms of the capacity of the transportation system, surrounding development context, and natural environment. Balance alone is not enough if the workers cannot afford to live there or if the jobs are not aligned with the skills of residents.
- A balance of income to home value to ensure that workers can find housing that is affordable or acceptable to them and, vice versa, residents can find jobs that suit their skill sets and meet their income needs. If there is an imbalance between job pay and home values in a community, people will continue to commute long distances.

Figures 4.2 and 4.3 show these two ratios mapped by Census tract. Areas in blue in 4.2 are dominated by housing with a shortage of jobs, whereas areas in red have substantially more jobs than housing. In 4.3, Census tracts in red and blue have significant imbalances between average home value and wages, suggesting that residents may have to travel to find employment in line with housing costs and vice versa for workers.

Looking at these data at the regional or even Census tract level masks considerable diversity. These metrics are more relevant when used in the context of economic development decisions and land use zoning, where smart growth efforts can guide residential, commercial, and industrial development to the areas where it is needed most.

These two ratios are not the sole determinants of where people live and work, but are very important in determining whether a community is self-sufficient and meets the livability needs of its residents. For example, more than 50 percent of the Region's residents cross county borders as part of their daily commute.[54] This suggests that many of the Region's residents must travel significant distances to get to work.

Furthermore, the recent Many Voices, One Valley study suggests that, while 84 percent of residents like living in the Hudson Valley, 69 percent of residents are disappointed with the quality of their local jobs.[55]

[54] US Census, 2010. ACS.

[55] Marist College, 2012. Many Voices, One Valley. http://www.manyvoicesonevalley.org/2012-executive-summary/

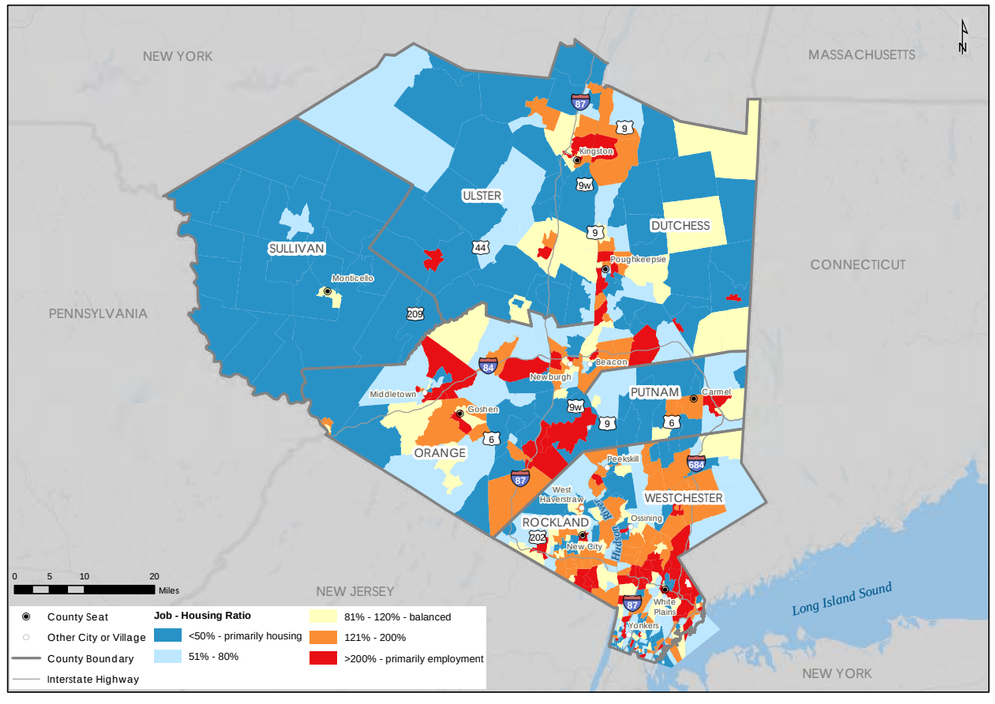


Figure 4.2 Jobs to Housing Ratio

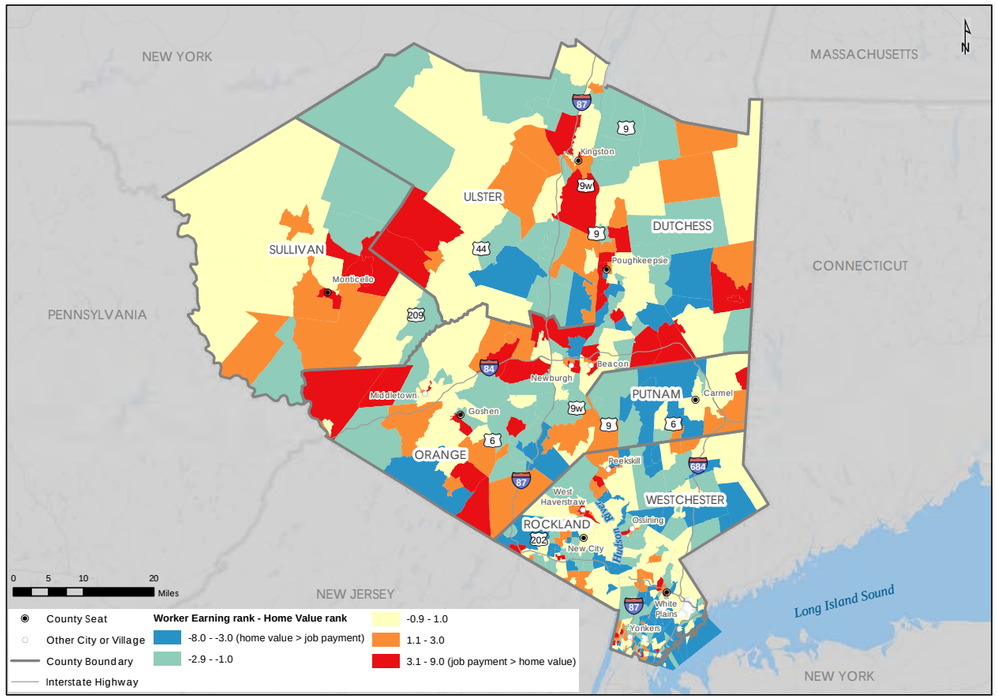


Figure 4.3 Income to Home Value Ratio

Measuring these variables in a meaningful way is challenging. For example, there may be a balance of average income to average home value in a community, but the same community may have virtually no jobs and abundant housing. Comparing these statistics allows one to identify areas with significant imbalances and take corrective measures through planning and targeted investment, for example to rezone commercial space as residential and vice versa.

> ...more than 50 percent of the Region's residents cross county borders as part of their daily commute.

Parks and Recreational Land

Approximately 16 percent of the Region's land area consists of parks (see Figure 4.4).[56] Because of the abundance of park and recreational land, more than 60 percent of the Region's population can access parks and recreational areas within one-half mile of their homes.[57]

Proximity to Schools and Services

An important facet of a complete community is proximity to services and schools. A detailed analysis of proximity to schools and services has not been completed as part of this Plan, and merits its own separate study.

Proximity to schools is important because if schools can only be reached by automobile, it prevents students from walking, biking, or taking mass transit to class. This makes it difficult for students to attend school if they miss their bus or cannot easily obtain a ride. It also discourages students from making the most of out-of-class activities provided by schools as they must abide by bus schedules or have unfettered access to a personal vehicle.

[56] Scenic Hudson. 2012. Parks and Recreation Data.

[57] US Census. 2010. Census of Population and Housing.

Decreasing the distances traveled for children to attend school would reduce the burden that the cost of busing places on already cash-strapped school districts. This may, in turn, reduce the necessary tax burden on the local population.[58] Additionally, walking or biking is a good form of exercise.

Auto-centric schools force the local community to access many of the amenities provided by school facilities such as auditoriums, play fields, and day-care using their personal vehicles. This increases GHG emissions and decreases the interaction between the school and community as a whole, decreasing the community's sense of ownership of the school. Schools act as hubs for the community, providing education as well as healthcare services, employment opportunities, after-school programs and services, and other community services. If schools are close to community centers and easily accessible by multiple modes of transportation, they can serve as anchors for the revitalization of town centers.

> In the Mid-Hudson Region, every county except for Putnam has at least one Census tract that can be classified as a food desert… Approximately 34,000 people reside in areas that can be considered food deserts.

Access to food is another critical requirement for a livable, complete community. The Healthy Food Financing Initiative Working Group considers low-income Census tracts[59] where a substantial number or share of residents has low access[60] to a supermarket or large grocery store as food deserts.[61] In the Mid-Hudson Region, every county except for Putnam has at least one Census tract that can be classified as a food desert, according to these criteria. Approximately 34,000 people reside in areas that can be considered food deserts.[62]

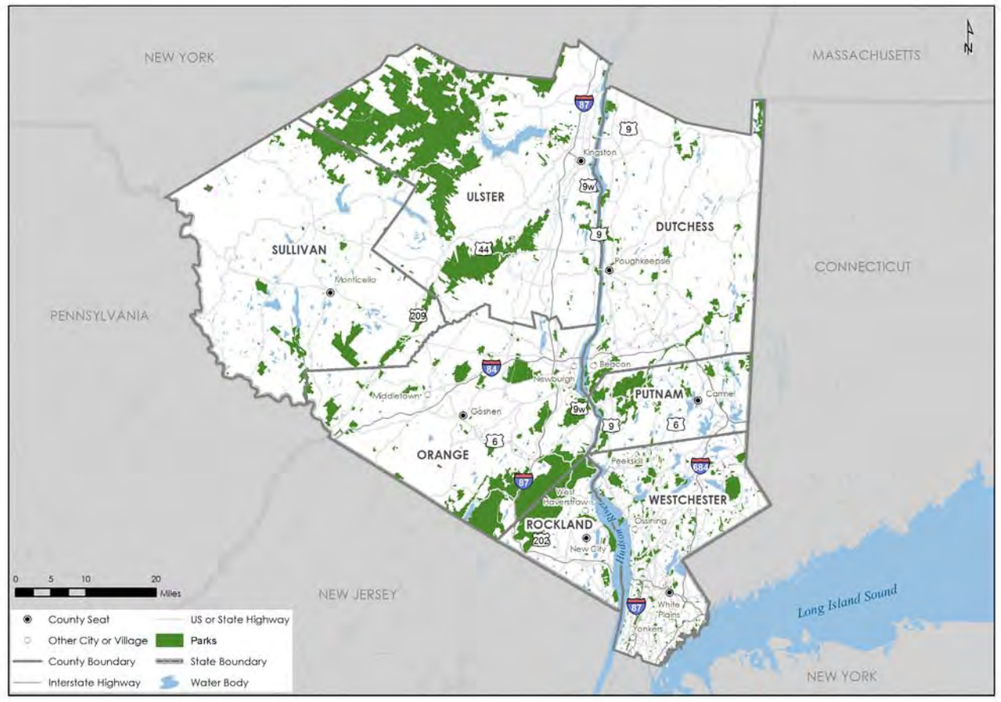


Figure 4.4 Parkland, 2010

[58] PACE Law Center. 2010 Ulster Intergovernmental Report.

[59] To qualify as low-income, Census tracts must meet the Treasury Department's New Markets Tax Credit (NMTC) program eligibility criteria, which defines a low-income Census tract as: any Census tract where (1) the poverty rate for that tract is at least 20 percent, or (2) for tracts not located within a metropolitan area, the median family income for the tract does not exceed 80 percent of statewide median family income; or for tracts located within a metropolitan area, the median family income for the tract does not exceed 80 percent of the greater of statewide median family income or the metropolitan area median family income.

[60] At least 33 percent of the tract's population or a minimum of 500 people in the tract must have low access to a supermarket or large grocery store. Low access to a healthy food retail outlet is defined as more than 1 mile from a supermarket or large grocery store in urban areas and as more than 10 miles from a supermarket or large grocery store in rural areas.

[61] USDA, 2012. Food Locator. http://www.ers.usda.gov/data-products/food-desert-locator/documentation.aspx

[62] Ibid.

Brownfields, Contaminated Sites, and Hazardous Material Storage Facilities

Throughout the Region, there are more than 2,000 contaminated/brownfield sites or other regulated hazardous materials storage facilities.[63] These sites and facilities can limit development and, in some cases, present a risk to surrounding communities if improperly managed. These hazards are discussed in greater detail in the context of climate change vulnerabilities. The NYSDEC maintains a database of spill incidents, environmental remediation sites, and bulk storage facilities, which is updated nightly.[64] As of December 2012, the NYSDEC lists more than 330 environmental remediation sites in the Region as participating in one of the various state cleanup programs.

Air Quality

The Region's air quality needs improvement to meet regulatory standards. Table 4.1 shows the individual counties in the Region and which of them are currently in non-attainment for air quality. The Table shows that parts of the Region are out of attainment for particulates (PM-2.5) and ozone, which result from fossil fuel combustion, among other processes.

Despite non-attainment, the Region fares better than NYS in terms of the number of asthma-related Emergency Department visits (see Figure 4.5).[65] However, this number may be skewed by the inclusion of NYC in the statistics.

Air quality is closely linked to transportation and energy, as combustion processes (among other causes) lead to the creation of pollutants. Transitioning to cleaner fuels and reducing vehicle miles traveled can greatly improve air quality.

Vector-Borne Diseases

Vector-borne diseases—namely, diseases transmitted by mosquitoes, ticks, and fleas—pose a public health risk for residents of the Mid-Hudson Region. Of particular concern in the Region are West Nile Virus and Lyme disease.

West Nile Virus, spread by mosquitoes, can have serious human health impacts.[66] In 2012, the Region had nine reported cases, compared with only four in 2010 and 2011.[67] West Nile Virus may increase in prevalence as a result of climate change.

Table 4.1 Non-Attainment by Pollutant and County 2010-2012

Location	2010	2011	2012
Dutchess	8 Hour Ozone (1997)	8 Hour Ozone (1997)	8 Hour Ozone (1997)
Orange	8 Hour Ozone (1997)	8 Hour Ozone (1997)	8 Hour Ozone (1997)
	PM-2.5 (1997)	PM-2.5 (1997)	PM-2.5 (1997)
	PM-2.5 (2006)	PM-2.5 (2006)	PM-2.5 (2006)
Putnam	8 Hour Ozone (1997)	8 Hour Ozone (1997)	8 Hour Ozone (1997)
Rockland	8 Hour Ozone (1997)	8 Hour Ozone (1997)	8 Hour Ozone (1997)
	PM-2.5 (1997)	PM-2.5 (1997)	8 Hour Ozone (2008)
	PM-2.5 (2006)	PM-2.5 (2006)	PM-2.5 (1997)
			PM-2.5 (2006)
Sullivan	In Attainment	In Attainment	In Attainment
Ulster	In Attainment	In Attainment	In Attainment
Westchester	8 Hour Ozone (1997)	8 Hour Ozone (1997)	8 Hour Ozone (1997)
	PM-2.5 (1997)	PM-2.5 (1997)	8 Hour Ozone (2008)
	PM-2.5 (2006)	PM-2.5 (2006)	PM-2.5 (1997)
			PM-2.5 (2006)

Source: US EPA, 2012. Green Book Non-Attainment Areas for Criteria Air Pollutants.

[63] Based on available NYSDEC and US EPA data

[64] NYSDEC, 2013. Environmental Remediation Databases. http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=1

[65] NYS Department of Health (NYSDOH), 2011. Information on Asthma in New York State. http://www.health.ny.gov/statistics/ny_asthma/

[66] CDC, 2012. West Nile Fact Sheet. http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factSheet.htm

[67] CDC, 2012. Incidence of West Nile Map. http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control12MapsAnybyCounty.htm

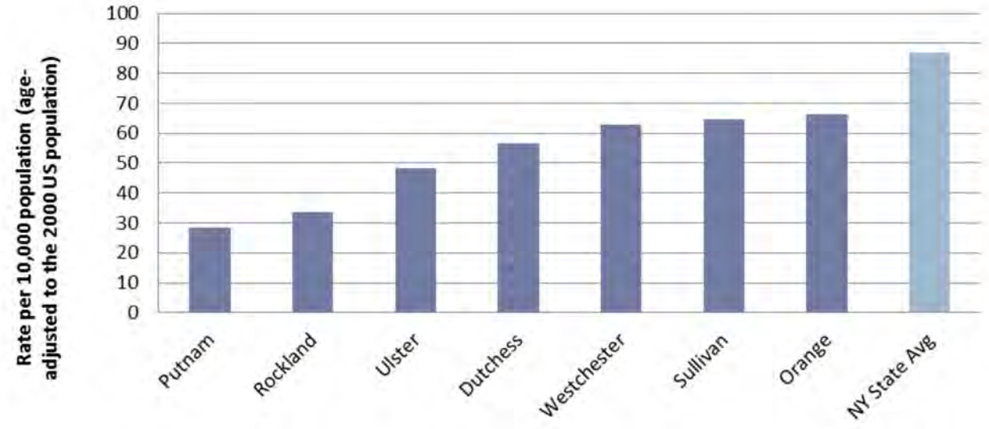


Figure 4.5 Average Asthma Emergency Department Visit Rates in the Mid-Hudson Region by County Compared with NYS (2007-2009)

There is a close relationship between land use and Lyme disease. Each shopping mall, golf course, or other residential or commercial development that is in or adjacent to woodlands disturbs habitat and contributes to forest fragmentation. Mice and deer, which thrive in disturbed and fragmented habitat, are especially important as they act as carriers to ticks that carry the Lyme bacteria (*Borrelia burgdorferi*). As a result of this increase in carrier species populations, the Region has become a hotspot for Lyme disease (see Table 4.2) with an incidence of the disease at the county level ranging from 2 to 10 times the NYS average.[68] See Chapter 7 for further discussion of forest fragmentation.

In order to help limit the spread of this disease, local land use planning and implementation must take into account the forest fragmentation created as a result of development. Municipal health officials also must work to raise awareness of the disease. Smart growth principles that decrease the fragmentation of forests will allow for better protection of habitat, limiting the spread of Lyme disease vectors in the Region.

Table 4.2 Lyme Disease per 100,000 Population

	Lyme Disease				Population	
Location	2007	2008	2009	Total	2008	Incidence
Dutchess	551	1,141	979	2,671	292,878	304.0
Orange	510	991	1,088	2,589	379,647	227.3
Putnam	140	202	381	723	99,244	242.8
Rockland	200	353	328	881	298,545	98.4
Sullivan	69	118	114	301	76,189	131.7
Ulster	361	778	582	1,721	181,670	315.8
Westchester	360	1,026	659	2,045	953,943	71.5
Region	**2,191**	**4,609**	**4,131**	**10,931**	**2,282,116**	**159.7**

Source: NYSDOH, 2011. http://www.health.ny.gov/statistics/chac/general/lyme.htm

[68] NYSDOH, 2011. Lyme Disease per 100,000 population.

4.1.3 Transportation

Roads and Bridges

With only 40 percent of the Region's population living in areas that are within easy walking distance of mass transit, the road and bridge network is of paramount importance. There are 3,200 miles of limited access highways and 16,700 miles of local roads in the Region.[69] The tolled mainline of the NYS Thruway, or Interstate 87, runs through Westchester, Rockland, Orange, and Ulster counties, connecting NYC and Albany. The Region is also served by:

- I-84, which carries highway travelers from Massachusetts through Connecticut and New York to Pennsylvania
- I-684, which serves Westchester and Putnam counties
- I-95, which serves southern Westchester County
- I-287, between Greenburgh and I-95
- I-86/NYS Route 17 serving Sullivan and Orange counties
- The Taconic Parkway, serving Dutchess, Putnam, and Westchester counties

The Region's road and bridge network is showing considerable wear and tear. For example, 42 percent of the Region's 2,691 bridges are either functionally obsolete or structurally deficient, and this share has grown in recent years.[70] These bridges need either significant repair or replacement. The state of repair of roads is also declining. In 2002, the average road was rated 7.1, or 'Good' condition, meaning that distress was only beginning to show.[71] In 2011, the average road in the Region was given a rating of 6.7, or 'Fair' condition, meaning that distress in the pavement was clearly visible.

Bus and Rail

The bus network primarily serves denser urban areas, such as Yonkers, White Plains, and New Rochelle. Bus service is also widespread in many of the towns and villages in the southern half of Westchester County, and in a more limited way in smaller cities, towns, and villages such as Nyack, Spring Valley, Poughkeepsie, New Paltz, Monroe/Kiryas Joel, Middletown, Newburgh and Kingston. The Region's bus infrastructure is well-developed—the Bee-Line in Westchester County is the second largest bus system in NYS, carrying approximately 30 million riders annually.[72]

[69] NYS Department of Transportation (NYSDOT), 2012. Roads.
[70] NYSDOT, 2012. Bridge State of Good Repair.
[71] Ibid.
[72] Westchester County Department of Public Works and Transportation

According to the National Transit Database and Rockland County, in 2010 there were seventeen bus operators in the Region: [73]

- Two in Dutchess County
- Five in Orange County
- One in Putnam County
- Seven in Rockland County
- One in Ulster County
- One in Westchester County

A few of these operate across county borders.[74] Westchester County's Bee-Line service is notable in that it offers service into Bronx County to connect to employment centers and the NYC subway system, as well as parts of Putnam County and Connecticut. As well, the TAPPAN ZEExpress Bus Service connects Rockland and Westchester County and multiple Metro-North lines. The OWL bus service connects Orange, Rockland, and Westchester counties.

There is potential to increase inter-operability among the Region's systems, which are primarily county or municipality-operated. Already, the Bee-Line accepts NYC Transit MetroCards for payment, and free transfers are provided between Bee-Line and other regional services such as TAPPAN ZEExpress, OWL, Leprechaun, and I-Bus services. Expanding interoperability helps encourage commuting by simplifying things like payment and eliminating double-fares.

The Region's commuter rail network has five lines, three emanating from NYC's Grand Central Terminal and two from Hoboken, New Jersey (NJ). The Metropolitan Transportation Authority's (MTA) Metro North Railroad has either total or partial responsibility for each of the commuter lines in the Region.[75]

Two of the nation's major intercity rail corridors traverse the Region. The Northeast Corridor, Amtrak's busiest, has a station in New Rochelle before heading into Connecticut. The Empire Corridor, Amtrak's fifth busiest, has stations in Westchester, Putnam, and Dutchess counties on the east side of the Hudson River.

Other Modes

There are two commercial airports, Westchester County Airport in White Plains and Stewart International Airport in Newburgh. Other local airports cater primarily to private craft, but rarely handle commercial traffic.

There is a small amount of ferry infrastructure, including docks, piers, and ships, in place to handle passenger service on the Hudson River. Ferry service in Newburgh and Haverstraw provides transit connections to Metro-North's Hudson rail line.

There are nearly 700 miles of bike routes and trails, which amount to 1.6 feet per capita.[76] There are no comparable regional data sets to compare to, and so this statistic should be considered as a regional baseline to be increased through Plan implementation and through better data collection. Many of the Region's paths are intended for recreational purposes.

Transportation Trends by Mode

In 2009, there were over 1.7 million registered vehicles in the Mid-Hudson Region (one for every 1.35 people) and annual vehicle miles traveled (VMT) exceeded 23 billion, or 10,100 per capita.[77] Average VMT per capita in the US in 2010 was about 9,600.[78] One possible explanation for VMT per capita being higher is that a large portion of the Region's VMT is due to freight vehicles and through traffic using the Region's limited access highways. Also, high VMT per capita is indicative of auto-dependent sprawl, which characterizes parts of the Region.

[73] Other bus systems exist in the Region, but are not listed in the National Transit Database either because they are small private or municipal systems that do not volunteer data, or they have never received funds from the Federal Transit Administration. An example of such a system is the private Short Line bus company which offers service from Monticello in Sullivan County to NYC amongst other origins and destinations.
[74] National Transit Database. 2012. Bus Operators.
[75] MTA, 2012. Metro-North Railroad.
[76] NYMTC, 2012. Bike Lanes.
[77] NYSDOT, 2012. VMT.
[78] US DOT, 2012. Research and Innovative Technology Administration. www.rita.dot.gov

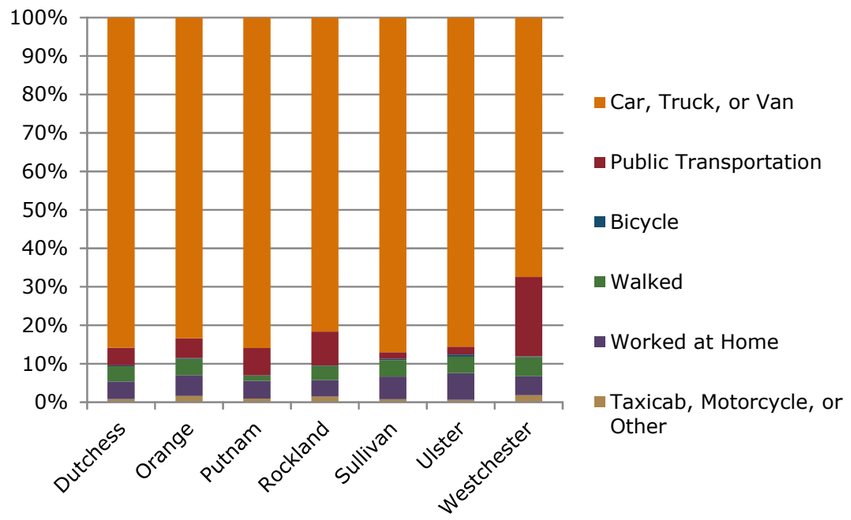


Figure 4.6 Work Trips by Mode, 2010

In general, VMT is not a highly reliable measure of vehicle use, as the data are only sampled by the NYS-DOT on a small proportion of the state's roads once every four years. In between these sample years, VMT are calculated through a process of interpolation.

The Census' American Community Survey, which asks workers to self-report their commuting behavior, is another valuable source of data. In 2010, the ACS reported that 77 percent of the Region's workers commuted by automobile (see Figure 4.6). Of that percentage, 88 percent drove alone in their cars and 11 percent carpooled.[79] Fewer commuters drove to work compared with the national average. One of the reasons for this is because many residents work in NYC, which is well served by mass transit from many parts of the Region. Additionally, a small percentage of workers work from home. However, of those commuters that drove, a larger proportion drove alone.

Nearly 12 percent of the Region's commuters used mass transit to get to work compared with less than 5 percent of the nation's workers.[80] Ferries make up a negligible proportion of commuter trips, accounting for only 0.02 percent of trips in 2010.[81] Bicycling and walking, while popular for recreation, are less common for commuting compared with other modes. However, biking and walking are slightly more common than in the rest of the country. In 2010, 4.5 percent of the Region's commuters rode a bike or walked to work, compared with 3.3 percent throughout the US.[82] These data may not represent the full extent of bicycling and walking as a commuting mode. The ACS asks respondents to report how they 'usually' get to work and, if more than one mode is used, they are asked to select the mode they use for the longest distance. This means that commuters who bike or walk to work two days a week will not be counted, and commuters that bike or walk to the train station most likely will not be counted either.

A more precise measure of change in vehicle use is the number of annual Hudson River bridge crossings, which are individually tallied by the NYS Bridge Authority and Thruway Authority. As seen in Figure 4.7, in 2011 there were 101.1 million bridge crossings over the Hudson River in the Region.[83] Notably, this traffic is down by 1.6 million crossings (or 1.6 percent) since 2002. Interestingly, truck traffic at bridge crossings declined by 15 percent from 2002 to 2011.

79 US Census, 2010. ACS.
80 Ibid.
81 Ibid.
82 Ibid.
83 NYS Thruway Authority, 2012. Bridges.

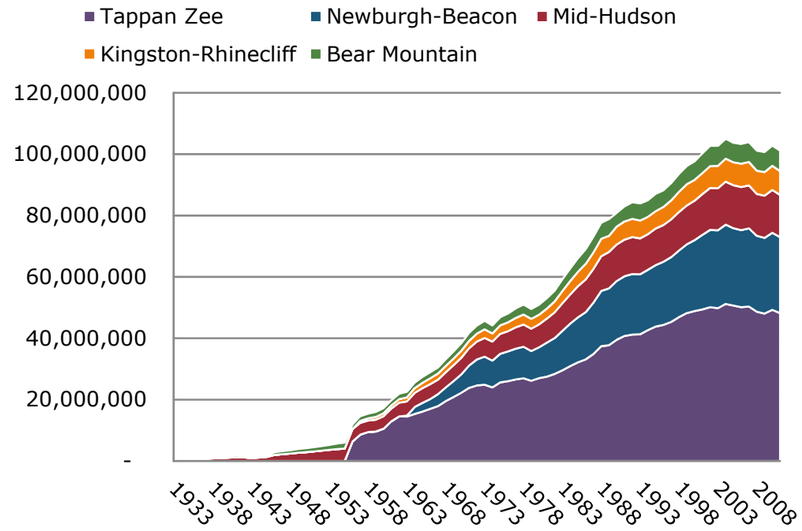


Figure 4.7 Hudson River Bridge Traffic, 1933 to 2011

In 2010, fueling stations in the Region sold nearly 820 million gallons of gasoline, meaning the average vehicle consumed around 480 gallons per year.[84] While this seems low compared with the national average, which was 530 gallons for light duty vehicles in 2010, it may underestimate fuel consumption.[85] As of July 2012, the combined local, state, and federal gas taxes in NYS were 67.7 cents per gallon, compared with 32.9 cents per gallon in NJ.[86] As a result, many drivers may go out of their way to purchase gas in NJ. Because of this, the volume of fuel that is burned is likely much greater than the volume of fuel purchased in the Region.

Together in 2011, the Region's two commercial airports accommodated 2,317,611 passengers, down nearly 250,000 from 2007.[87] While passenger travel has increased by 252,480 at Westchester Airport, during the same time period passenger travel decreased by over 500,000 at Stewart Airport, a reduction of nearly 55 percent. Both airports also handle freight cargo. In 2010, they handled 119,372 and 16,835 tons, respectively.[88] Comparative year-to-year data are not readily available.

For centuries the Hudson River served as one of the main drivers of economic growth for the Region, carrying freight between major hubs. While there are no longer any major commercial ports in the Region, the Port of Albany and the Port of New York and New Jersey are located to the north and south of the Region. In 2011, the Port of New York and New Jersey was the third largest port in the nation and the largest on the East Coast, handling over 85 million metric tons of cargo.[89] Much of the cargo offloaded in the port travels through the Region by rail or truck.

The Port of Albany is smaller, handling just over 305 thousand metric tons in 2011, but is still an important economic driver for the Region.[90] The vast majority of the Port's cargo is outbound, meaning that cargo is collected there by truck or rail and loaded onto ships. In 2011, the Port completed a $12 million renovation project to increase capacity, suggesting that the amount of cargo that the Port handles will continue to grow in the future.[91] In addition, the ships the Port services pass through the Region on their way to Albany and support various related services along the river. For example, the Hudson River Pilots Association recently opened the Mid-River Pilot Station in Hyde Park, where ships stop to pick up river captains to safely traverse the stretch of the Hudson River between NYC and Albany.[92]

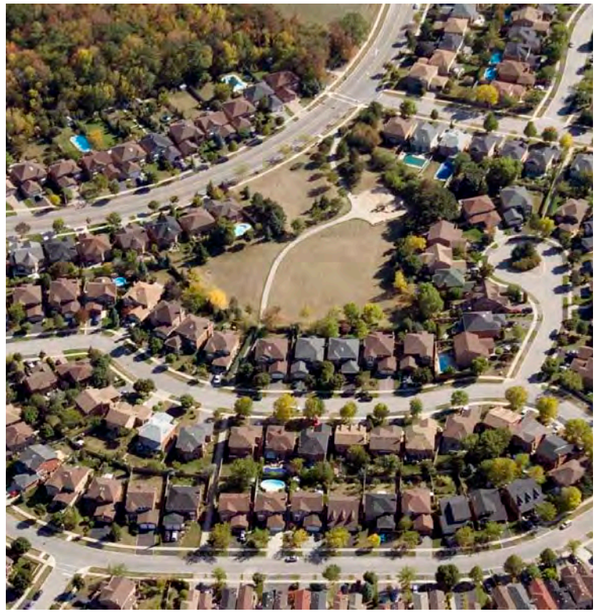
84 NYSERDA. 2012. Gasoline Sold.
85 US DOT, 2012. Research and Innovative Technology Administration.
86 Ibid.
87 Port Authority of New York & New Jersey. 2011. Airports.
88 Ibid.
89 Port Authority of New York & New Jersey. 2011. Ports.
90 Port of Albany. 2011. Annual Report.
91 Ibid.
92 Port of Albany. 2012. Pilotage.

4.1.4 Environmental Justice Considerations

Ensuring access to a diversity of housing and jobs is a central EJ concern. As noted, housing and transportation costs in the Region are high, which disproportionately affects the poor.[93] Furthermore, as shown in the discussion of livable communities, there are many parts of the Region where housing is located away from job centers. This forces individuals to travel—sometimes considerable distances—to- and- from the workplace. This can be a source of increased expenditure and can have a particularly significant impact on low-income households.[94] In this context, transit cuts can be particularly impactful on EJ communities.

Parts of the Region have come under scrutiny for access to fair and affordable housing—as noted by Westchester County, "Even in good economic times, Westchester has had a shortage of fair and affordable housing. Under state law, the County has limited legal authority to actually build housing."[95]

Environmental justice principles require that special consideration be given to the siting of affordable housing. If affordable housing options are located in polluted or otherwise degraded locations, health problems (including morbidity) can result due to increased exposure to environmental toxins such as air pollution, lead, etc.[96]



In the past, the placement of highway and transportation infrastructure sometimes caused a disproportionate impact (in terms of noise, air quality, mobility, visual impacts, etc.) on low-income or minority populations. To help combat this trend, the US DOT now officially evaluates its projects to avoid disproportionately affecting environmental justice communities.[97]

The Plan's recommendations help address many EJ concerns. For example, Transit Oriented Development (TOD) helps increase access to a diversity of housing and jobs near transit centers, which can allow people to work, shop, and recreate in the same area.

[93] Morello-Frosch, Pastor, Sadd, Shonkoff, 2012. The Climate Gap http://dornsife.usc.edu/pere/documents/ClimateGapExecSumm_10ah_small.pdf
[94] Surface Transportation Policy Project, 2003. Transportation Costs and the American Dream. http://www.transact.org/library/decoder/american_dream.pdf
[95] Westchester County Planning, 2012. Housing for Westchester. http://homes.westchestergov.com/
[96] Health Canada, 2013. Health Effects of Air Pollution. http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/effe/health_effects-effets_sante-eng.php
[97] US DOT, 2000. Overview of Transportation and Environmental Justice. http://www.fhwa.dot.gov/environment/environmental_justice/overview/

4.2 Climate Change, Land Use, Livable Communities, and Transportation

4.2.1 GHG Emissions

Land Use and Livable Communities

Changes in land use patterns impact the extent and composition of forests in the Region. As land is cleared for development or other uses, the ability of forests to store (or 'sequester') carbon in their trees, forest litter, and soils is impacted. Wetlands in the Region are also effective carbon sinks and can help mitigate floods. Land use changes in the Mid-Hudson Region in 2010 resulted in a net emission of 5.3 million MTCO2e. Results by county are shown in Table 4.3. These data have significant limitations and should be viewed with a degree of caution—see callout box below. See Chapter 8 for further discussion of wetlands.

Table 4.3 2005-2010 Net Change in Forest Carbon Stocks

Location	GHG Emissions in MTCO2e
Dutchess	1,825,360
Orange	(1,359,459)
Putnam	653,119
Rockland	(703,539)
Sullivan	4,817,816
Ulster	833,305
Westchester	(811,868)
Region	**5,254,734**

Source: Attachment I: Regional GHG Inventory

Transportation

The combustion of fuel in vehicles results in emissions of CO_2, CH_4 and N_2O. The amount of CO_2 emitted by vehicles depends on the amount of fuel consumed, whereas CH_4 and N_2O emissions vary based on control technologies used by vehicles. On-road vehicles are considered to include passenger cars, other 2-axle and 4-axle vehicles, single-unit trucks, buses, combination trucks, and motorcycles.

Total emissions from on-road vehicles in 2009 (proxy for 2010) were approximately 10.3 million MTCO2e (see Table 4.4). Motor gasoline and diesel accounted for 87 percent and 13 percent of on-road emissions, respectively, while motor gasoline, diesel, and ethanol (primarily included through blending with motor gasoline) account for 82 percent, 12 percent, and 6 percent of energy consumption on the basis of British Thermal Units (Btu).

On-road emissions in the Region account for more than 84 percent of all transportation emissions. The remainder of emissions stem from boats, planes, trains, and off-road vehicles (including equipment such as lawnmowers and all-terrain vehicles).

Calculating GHG Emissions due to Land Use Change

The US Forest Service's Forest Inventory and Analysis database, used to calculate GHG emissions from land use, land use change, and forestry focuses on the amount of canopy coverage and the type and size of trees in forests, which indicate forest carbon sequestration. This is a different way of calculating land use change than a method built on data from the US Census Bureau. The Census Bureau measures urban areas mainly using block level population density, which is more indicative of development and transportation infrastructure. The methods are different and direct comparison is difficult.

The Forest Service's dataset is, at its core, based on satellite imagery. Satellite imagery data may not precisely calculate change in forest cover. For example, the NYS property assessment data show that 18% of the Region is wild, natural forest. The NYSDEC forest fragmentation data suggest that over 90% of the Region is forest. The Forest Service data indicate that 62% of land area is forest.

Table 4.4 Transportation GHG Emissions

	GHG Emissions (in MTCO2e)					
Location	On-Road	Air	Marine	Rail	Off-Road	Total by County
Dutchess	1,253,476	2	68,543	47,371	113,231	1,482,623
Orange	1,988,057	40,044	31.074	27,437	117,542	2,173,111
Putnam	906,346	-	26.650	20,717	36,752	963,842
Rockland	1,215,184	-	54,978	10,804	102,364	1,383,330
Sullivan	392,347	4	9,189	518	48,117	450,175
Ulster	968,418	1	105,874	13,800	63,346	1,151,439
Westchester	3,529,093	241,184	384,669	7,184	352,960	4,515,090
Region Total by Source	**10,252,920**	**281,235**	**680,978**	**127,831**	**834,313**	**12,177,277**
Region Percent by Source	**84.2**	**2.3**	**5.6**	**1.0**	**6.9**	**100.0**

Source: Attachment I: Regional GHG Inventory

4.2.2 Climate Change Vulnerability

Land Use and Livable Communities

Land use patterns play a large role in determining how vulnerable a population, community, or other valued asset is to climate-related hazards. For example, housing and other infrastructure located in low-lying areas may be susceptible to flooding. Removal of wetlands or paving large areas can eliminate natural flood buffers. Public health may be put at risk during periods of extreme heat or cold. Table 4.5 presents potential climate effects that impact land use and the livability of communities.

Sea level rise and coastal flooding from storm surge are already affecting and will increasingly affect NYS' entire ocean and estuarine coastline from Montauk Point to the Battery and up the Hudson River to the federal dam at Troy. This was evidenced most recently by the impacts of Hurricane Sandy, which flooded swaths of low-lying land in the Region.

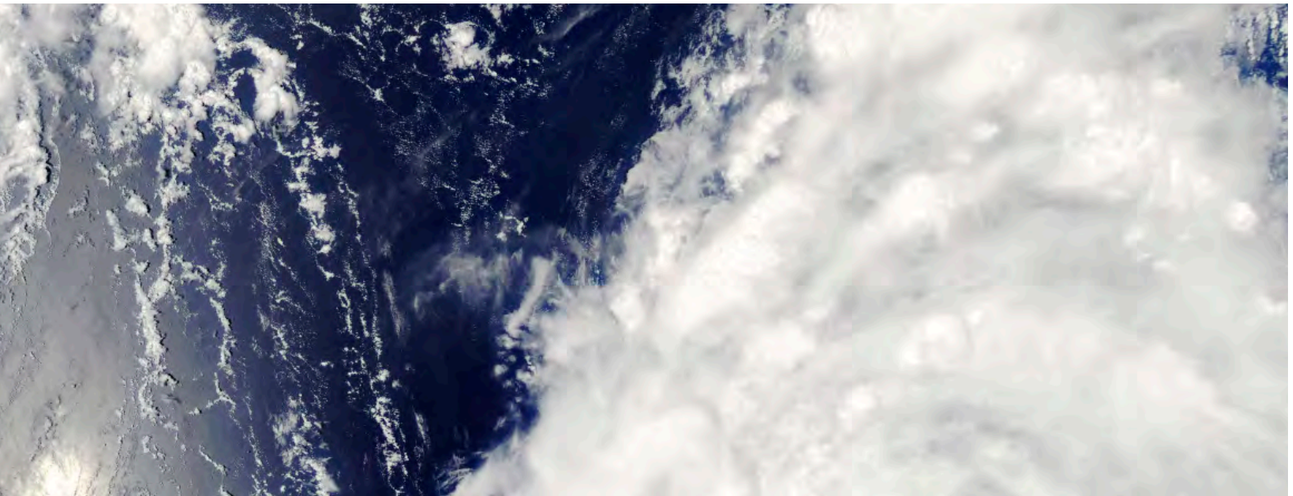


Table 4.5 Summary of Land Use and Livable Communities-Related Climate Effects in the Mid-Hudson Region

Asset	Climate Impact	Climate Effect	Description
Developed Areas and Open Space	Extreme weather; Flooding	Property damage	Residential, recreational, cultural, agricultural, and historical properties will experience damage from severe weather events—flooding in particular.
Agricultural Lands			See Chapter 7
Biodiversity			See Chapter 7
Public Health	Extreme heat	Reduced air quality	High heat days result in increased ozone (smog) levels.
	Increase in annual average temperature	Increase in vector-borne diseases	Warmer weather results in longer breeding seasons and ranges for pests such as ticks and mosquitoes that carry diseases including Lyme disease and West Nile virus.
	Extreme heat	Increase in heat-related illness	More high heat days and heat waves can lead to heat-related illnesses such as heat exhaustion and heat stroke.
	Extreme weather; flooding and heat	Disruption of medical service	Flooding and severe weather can prevent care givers from reaching patients and providing medical attention. Certain individuals rely on electricity to run medical devices and are vulnerable to power outages that could result from extreme weather including heat, flooding and other storms.

Source: Attachment II: Climate Change Vulnerability Assessment

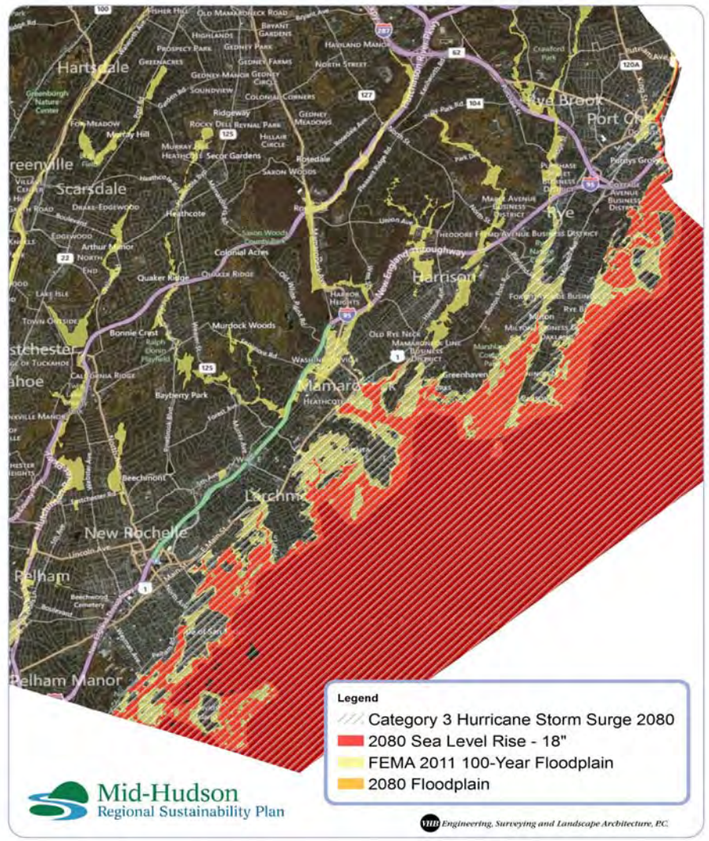


Figure 4.8 Coastal Climate Impacts

Mapping analysis completed as part of the planning process (see Attachment II for the details) shows that the coastline in Westchester County along Long Island Sound is particularly vulnerable to sea level rise and storm surges. Figure 4.8 shows how the coastal area of Westchester County will be impacted by flooding, storm surge and sea level rise by the end of the century. As a result of climate change, some residential areas and parks such as Pelham Bay could be inundated with as little as 18 inches of sea level rise. Land along the Hudson River is also highly vulnerable to impacts from sea level rise and storm surge.

In addition to flooding from sea level rise, increased frequency and severity of storms could present considerable added risk to communities and facilities located in flood zones in higher elevation areas, such as the Catskills. In 2011, the Catskills suffered tens of millions of dollars of damage due to extensive flooding caused by Hurricane Irene.[98]

Of the more than 2,300 contaminated, regulated or brownfield sites in the Region, 312 are in the existing FEMA 100-year floodplain; 316 would be in the 2080 floodplain, which incorporates 18 inches of sea level rise (SLR). At present, 78 sites are in the existing storm-surge inundation zone and 128 would be located in the 2080 storm surge inundation zone (which includes 18 inches of SLR). For these hazard sites that are potentially vulnerable to flooding, standard safeguards and/or remediation engineering solutions may not be appropriate.

[98] The New York Times, 2011. In Catskill Communities, Survivors Are Left With Little but Their Lives. http://www.nytimes.com/2011/08/30/nyregion/storm-leaves-catskill-towns-little-but-debris.html?_r=0

Many climate hazards have cascading effects that can threaten human health. For example, as the climate warms, air quality will decline due to more high ozone days. Milder winters will bring more cases of and longer exposure to vector-borne diseases such as West Nile virus and Lyme disease. Heat-related illnesses such as heat exhaustion and heat stroke will increase due to more frequent and more extreme high heat days. In the Mid-Hudson Region, the number of days per year with maximum temperatures exceeding 90 F could increase from 12 to 75 days, based on a high emissions scenario (see Chapter 2).

Emergency response facilities (critical facilities), such as hospitals, fire stations, police stations and schools (often used as shelters), need to take extra precaution to be protected from hazards such as flooding and sea level rise. See Attachment II for a list of critical facilities that are vulnerable to flooding, storm surge from a Category 3 hurricane, and SLR.

Transportation Vulnerabilities

Climate change could impact the Mid-Hudson Region's transportation system in a variety of ways. For example, sea level rise and increased precipitation may inundate low-lying areas and overload drainage systems. This was recently experienced during Hurricane Sandy (See Figure 4.9).

Culverts and bridges subject to flash floods that exceed design capacity can cause roads to washout—this is significant given that there are over 2,800 bridges in the Region—half of which cross a river or stream.[99] Chapter 8 discusses this issue in greater depth.

For a list of climate impacts to the Region's transportation see Table 4.6.

[99] This number came from GIS analysis using the NYSDOT's Bridges layer file, a vector point file consisting of bridges that carry or cross a public road.

Figure 4.9: Boat Deposited on Metro North Tracks due to Hurricane Sandy (Source: REUTERS)

Table 4.6 Summary of Transportation Related Climate Effects in the Mid-Hudson Region

Asset	Climate Impact	Climate Effect	Description
Roads, Highways, and Pedestrian Ways	Flooding and Intense Precipitation	Infrastructure damage	Increased precipitation and sea level rise can cause flooding on roadways. Intense precipitation events can overload drainage systems. Culverts too small to handle the increased water volume can cause roads and trails to washout.
	Extreme Heat	Infrastructure damage; Summertime construction delays; Traffic signal outages	Extreme heat can damage pavement and other materials on roads, runways, and bridges. Heat can also cause delays in construction due to worker health, although milder winters will extend the construction season. Power outages during heat waves will affect traffic signals and impact traffic flow.
	Warmer Winters	Increase in potholes, cracks and frost heaves; Reduced salt use in the winter	Warmer winters mean more freeze/thaw cycles which cause potholes, cracks, and frost heaves in pavement. Warmer winters could also reduce costs from snow removal and road salting.
Railroads and Mass Transit	Severe storms	Service delays and disruptions	An increase in severe storms could result in service delays and disruptions while tracks and roadways are cleared of debris or water. High winds and heavy precipitation can also damage roadway and rail infrastructure.
	Extreme Heat	Infrastructure damage; Service delays; Passenger discomfort	Heat can damage railroad infrastructure such as railroad tracks, electrified third rail, and catenary wires. Heat also causes service delays since trains run slower in the heat and power outages impact rail signals. Extreme heat also creates discomfort for passengers using mass transit.
Aviation	Severe Storms	Delays and cancellations	Weather related delays could become more frequent at airports.
	Extreme Heat	Infrastructure damage	Airport runway surfaces may need to be constructed with different materials to cope with more high heat days.
Shipping and Bridges	Severe Storms; Drought	Increase need for dredging; Increase in bridge scour; Bridge closures	Reduced river levels during certain periods of the year and sediment redistribution from storms could increase the need for dredging and/or lead to bridge scour. High winds could also cause temporary closure of larger bridges.
	Warmer Winters	Longer shipping season	Reduced ice cover in the winter will allow for a longer shipping season.

Intense precipitation and storms could compromise rail and road infrastructure. Strong storms bringing high winds often leave debris on tracks causing delays and damage. Flooding and sea level rise along the Hudson River threatens much of the Region's rail infrastructure, which largely runs parallel to the river. Sea level rise may not directly inundate rail infrastructure, however it will likely eliminate the buffer zone that protects this infrastructure from flooding. The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) analysis indicates that, by the end of the century, 237 miles of rail would be vulnerable to inundation during a Category 3 hurricane, assuming moderate (18") of sea level rise. Table 4.7 shows how many miles of rail could be inundated under each scenario. Figure 4.10 shows rail and roadway in Croton that is particularly vulnerable to sea level rise.

Table 4.7 Miles of Rail within Climate Hazard Areas

	Miles of Rail
Total in Region	887
FEMA Floodplains*	177
2080 Floodplains*	212
2012 Cat. 3 SLOSH	175
2080 Cat. 3 SLOSH	237
2080 SLR	10

*Does not include Putnam and Rockland Counties, because floodplain data were not provided

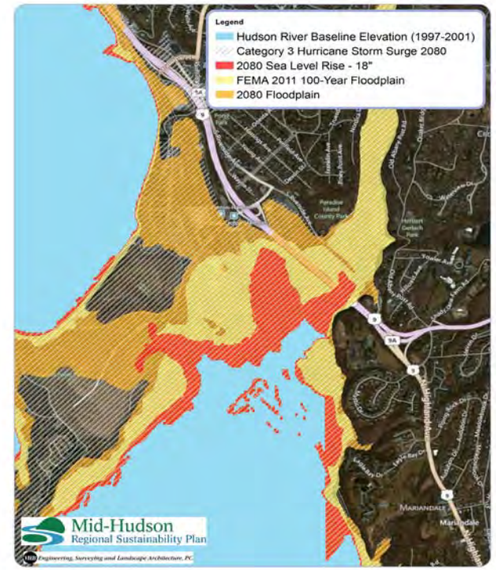


Figure 4.10 Croton Rail/Roadway Flooding

4.3 Objectives

The Mid-Hudson Region benefits from access to a great mass transit system, vibrant communities, as well as a pattern of development that combines truly rural with truly urban landscapes. To preserve this—and help reverse the trend toward inefficient sprawl—the Plan includes the following objectives:

TL1: Strengthen Centers Supported by Transit

- Revitalize the centers in the Region that are serviced by mass transit. These centers are, or have the potential to be, walkable places with multiple transportation options, allowing people to live, work, and travel in ways that minimize environmental impacts.
- Direct growth to existing centers, which have capacity in their transit, roads, and utilities to absorb growth, making more efficient use of land and infrastructure and saving money. Increasing the density of existing centers will help protect open space from development pressure.
- Ensure that new development provides a diversity of housing options.
- See callout box on page 4-22 for further detail.

TL2: Create Complete Communities

- Make all of the Region's communities—whether urban, suburban, or rural—more sustainable and livable. A complete community is one where residents can access jobs, a diverse mix of services, schools, recreational opportunities, and open space within a short distance of their home without having to drive. Investing to make existing communities more complete will help lower household transportation costs, reduce fuel consumption, improve air quality, promote public health, and discourage sprawl.
- See callout box on page 4-24 for further detail

As described earlier, significant parts of the Region's infrastructure, including transportation and utility assets, are in need of repair and/or are vulnerable to the effects of climate change and other hazards. This can lead to significant disruptions in services, as experienced recently during Hurricane Sandy, impacting the Region's economy. As well, many roads and rail lines were not designed to accommodate current traffic volumes and will need to be rebuilt.

TL3: Reduce Transportation Fossil Fuel Consumption and GHG Emissions

- Create a safer, more efficient multi-modal transportation system that gives residents, workers, and visitors more transportation choices.
- Reduce transportation fuel consumption and GHG emissions by shifting travel to carpooling, mass transit services, and non-motorized modes and by increasing the efficiency of the Region's passenger and freight transportation system.
- Reduce the need to travel through smart planning and zoning practices.
- Increase the use of clean fuel vehicles in the Region.
- Make better use of existing infrastructure, to avoid the need for new investment and to reduce long-term maintenance costs.

TL4: Improve the Safety, Integrity, and Resilience of Regional Infrastructure for All Users

- Design transportation facilities and other infrastructure to take into consideration all hazards, including the impacts of climate change.
- Ensure adequate maintenance to improve safety and maximize the longevity of infrastructure investments.
- Improve the response to natural disasters when they occur, particularly by preparing hazard mitigation plans and after action reports, to ensure that response and recovery creates more resilient communities and infrastructure systems.

TL1: Identifying Centers for Growth

Centers are cities, towns, and villages with above average population, housing, and job densities, robust road, transit, bike, and pedestrian networks, and the capacity to support mass transit service, which make them good targets for 'smart growth' development.

To identify regional centers for growth, a spatial analysis of land use and transportation patterns was completed. This analysis defined centers as places with above average transportation connectivity, measured by the density of the street grid, access to rail and/or bus transit services, and the walkability between schools, housing, and other activity centers.

Another factor used to identify centers was Transit Score, an indicator developed by NJ Transit and Delaware Valley Regional Planning Commission that incorporates existing population and employment density and the density of zero-car households into one indicator that helps identify areas suitable for investment in different transit modes, such as fixed route bus services, bus lanes, bus rapid transit, or rail.

In addition to the quantitative analysis described above, the planning team reviewed the Region's counties' own stated priority growth areas and reviewed these areas' land use characteristics using satellite imagery. The methodology used in this analysis, described above, adopts a consistent approach to defining centers across the entire Region. Centers for growth are listed in Table 4.8 and are shown in Figure 4.11.

This independent analysis should NOT be taken as overriding existing or pending analyses led by individual counties. Each of the Region's counties has taken an independent approach to targeting areas for growth and development, in many cases identifying additional centers based on criteria not included in this analysis. A common criterion in many county analyses is whether or not a center has a Main Street or other business district/historic area that can act as a true community center. The independent analysis conducted for the Plan highlights the importance of some regional centers, but should not be considered as a definitive classification or prioritization.

Table 4.8 Centers for Growth

Centers: Cities and Towns		Centers: Villages[1]	
City/Town Name	County	Village Name	County
Beacon city	Dutchess	Harriman	Orange
Poughkeepsie city	Dutchess	Cold Spring	Putnam
Poughkeepsie town	Dutchess	Nelsonville	Putnam
Middletown city	Orange	Haverstraw	Rockland
Monroe town	Orange	Kaser	Rockland
New Windsor town	Orange	Nyack	Rockland
Newburgh city	Orange	Spring Valley	Rockland
Port Jervis city	Orange	Suffern	Rockland
Clarkstown town	Rockland	West Haverstraw	Rockland
Haverstraw town	Rockland	Ardsley	Westchester
Orangetown town	Rockland	Bronxville	Westchester
Ramapo town	Rockland	Dobbs Ferry	Westchester
Stony Point town	Rockland	Elmsford	Westchester
Esopus town	Ulster	Hastings-on-Hudson	Westchester
Kingston city	Ulster	Irvington	Westchester
Eastchester town	Westchester	Larchmont	Westchester
Greenburgh town	Westchester	Mamaroneck	Westchester
Mamaroneck town	Westchester	Mount Kisco	Westchester
Mount Kisco town	Westchester	Pelham	Westchester
Mount Pleasant town	Westchester	Pelham Manor	Westchester
Mount Vernon city	Westchester	Port Chester	Westchester
New Rochelle city	Westchester	Tarrytown	Westchester
Ossining town	Westchester	Tuckahoe	Westchester
Peekskill city	Westchester		
Pelham town	Westchester		
Rye city	Westchester		
Rye town	Westchester		
White Plains city	Westchester		
Yonkers city	Westchester		

[1] Villages are confined within county borders, but some villages cross city/town borders

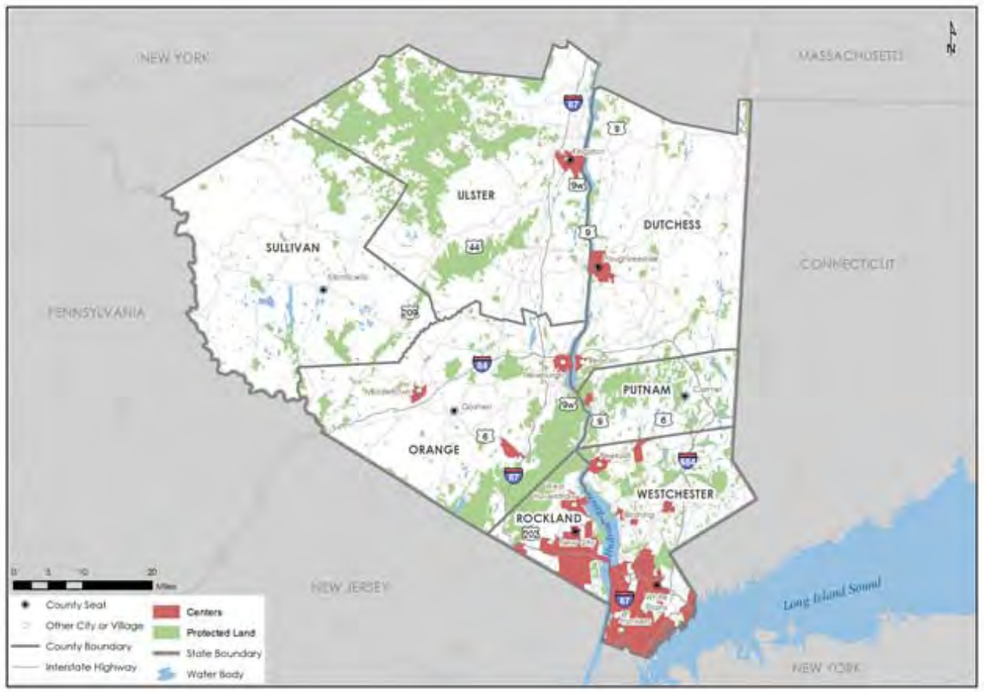


Figure 4.11: Centers for Growth

TL2: Complete Communities

A 'complete community' is any place, whether it is in an urban or rural setting, where residents can access jobs, a diversity of services, schools, recreational opportunities, and open space within a short distance of their home without having to drive. This is achieved by attracting high-paying jobs, essential services, and retail opportunities to village and hamlet downtowns. Additionally, it requires establishing bicycle and pedestrian connections among a community's services, residences, and local schools to facilitate mobility. Investing in the public realm, including sidewalks, crosswalks, bike lanes, and street trees, to create Complete Streets can help achieve this objective. According to Tri-State Transportation Campaign, as of late October 2012 six counties and over 30 municipalities in the Region have passed Complete Streets resolutions or policies, and another dozen or more are in the process.

Several metrics are proposed to evaluate Complete Community characteristics, including:

- Balance of housing to jobs (2a)
- Salaries to home values (2b)
- Increased multi-family housing (2c)
- Access to parkland (2d)
- Proximity to services (2e)
- Proximity to schools (2f)

The Complete Community concept has been developed in recognition of the fact that the vast majority of land in the Region consists of open space or low-density suburban and rural development without access to mass transit services. These places generally do not have sufficient population and job density to support mass transit services and high-density, mixed-used transit-oriented development. Despite this, there are many other ways these communities can reduce GHG emissions and environmental impacts while preserving a suburban or rural character, enhancing their livability, and providing the quality of life that their residents value.

There are over 81 incorporated villages in the Mid-Hudson Region. There are also hundreds of unincorporated hamlets, many of which contain traditional Main Streets or smaller centers, where basic retail and services are concentrated in walkable environments. These communities already act as magnets for tourists, as well as for families seeking to change lifestyles. The objective is to revitalize or reinforce the success and traditional character of these places by attracting more jobs, retail, schools, multifamily housing, and other activities. This allows residents to link numerous activities in a single trip, such as shopping for groceries, mailing a package, and visiting the dentist, saving time, money, and reducing GHG emissions, all while protecting open space from development.

4.4 Indicators

Table 4.9 presents a series of sustainability indicators for the land use, livable communities, and transportation focus area. These indicators should be used by local government and by regional institutions to track performance in achieving the objectives listed in Section 4.3. The data sources and calculations methodologies for each metric can be found in Appendix B.

4.4.1 Metrics and Targets

Table 4.9 Indicator Inventory: Tier 1 Indicators

Objective	Metric	Current Value	Target 2020	Target 2035	Target 2050
TL1: Strengthen centers supported by transit					
1a. Stabilize land consumption	Acres of urbanized land per capita	0.31 (2010)	0.30	0.25	0.20
1b. Direct growth to centers supported by transit	Percent of population and jobs in centers supported by transit	Pop: 48%; Jobs: 54% (2000)	Pop: 52%; Jobs: 56%	Pop: 56%; Jobs: 58%	Pop: 60%; Jobs: 60%
TL2: Create Complete Communities					
2a. Improve job-housing balance	Ratio of the number of jobs to the number of housing units	Measured at Census tract.			
2b. Improve job pay-home value balance	Ratio of average annual job pay to median home values	Measured at Census tract.			
2c. Increase share of new housing units built in multi-family buildings	Share of new housing units built in multi-family (5+ units) buildings	19.6% (2011)	22%	28%	35%
2d. Increase access to parkland	Percent of people living within one half mile of a park	61% (2010)	62	64	68
TL3: Reduce transportation fuel consumption and GHG emissions					
3a. Reduce transportation fuel use	Gallons of gasoline sold per registered vehicle	482 (2010)	440	320	240
3b. Shift work travel from single-occupant vehicles to carpool, transit, and non-motorized modes	Change in carpool, transit, and non-motorized minus change in single occupant vehicle work trips	7.99% (2005 to 2010)	8.5%	9.0%	9.5%
3c. Reduce vehicle travel	Annual VMT	23.1 billion (2009)	22 billion	19 billion	15 billion

Table 4.9 Indicator Inventory: Tier 1 Indicators

Objective	Metric	Current Value	Target 2020	Target 2035	Target 2050
3d. Reduce vehicle ownership	Active vehicle registrations per 1,000 capita	742.7 (2010)	730	6500	500
3e. Reduce Hudson River bridge crossings per registered vehicle	Hudson River bridge crossings per registered vehicle	60.4 (2010)	58	55	50
3f. Reduce commercial truck traffic at toll barriers	Annual commercial truck traffic at all toll barriers in the Region	7.7 million (2009)	7.5 million	7.3 million	7 million
3g. Reduce transportation fuel use	Transportation fuel use (MBtu) per capita	79	67	55	39
3h. Reduce transportation GHG emissions	Transportation GHG emissions per capita	5.19	4.55	3.35	2.0
TL4: Improve the safety, integrity, and resilience of regional infrastructure for all users					
4a. Reduce vehicle accidents	All injuries due to motor vehicle accident per 10,000 registered vehicles	68.2 (2007)	60	30	0
4b. Reduce pedestrian and bicyclist injuries due to vehicle accidents	Pedestrian and bike injuries due to vehicle accidents per 10,000 registered vehicles	8 (2010)	7	4	0
4c. Improve bridge conditions	Percent of bridges that are classified as "structurally deficient"	12.8% (2012)	12%	10%	8%
4d. Improve road conditions	Average condition rating of road pavement	6.73 (2011)	7	7.5	8
4e. Passenger rail lines in storm surge hazard areas	Percent of the passenger rail network located in 100-year floodplain and SLOSH zones	26.7% (2012)	26.7%	26.7%	20%
4f. Roads in FEMA 100-year floodplains and SLOSH hazard areas	Miles of roads in 100-year floodplain and SLOSH zones	244	244	220	200
4g. Population in FEMA 100-year floodplains and SLOSH hazard areas	Population (evenly distributed within a Census tract) residing within a FEMA 100-year floodplain or SLOSH zone	240,404	240,404	220,000	200,000

4.4.2 Limitations and Tier 2 Indicators

For all metrics, the highest quality data covering the largest extent of the Region were used. In some cases, data were unavailable or did not make sense being calculated at the regional scale, particularly for the Complete Communities objective (e.g., 2a, 2b, 2e, and 2f). Known data quality issues or geographic coverage limitations are listed below by metric:

- Indicators 1b and 2a : These indicators were computed using Census Transportation Planning Products (CTPP) data from 2000, the most recent year available. In 2013, 2010 CTPP data will be released and the indicators can be updated with the more recent numbers.
- Indicator 3b: This indicator used ACS data to determine the usage for each of the modes listed. When the 2010 CTPP is released, it may be beneficial to re-do this analysis with 2000 CTPP and 2010 CTPP data as these data sets contain more modal categories.
- Indicator 3c and 3h: Limitations to the use of VMT data are discussed in Section 4.1.3.
- Indicators 4e, 4f, and 4g: FEMA 100-year floodplain maps were not available for Rochester or Putnam counties.

Some of the proposed indicators are better used at the Census tract or county level, such as those associated with TL2, as they are spatially- and place-specific. As well, certain indicators (e.g., 4e through 4f) are only proxies. The physical location of infrastructure as mapped does not necessarily correlate well with its actual flood vulnerability, as structural and other measures can help mitigate vulnerability without actually relocating infrastructure.

Table 4.10 Tier 2 Indicators

Objective	Metric
TL2	Bike routes and trails
TL2	Percent of people living within one mile of at least six basic services
TL2	Percent of people living within one mile of a school
TL3	Local vs. through traffic
TL3	Park and ride locations and capacity

Table 4.10 lists proposed Tier 2 indicators, which are either difficult or impossible to calculate using existing data. Were accurate data sources to become available in the future, these metrics would be useful for local governments while making decisions regarding the implementation of this Plan.

4.5 Initiatives for Implementation

Over the last several decades, much of the Region's development has been low density, consisting of single-family homes on large, previously undeveloped (greenfield) lots. This type of development requires substantial investment in new roads and utilities, perpetuates auto dependency, and often permanently eliminates a community's natural assets such as forests. A comprehensive set of 'smart growth' strategies is needed to reverse this trend.

In Table 4.11, a series of initiatives are presented—these are described in detail in Section 4.5. A preliminary ranking was completed to establish priority. High priority initiatives are those that impact multiple Plan focus areas while also scoring well against other prioritization criteria described in Chapter 3. Medium priority initiatives are those that do not have as broad an impact or score as highly.

Wherever possible, example projects or case studies have been given that typify the efforts needed to achieve the Plan's objectives. Note that examples provided are not intended to be comprehensive, but are simply ideas submitted during the planning process with sufficient information to illustrate the concepts being proposed. A List of Project Ideas containing all ideas submitted during the planning process can be found in Appendix C. Additional Resources to help individuals, local governments, or organizations with implementation can be found in Appendix D.

In Chapter 9, a series of strategic priorities for the Region are described, drawing from recommendations that arose in discussion among multiple Working Groups. These strategic priorities necessarily include initiatives that impact the Land Use, Livable Communities, and Transportation focus area.

Table 4.11 Initiatives for Implementation	TL1: Strengthen Centers	TL2: Complete Communities	TL3: Reduce GHGs and Fuel	TL4: Improve Safety and Resilience
High-Priority Initiatives				
Implement Transit-Oriented Development	✖	✖	✖	✖
Promote Land Efficient Development	✖	✖	✖	✖
Expand and Upgrade Mass Transit	✖	✖	✖	✖
Improve Streets , Sidewalks, and Trails	✖	✖	✖	✖
Medium Priority Initiatives				
Use Transportation Demand and Systems Management to Relieve Roadway Congestion and Improve Freight Efficiency			✖	✖
Mandate Improvements in Fleet Vehicle Fuel Efficiency			✖	✖
Rollout New Commuter Incentives			✖	

4.5.1 Implement Transit-Oriented Development

TOD projects target new, dense, mixed-use development with a diversity of housing options into areas around transit hubs, allowing residents to live, work, shop, and play without having to travel long distances in an automobile. There is extensive literature on the benefits of TOD. Successful TOD efforts often require amendments to comprehensive plans coupled with other zoning, land use and policy changes (see callout box).

The Mid-Hudson Region has shown considerable interest in TOD. For example, the Tappan Zee Bridge/ Route 287 project has been in the study phase for many years, with the goals of promoting TOD, while cities such as Yonkers have worked hard to redevelop transit-served areas.

All centers served by transit should be explored for new opportunities to promote TOD. There is an opportunity to use TOD to help improve the balance between jobs and housing in a locality, and to correct for housing shortages. Successful TOD needs to be planned as part of a broader strategy to create complete communities, so that there is quality green space, schools, parks, and services within walking distance.

While TOD is critical, care needs to be taken, especially when working in waterfront areas, that redevelopment ensures resilience to flooding, storm surge, falling trees, and other climate-related stressors. This can include simple things like locating emergency generators and other equipment above the ground floor to more complex engineered controls.

Challenges to Infill development

Building on previously developed land—and rehabilitating existing buildings in the downtown or 'Main Street' areas of established centers is easier said than done. Infill development can be more expensive for developers because of the higher costs of land acquisition, removing or rehabilitating existing structures, and environmental remediation. Infill is also constrained by the size and layout of existing parcels, potentially complex transportation and parking issues, and more.

Another challenge to implementing TOD and LED (and smart growth more generally) is the reliance of municipalities on local property taxes to fund services, such as schools, police, and fire. This creates an incentive to zone for commercial uses that generate positive tax revenues, while excluding new residential development that will increase population and, in turn, school costs. This pushes new residential development away from established communities that are likely to be less auto-dependent. Education is needed so that communities understand that multifamily residential development in compact, mixed-use centers can, in many cases, have net-positive fiscal impacts.

Example Projects

New Rochelle Transit Center TOD Zone

There are several properties near the train station in New Rochelle that are underutilized, a few of which are owned by the City, presenting opportunities for new development that could support greater use of the train station. The City has retained a consultant to undertake a TOD Smart Growth Study. The project goal is to identify how to create a vibrant TOD Zone around the New Rochelle Transit Center, leveraging the city's transit assets to provide improved access to housing and jobs locally and regionally. New Rochelle's proximity to the employment centers of NYC, Stamford, and White Plains, and the surrounding region, makes it ideally positioned for TOD.

Downtown Harrison TOD

The downtown of Harrison, NY is located right next to a train station on Metro-North's New Haven Line on the Northeast Corridor and is served by the Westchester Bee-Line bus system. There are currently 3.3 acres of surface parking lot adjacent to the train station prime for TOD. The plan, developed over a number of years by the Harrison community and Metro North, involves transforming these acres into a high-density, mixed-use development with residential units, street-level retail stores and restaurants, a structured parking garage, and convenient connections to the train station.

Harriman/Woodbury Commons TOD

The Metro North train station in Harriman is adjacent to an enormous site that is planned for a TOD development. In addition, the 130-acre site is adjacent to the NY Thruway and one mile south of Woodbury Commons, a shopping mall that is visited by 12 million shoppers per year. These are location advantages that give it the potential to shift the travel mode of future residents, workers, and shoppers. The existing TOD plan is the largest in the state and has been approved for up to 2 million square feet of multi-family residential, retail, office, hotel, and entertainment uses. Current zoning allows for up to 25 dwelling units per acre near the train station and building heights up to 45 feet.

Improving Livability

There is tremendous opportunity to improve the livability of communities through targeted investment in parks, recreational facilities, and other public facilities. As part of all TOD and LED projects, public and community facilities and infrastructure should be carefully integrated in a way that ensures access to all users. As well, municipalities should work to identify areas underserved by community facilities and infrastructure. One low-cost fix is to work with school districts to open recreational facilities and playgrounds to the community.

Implementing Best Practices in Planning, Zoning, and Local Ordinances: A Prerequisite for Success

The adoption of enabling planning and zoning ordinances, regulations, and legislation is absolutely critical to achieving this Plan's goals. ***Many of the proposed initiatives will not be able to proceed unless they are called for in local comprehensive plans and permitted under existing zoning regulations.*** *New or revised plans, ordinances, and regulations may be needed to enable:*

- Zoning for higher densities and mixed uses
- Reduced parking requirements or shared parking for TOD and LED projects
- Fee waivers or expedited processing for projects meeting certain sustainability criteria
- Changes to minimum acreage requirements and/or approval of cluster zoning
- Transfer of Development Rights
- Mandatory transportation plan development and/or shuttle service for large employers/ new developments
- Construction of 'secondary suites'
- District energy or on-site power generation (see Chapter 5)
- Fleet efficiency requirements
- Anti-idling legislation
- Neighborhood design criteria that encourage compact development and interactive streetscapes
- Green building criteria for new development or major renovations
- Green infrastructure/on-site stormwater management (see Chapter 8)
- Greywater reuse and distributed wastewater treatment systems
- Inclusion of showers and bike infrastructure in commercial facilities

This is only a partial list of the best practices that can facilitate the change this Plan seeks to achieve—critically, local government planners, volunteers, and engaged citizens must work together to share best practices and successful models (see Chapter 10), as the Region should benefit from the work of pioneering municipalities and organizations. Appendix D (Additional Resources) provides numerous references and links containing model smart growth zoning codes and ordinances.

4.5.2 Promote Land Efficient Development (LED)

In addition to TOD, projects should seek to encourage more compact, mixed-use development in centers (e.g., hamlet areas) that are not in proximity to mass transit. These centers may not be ideal for TOD but nonetheless contain assets that are vital for the surrounding communities.

For example, universities like SUNY New Paltz, which are majors employers located in existing centers without mass transit, provide an economic platform that can support LED. LED efforts can also help increase the population in areas proximate to existing Main Streets or centers, which can help revitalize these areas and sustain local small businesses.

Similar to TOD projects, successful LED efforts may require amendments to comprehensive plans coupled with zoning, land use and policy changes. Both LED and TOD efforts should seek to accommodate the needs of all users, including low-income families, seniors (including those living alone), persons with disabilities, and so on.

[100] ICSC Webinar 2012. NY TIF - The New Opportunity for Redevelopment. http://www.icsc.org/2012WB24/TIF%20Webinar%20PowerPoint,%206-13-12.pdf
[101] Lisberg, City & State 2012. Incremental Improvement. http://www.cityandstateny.com/incremental-improvement/

Achieving both TOD and LED requires investment. Cash-strapped local governments need new financial mechanisms and revenue streams, many of which will require some state-level support or legislative reform. For example, NYS currently permits the use of Tax Increment Financing (TIF) as a tool to help focus development in centers and create more complete communities[100]; TIF is infrequently used in NYS.[101] Municipalities should explore opportunities to use TIF or other mechanisms that enable the use of future tax revenue increases to pay for redevelopment or infrastructure that can help direct growth into centers.

Example Projects

US Lace Curtain Mill Factory LED

In Kingston, the Rural Ulster Preservation Company is pursuing the transformation of an abandoned factory into affordable housing for low-income populations. The US Lace Curtain Mill Factory, built in the 19th century and bought in the 21st century for $575,000, will now undergo a multi-million dollar renovation, which will convert the building into 55 affordable live-work units for artists. Adaptive re-use projects, such as this one, consume far less land than a similar development on a greenfield site and generally require fewer resources to construct.

Generic Environmental Impact Studies for Designated TOD and LED Areas

To attract private investment such as TOD or LED, local governments should coordinate to establish a revolving loan fund to finance Generic Environmental Impact Studies for areas targeted for TOD and LED. The loan fund would allow local governments to develop station area or sustainable neighborhood development plans as Generic Environmental Impact Studies with sufficient detail and analysis to obviate the need for project-specific environmental impact statements. Developers benefitting from such studies would then be charged a pro-rata amount for the cost of such studies and their payments used to discharge the loan. These repayments could then be used to fund other studies in other municipalities. Such a financing mechanism would streamline the development review process and favor projects consistent with the objectives of this Plan.

Community Design Best Practices for TOD and LED

Many organizations in the US, such as the Congress for New Urbanism, have developed guidelines and best practices for urban development that align with the objectives of this Plan. These include the relatively new Leadership in Energy and Environmental Design (LEED) for Neighborhood Development system. More information can be found in Appendix D, Additional Resources. Below are several guiding principles for good urban design in the Mid-Hudson Region.

Good urban design is contextual: *At the building scale, this means that size and placement is in keeping with adjacent structures. At the scale of a neighborhood, this means extending as much as possible the existing street and block pattern. At the scale of the landscape, this means placing buildings where they have a minimum impact on natural systems and on scenic view sheds.*

However, where existing settlement patterns are unsustainable—such as sprawling, disconnected subdivisions and auto-dependent commercial strips—contextual urban design should respond by trying to heal some of the problems—good practices for these situations can be found in Orange County's Design Manual—see http://www.orangecountygov.com/. Development can fill gaps in street frontages or create linkages to isolated projects. Development can help create 'complete communities' by introducing new activities into isolated neighborhoods or large single-purpose developments such as shopping malls. Over time, new development can transform commercial corridors by introducing pedestrian amenities and by rationalizing car movements.

Good urban design organizes development around well-designed public spaces: *A core function of urban design is to use street and block networks and site design guidelines to determine how buildings relate to each other. But good urban design does more than just organize development - it creates places that have a clear identity in the public imagination, such as parks and plazas that are brought to life by community activities, farmers markets, concerts, and more.*

Public spaces are not just parks and plazas: *In fact, the most fundamental public open space is the street, accounting for more land area than any other public space. Good urban design means creating great streets, from bustling 'Main Street' to quiet neighborhood streets. Buildings need to relate in a consistent way to the street and should be oriented towards the street. And like great parks and plazas, streets should accommodate multiple uses, from strolling to biking, from casual interaction to the annual parade.*

Good urban design supports alternative forms of mobility: *In centers, this means creating walkable environments. In more rural areas, this means siting buildings and designing roads in ways that manage the automobile and support biking and other modes of transportation.*

Good urban design supports transit: *This means that as much as possible, uses are clustered so that transit stops attract as many riders as possible. Road networks are designed to maximize connectivity so that transit vehicles can efficiently reach multiple destinations. Space is allocated for transit-supportive amenities such as stops, information kiosks and well-designed parking areas.*

Good urban design responds to natural systems: *Neighborhoods can be designed in ways that are 'low impact'. For example, neighborhood design can reflect natural drainage patterns and maximize re-infiltration so that run-off does not compromise adjacent wetlands and water bodies—see Chapter 7 for more discussion of this topic.*

Good urban design is energy efficient: *Buildings are designed and sited so that passive solar benefits are optimized. Neighborhoods are designed to enable district heating and cooling systems—see Chapter 4 for more discussion of this topic. To the greatest extent possible, existing infrastructure is used.*

4.5.3 Expand and Upgrade Mass Transit

Transit ridership needs to be encouraged through various means, including: expanding transit services, improving equitable access to existing transit services, expanding para-transit services, optimizing transit operations, reforming management procedures and institutional structures for greater efficiency, and building new transit infrastructure capacity.

Potential operational improvements include changes such as increased or more reliable service, fare integration amongst agencies, or extended operating hours. As decisions are made to invest in transit, consideration should be given to maintaining flexibility. Some transit modes, such as buses, can easily be repurposed for other uses, making them valuable in emergencies or large-scale disasters.

There is considerable ongoing discussion of providing new transit service along the I-287 corridor, which connects Westchester and Rockland County via the Tappan Zee Bridge.[102] Dedicated bus lanes will be included in plans from the start, and a Regional Transit Task Force has been convened to evaluate further options including Bus Rapid Transit (BRT).[103]

Decisions to invest in areas outside the Region can impact transit ridership—for example, the MTA's efforts to provide Metro-North access into Penn Station could have direct or indirect impact on some Mid-Hudson commuters.[104] As well, many commuters to NYC traveling from the west side of the Hudson River use the Exclusive Bus Lane at the Lincoln Tunnel, which is currently operating above capacity. Improvements to this infrastructure could increase capacity for some of the Region's commuters.

> Building new transportation infrastructure will be required in the future, but the State and the Region will have to strategically prioritize investments to ensure the sustainability of its transport system. The State took the first step in this direction with the passage of the Smart Growth Public Infrastructure Policy Act which prioritizes funding for sustainable, mixed-use, infill infrastructure.

Example Projects

Central Avenue Bus Rapid Transit (BRT)

The Central Avenue BRT Project, sponsored by the Westchester County Department of Transportation, involves building a 14.4 mile express bus route along NYS Route 100, connecting major destinations in the Region including: Downtown White Plains, the Westchester County Center, Cross County Shopping Center, Yonkers Raceway, NYC Subway, and other Westchester Bee-Line bus routes. The project will include intelligent transportation systems, such as traffic signal priority at most intersections and queue jump lanes at selected intersections, preferential roadway treatments, and attractive bus stations with shelters, real-time arrival information, low floor boarding, and off-board fare collection. These features could reduce travel times by 16 to 37 minutes one way, or 25-35 percent, generating ridership increases of up to 35 percent. The project is estimated to cost $32.79 million over several years.

The corridor has high concentrations of dense, residential and commercial development that could help attract riders, as well as many underutilized or vacant properties that could be redeveloped. The Westchester Department of Public Works and Transportation is contemplating several park-and-ride locations and TOD projects to support and complement the new service.

This is a relatively inexpensive transit project (compared to light rail or commuter rail) in a dense corridor that could potentially move millions of riders that may otherwise drive to work.

4.5.4 Improve Streets, Sidewalks, and Trails to Promote Non-Motorized Transportation

Improving the design, safety, and condition of street right-of-ways and pedestrian corridors will encourage travelers to walk for short trips rather than drive, reducing fuel use and GHG emissions and improving health. Projects could include repaving local or feeder streets, upgrading sidewalks, adding pedestrian-friendly street signals, adding street furniture and shade trees, adding curb bulb-outs, and other measures.

[102] NYS, 2011. Tappan Zee Bridge Environmental Review http://tzbsite.com/index.html

[103] Westchester County Planning, 2013. New Hudson River Bridge at Tappan Zee and I-287 Corridorhttp://planning.westchestergov.com/tzb-and-i-287

[104] Kabak, 2012. 2nd Avenue Sagas. MTA Moving Forward on Penn Station Access Studies. http://secondavenuesagas.com/2012/06/21/mta-moving-forward-on-penn-station-access-studies/

In 2011, Governor Cuomo signed the Complete Streets legislation, requiring state and local departments of transportation to consider incorporating new safety and multi-modal elements into streets and roadways. Now it is up to the counties and municipalities to formally adopt these principles into their design guidelines. A series of demonstration projects could help speed up this process up and encourage adoption.

The 2011 Complete Streets legislation aims to build streets that accommodate all users, including pedestrians, bicyclists, and mass transit modes, with quality design. Such improvements may require additional public funds for sidewalks and bike lanes, for example, which are not always available.

Additionally, by making bicycling safer and more convenient, the Region can increase access to transit, reduce vehicle use and fuel consumption, promote healthy activities, and improve quality of life. Creating new bike lanes, creating bike boulevards, adding bike parking at train stations, and installing bike racks on buses, trains, and at job locations all help promote bicycling as a means of transportation as well as a healthy recreational activity. As well, existing recreational trails can be expanded or better connected with existing centers, facilitating car-free recreation.

Example Projects

Golden's Bridge Pedestrian Improvements

The hamlet of Golden's Bridge located in the Town of Lewisboro is currently pursuing a grant from the Federal Highway Authority to implement pedestrian improvements at the intersection of Route 22 & 138. The Town of Lewisboro proposes to construct sidewalks, crosswalks, and pedestrian refuges in the area around the intersection to encourage people to walk between the hamlet, nearby shopping center, and Metro North train station, thereby increasing pedestrian access to many of the local businesses. The completion of this project would demonstrate to other towns the benefits of pedestrian friendly improvements to their road networks. Lewisboro has already adopted a Complete Streets policy, as have many other municipalities in the Region.

Hudson Fjord Hike/Bike Trail

Scenic Hudson is pursuing the phased implementation of the Hudson Fjord Hike/Bike Trail, an eight-mile path between Little Stony Point in Cold Spring and Breakneck Ridge in Beacon, joining Philipstown and the town of Fishkill in Putnam County along Route 9D. The trail would provide a connection for bicycle and foot traffic, providing safe access to the nearby hiking trails in Hudson Highlands State Park, the Hudson River, and the towns and train stations along the busy road. This project would provide other towns in the Region with an excellent example of retrofitting an existing auto-orientated roadway to improve safety for all users, including pedestrians and bicyclists.

Connect the Wallkill Valley Rail Trail and O&W Rail Trail with Public Infrastructure

In Kingston, the Wallkill Valley Rail Trail and O&W Rail Trail terminate at the city's edge. By connecting these trails to the city center through complete streets strategies along the Broadway and Greenkill Avenue corridors, Kingston could create a Rail Trail Hub in that reduces fossil fuel consumption, enables freedom of mobility, encourages more physical activity, allows children to walk or bike to school, reduces traffic congestion, and encourages economic development.

4.5.5 Use Transportation Demand/ Systems Management to Relieve Roadway Congestion and Improve Freight Efficiency

Efforts to decrease road congestion and encourage people to drive more efficiently can reduce fuel consumption and GHG emissions and have direct economic benefits. Strategies include adjusting the price of parking or expanding parking capacity in certain areas such as train stations, improving highway conditions, or implementing traffic management systems, such as synchronizing and optimizing traffic signals. In some cases new infrastructure is required.

Similar initiatives can be targeted at freight transportation systems. There is an ongoing process to develop/update comprehensive Regional Transportation Plans, which will address opportunities for optimizing the efficiency of roadways, rail networks, and other transportation systems. This process is being spearheaded by the Region's MPOs.[105]

To facilitate mass transit use while also relieving congestion, shuttles can be established between park-and-rides and transit hubs. This already happens in some CT cities, where shuttles to Metro-North stations have helped relieve pressure on roads and overcrowded parking areas adjacent to the stations.[106]

In some cases, road expansion may be promoted to relieve congestion. These decisions should be evaluated in light of their potential to induce travel and sprawl. All road expansion projects in the Region should be coupled with a Transportation Demand Management (TDM) or Transportation Systems management (TSM) strategy.

Example Projects

Route 17 TDM and TSM

NYS Route 17, which was originally a two-lane road, is in the process of being converted to an interstate (US I-86). When the project is complete, the length of the 381-mile corridor from the border of Pennsylvania to where it meets I-87 in Orange County will be a multi-lane highway that meets US DOT's Interstate standards. Over half of the project is complete, mainly the western half, which has already been designated I-86, and the eastern half of Route 17 is still in various stages of project development. As this project progresses, implementation of a suite of TDM and TSM strategies should be seriously considered, to help manage congestion and increase the capacity of the corridor.

TDM strategies could include policies and programs to increase carpooling or the addition of infrastructure to reduce demand for single-occupant vehicles. TSM strategies could include adding sufficient acceleration/deceleration lanes, reducing sharp curves, or widening shoulders for emergency vehicles.

Expanded Park-and-Ride

Many of the Region's park-and-ride facilities are at or near capacity.[107] Expanding these facilities or developing new facilities would help promote carpooling and mass transit. For example, the park-and-ride in Tuxedo, NY can be expanded to accommodate hikers and commuters, providing a transit and recreational benefit. Many other park-and-ride expansion projects in the Region are in various phases of study, design, or development.

Intermodal Freight Hub

There are potential opportunities to create new intermodal hubs, which could improve freight efficiency. For example, the Village of Maybrook was historically a rail hub. It is now a trucking hub. Trucking, air freight, passenger rail and air all come together at this location and there is a much land in the public domain.

[105] New York Metropolitan Transportation Council: http://nymtc-rtp.org/

[106] Metro North Railroad 2009. New Shuttle Bus Between New Fairfield, CT and Southeast, NY Expands Transportation Options Beginning May 18. http://www.mta.info/mta/news/releases/?agency=mnr&en=090513-MNR15

[107] Times Herald-Record, 2012. Park and Ride Spots Scarce in Orange. http://www.recordonline.com/apps/pbcs.dll/article?AID=/20121026/NEWS/210260354

4.5.6 Mandate Improvements in Fleet Vehicle Fuel Efficiency

Local governments, school districts, and private companies often maintain large fleets of vehicles and equipment. There is an opportunity to significantly improve air quality and reduce GHG emissions through voluntary or mandatory implementation of stricter fuel efficiency standards. Local government should modify procurement standards to mandate more efficient or cleaner vehicles. This can apply to vehicles direct purchased or leased by the entity, and/or to service providers and their fleet.

At a larger scale, new programs should be evaluated such as tax rebate programs that encourage users to sell their gas guzzlers and buy the most fuel efficient vehicles available.

Example Project

School Bus Retrofit and Replacement Program

The fleet of school buses in the Region is largely powered by diesel fuel. The Region needs to aggressively retrofit or replace this fleet to improve air quality and reduce GHG emissions. NYSERDA has funded school bus retrofit programs, and may continue to do so into the future.[108] Municipalities and school districts should take direct action where possible, and where necessary mandate, via procurement processes, that private bus companies retrofit older buses and purchase new, low or zero-emission buses powered by cleaner fuels.

Fleet efficiency programs should seek to adopt or reinforce anti-idling laws. Idling school buses increase pollutant emissions including GHGs. Such rules would not only reduce emissions but save bus companies thousands of dollars in fuel costs.

4.5.7 Rollout New Commuter Incentives

Commuter-targeted programs, such as carpools, vanpools, and other employer-based incentive programs such as flexible work schedules, are needed to reduce fuel use and GHG emissions due to commuting. For example, vanpool programs—offered by employers or by major business centers—can remove up to a dozen single occupancy vehicles from the road, with significant energy and GHG reductions as a result. These programs can work in tandem with expansions to park-and-ride.

Commuter incentives aim to induce either a modal shift from vehicles to transit or encourage commuters to use their vehicles more efficiently. These policies can be sponsored by a government, as with commuter tax benefits, or by an employer, as with guaranteed ride home or parking cash out programs. Incentives such as tickets for various gas/toll/retail rebates could be offered to users of the program to encourage more commuters to carpool or switch to a manual mode of transportation. These incentives could be offered to all users of the system or a competition could be set up rewarding those who met a certain goal each month, such as employers who are able to shift a specific percentage of their workforce from driving alone to carpooling or using transit.

Currently, the NYSDOT offers a ridematch/rideshare program entitled 511NY Rideshare. The program matches commuters with similar origins and destinations so they can carpool or vanpool together. The program also offers a Guaranteed Ride Program that pays riders to use mass transit or a taxi if they miss their carpool because of an emergency.

Example Project

Mandatory Transportation Management Plans

While voluntary initiatives have great potential, some states and municipalities in the US have passed laws mandating large employers (for example, those with 100 employees or more) to prepare transportation or mobility management plans.[109] In municipalities with multiple large employers, this strategy could help prompt action by the private sector.

Case Study: MetroPool

MetroPool has created Earth Day Challenges in the spring to encourage ridesharing. Employers were encouraged to enroll their employees to share rides. Employers also competed with one another to see which company could reduce the most rides, involve the most employees, etc. Individual participants were rewarded through a points system redeemable through retail stores, restaurants, etc. From 2009-2010 participation grew 20% while shared car trips doubled. Participating employers were interested in bragging rights, reducing their carbon footprint and in some cases moving toward corporate sustainability goals.

[108] http://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities/PON-1896-New-York-State-Clean-Air-School-Bus-Program.aspx

[109] Petersen, Urban Land 2012. Hidden Transit: How Companies are Going the Last Mile. http://urbanland.uli.org/Articles/2012/Aug/ul/PetersonHideen

5 Energy

The NYS Climate Action Plan Interim Report succinctly summarizes the challenges and opportunities facing our Region, particularly with regard to energy:

"Climate change, resulting primarily from the combustion of fossil fuels and other human activities, is a significant threat to our environment, economy, and communities. Climate change is already occurring; its adverse effects are well documented across the globe and throughout our Region. That realization, combined with the economic and national security vulnerability associated with our current, finite, fossil-based energy system, has created a sense of urgency in advancing a sustainable low-carbon energy future."[110]

By working aggressively to become a hub in the new clean energy economy and by making policies and investments that bring low-carbon choices to our citizens and future generations, the Mid-Hudson Region can be a crucible for change. This will bring economic development and new jobs, technological innovation, energy security, and cleaner air and water.

Our plan for energy is to:

- Become radically less energy and fossil fuel intensive while strengthening the regional economy
- Expand renewable generation exponentially as an energy source across the Region
- Improve the resilience of the energy delivery system throughout the Region

To achieve these objectives, we must:

- Expand energy efficiency programs
- Create community energy districts
- Expand renewable energy production and distributed generation
- Increase demand response participation
- Develop energy storage capacity
- Develop innovative project, financing, and policy models

[110] New York State Climate Action Council Interim Report, 2010. Executive Summary, page 1. http://www.dec.ny.gov/energy/80930.html

The Mid-Hudson Region's geography—connecting Long Island and NYC with the rest of NYS—limits the development of traditional thermal power plants, refineries, and other facilities. High local demand for electricity is compounded by the Region's role as a conduit for electricity to NYC. The Region's ability to attract and retain business and jobs is at risk due to the physical constraints of siting new energy infrastructure.

Recent storm damage and other climate effects underscore the vulnerability of the Region's energy infrastructure. If the Region is to meet the vision set by the REDC's recent economic development strategy, it must take action to reduce real and perceived risk to the Region's energy infrastructure. A sustainable energy system is about reducing risk, controlling costs, and investing in the local/regional economy. Mitigating this risk—by updating the Region's buildings, industrial facilities, and electrical grid—will create thousands of jobs, strengthen the local economy, and reduce the Region's dependence on fossil fuels and imported energy.

Fortunately, efforts to transform toward a low-carbon energy economy are thriving. The Region has long been home to highly skilled industry experts and businesses cooperating with non-governmental organizations, labor, municipalities, and academia. Projects borne of this collaboration have been funded by sustainability-oriented investors, venture capital and via innovative financing strategies. Critically, the Region's diverse population exhibits a growing appreciation of principles of sustainability and environmental justice. By combining leadership and innovation with broad appreciation of the importance of achieving sustainable development, the Region is ideally poised to lead NYS' efforts to achieve dramatic market transformation in energy generation and use.

> Recent storm damage and other climate effects underscore the vulnerability of the Region's energy infrastructure.

> By combining leadership and innovation with broad appreciation of the importance of achieving sustainable development, the Region is ideally poised to lead NYS' efforts to achieve dramatic market transformation in energy generation and use.

5.1 Baseline Conditions

Among US states and territories, NYS is a relatively low per capita energy consumer, representing just 3.8 percent of the nation's total energy consumption in 2010[111], despite being home to 6.3 percent (19.4 million) of the nation's population.[112] This relative efficiency derives chiefly from low per capita energy consumption in the NYC metropolitan area, where 40 percent of NYS' residents live. Without NYC, NYS' per capita energy use approaches the US average.

The Mid-Hudson Region is relatively efficient in energy use compared with NYS, containing 12 percent of NYS' population, but accounting for only 9.6 percent (360 trillion Btu) of NYS' annual energy consumption of 3,728 trillion Btu (2010).[113]

5.1.1 Net Energy Consumption

The Mid-Hudson Region is served by four electric utilities and four natural gas utilities. There are numerous vendors of other fossil-fuel derived products such as home heating oil.

> "Building a near-zero carbon electricity sector is the foundation of New York's transition to a low-carbon economy. …But for New York to achieve its goal of reducing GHG emissions 80 percent by 2050, close to 100 percent of New York's electricity will need to come from low-carbon sources—sources with near zero-carbon emissions—by 2050. Furthermore, as the use of carbon-intensive fossil fuels in the transportation and buildings sectors is phased out or reduced substantially, New York will need an adequate supply of low-carbon electricity to power those sectors. Therefore, over the next 40 years, New York will need to replace most of the existing fossil fuel-fired sources of electricity—coal, gas and oil-fired power plants—with low-carbon sources of power…."
>
> *- New York State Climate Action Council Interim Report 2010, chapter 8, page 8-9*

[111] US Energy Information Agency (EIA) 2010. State Energy Data System (SEDS). http://www.eia.gov/state/seds/
[112] US Census, 2010.
[113] US EIA, 2010. NYS profile. http://www.eia.gov/beta/state/print.cfm?sid=NY

Table 5.1 Net Energy Consumption (MMBtu) by County and Sector (2010)

Location	Residential Fuel	Commercial Fuel	Industrial Fuel	Transportation Fuel	Total MMBtu	MMBtu per Capita
Dutchess	11,431,954	9,008,045	6,588,229	21,829,687	48,857,914	166.43
Orange	14,982,928	12,066,659	2,720,296	32,530,175	62,300,059	162.44
Putnam	3,525,949	1,857,538	1,787,552	14,634,921	21,805,960	219.67
Rockland	13,498,330	8,157,600	5,960,033	20,359,437	47,975,399	159.83
Sullivan	3,482,764	4,956,662	172,910	6,628,649	15,240,984	200.99
Ulster	8,325,853	8,455,419	1,464,344	16,892,860	35,138,476	193.66
Westchester	35,443,876	20,828,408	6,696,102	65,914,196	128,882,582	134.82
Region	**90,691,653**	**65,330,331**	**25,389,466**	**178,789,925**	**360,201,375**	**157.31**

Source: Attachment I: Regional GHG Inventory
[Electricity and Natural Gas consumption included within each sector.]

After electricity conversion and delivery losses of about 30 percent[114], annual net energy consumption for the Mid-Hudson Region is 360 trillion Btus (2010—see Table 5.1). The corresponding annual expense associated with this energy use is $7.26 billion.[115]

> …annual net energy consumption for the Mid-Hudson Region is 360 trillion Btus. The corresponding annual expense associated with this energy use is $7.26 billion.

Transportation (including on road, off road, rail, air, marine sectors) is the single largest user of energy in the Region (See Figures 5.1 and 5.2). The dominant fuel source in transportation is petroleum, leading to petroleum's dominance as the largest fuel type consumed in the Region. The counties with the higher population densities consume less energy per capita across all the major consumption sectors (residential, commercial, industrial transportation—see Figure 5.2).

Table 5.2 Net Energy Use by Sector and Fuel Type (MMBtu) 2010

By sector	Percent	MMBtu
Transportation	50%	178,789,925
Residential	25%	90,691,653
Commercial	18%	65,330,331
Industrial	7%	25,389,466
Region	**100%**	**360,201,375**
By fuel type	**Percent**	**MMBtu**
Petroleum	47%	169,294,646
Natural gas	30%	108,060,412
Electricity	18%	64,836,247
Other[1]	5%	16,209,062
Coal	1%	1,801,007
Region	**100%**	**360,201,375**

Notes: [1] Ethanol (46.8 thousand Btu) is included in 'Other' totals and also in the petroleum category as a component of motor gasoline. Total consumption and percent are based on ethanol only as 'Other.'
Source: Attachment I: Regional GHG Inventory

[114] The process of creating and distributing electricity is inefficient. See callout on the NYS Energy Flow.
[115] NYSERDA 2013.

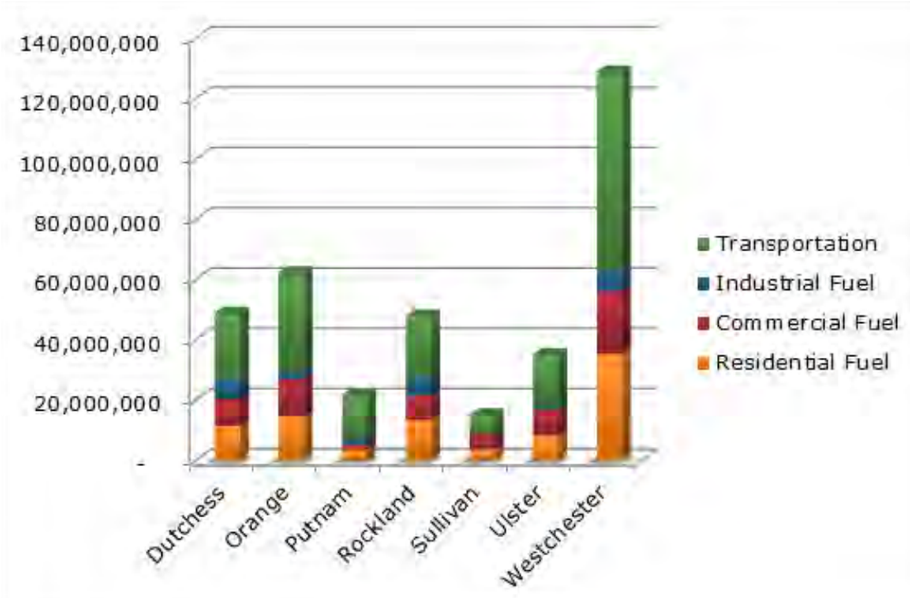


Figure 5.1 Energy use (MMBtu) by county and sector, 2010

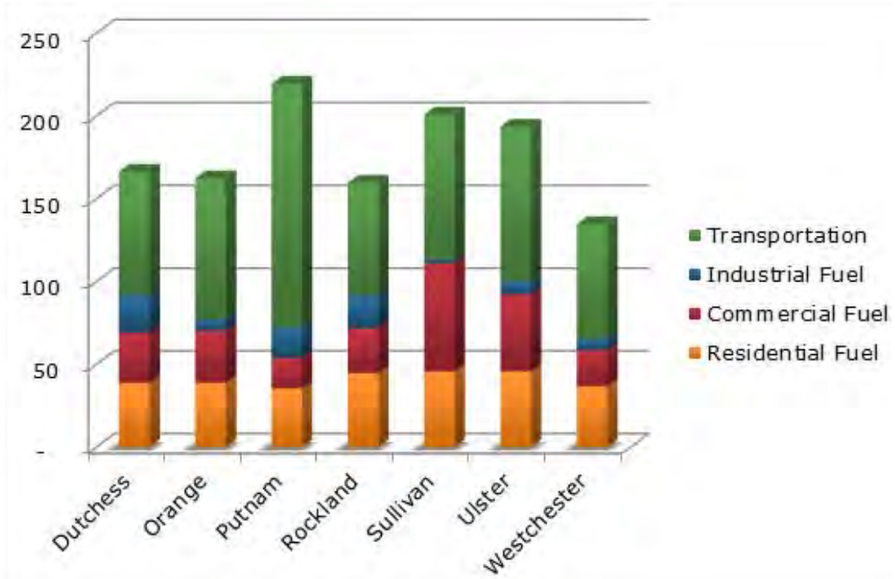
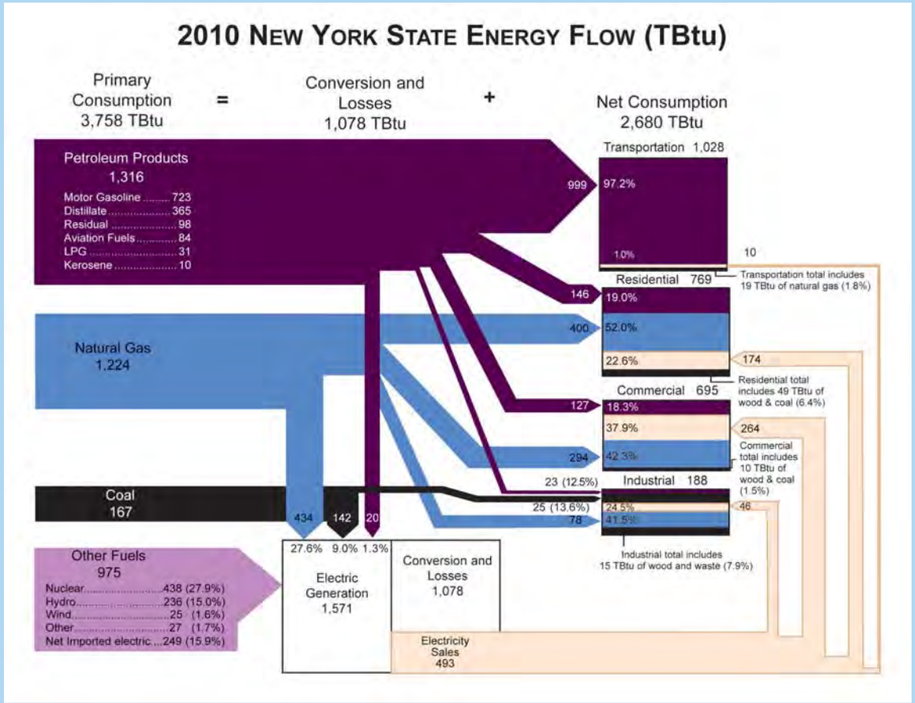


Figure 5.2 Energy use (MMBtu/capita) by county and sector, 2010

NYS Energy Flow

Approximately 30% of the energy used in NYS for electricity generation is consumed by energy conversion itself or lost during transmission and distribution. This conversion loss is endemic, large, and in many ways unavoidable in a system of large centralized generation facilities. But we can reduce the need for these losses by expanding distributed generation.



Source: NYSERDA, 2012. Patterns and Trends: New York State Energy Profiles: 1996-2010.
http://www.nyserda.ny.gov/en/Energy-Prices-Supplies-and-Weather-Data/~/media/Files/Publications/Energy-Analysis/EA-2010-pt-r.pdf

Table 5.3 Energy Use and Expenditure by Sector and Fuel Type, 2010

Sector	Percent[1]	MMBtu	Percent	Estimated Expenditure ($ millions)	Estimated Expenditure rate ($ million/ billion Btu)
Residential Fuel	50%	178,789,925	36%	$2,616.00	$0.0146
Commercial Fuel	25%	90,691,653	31%	$2,220.00	$0.0245
Industrial Fuel	18%	65,330,331	29%	$2,136.00	$0.0327
Transportation Fuel	7%	25,389,466	4%	$288.00	$0.0113
Region	**100%**	**360,201,375**	**100%**	**$7,260.00**	
Fuel Type					
Petroleum	47%	169,294,646	45.0%	$3,267.00	$0.0193
Natural gas	30%	108,060,412	15.0%	$1,089.00	$0.0101
Electricity	18%	64,836,247	39.0%	$2,831.40	$0.0437
Other[2]	5%	16,209,062	0.4%	$29.04	$0.0018
Coal	1%	1,801,007	0.6%	$43.56	$0.0242
Region	**100%**	**360,201,375**	**100%**	**$7,260.00**	

[1] Percent for Fuel type use and $ derive from the NYSERDA ENERGY FAST FACTS state-wide % with Mid-Hudson assumed to be 12% (pro-rated by population).
[2] Ethanol (46.8 thousand Btu) is included in "Other" totals and also in the petroleum category as a component of motor gasoline. Total consumption and percent are based on ethanol only as "Other".

5.1.2 Energy Prices and Expenditure in the Mid-Hudson Region

On a cost basis (unit of energy acquired per dollar expended), electricity is by far the most expensive fuel type in the Mid-Hudson Region (see Table 5.3). The Region is not unique in this regard—in 2010, NYS had the third highest average electricity prices in the US.[116]

Petroleum is 1.8 times more expensive than natural gas, due to low present-day costs for natural gas. Natural gas prices have dropped to approximately $17 per thousand cubic feet (MCF) from a high of nearly $23/MCF in 2008.[117]

Despite the recent drop in natural gas prices, fossil fuel prices have risen from 2000 to the present.[118] Since 2010, both heating oil prices and gasoline prices have risen sharply, as tracked by NYSERDA's average weekly price history. After hovering around $3 per gallon for most of 2010, #2 fuel oil jumped 30 percent entering the late fall of 2012 at around $4 per gallon.[119] The price of gasoline has risen similarly, as gasoline is derived from the same fuel stock oil.

> Reducing the amount of energy the Mid-Hudson Region imports by just 3 percent would leave an additional $129 million per year in the Region's economy.

5.1.3 Energy Dollar Exports

There is virtually no petroleum extraction in the Mid-Hudson Region. For all practical purposes, 100 percent of the fuel oil (including gasoline and kerosene) used for transportation and for space heating is imported. As a whole, NYS is a net energy importer.

According to NYSERDA, "New York is the fourth largest energy user of all the states. Nevertheless, households, businesses, industries, and electric utilities in New York rely largely on fuels produced elsewhere. Twelve percent of the total primary energy requirements were met from in-state resources in 2010."[120]

For example, NYS consumers buy hydroelectric power from Quebec. Nearly all petroleum-based fuels come from suppliers outside NYS. Of NYS' annual estimated energy expenditure ($60.50 billion in 2010), about half those dollars ($30 billion) left the state. Trying to retain even 3 percent of that annual exported expense will leave an extra $1 billion in the NYS economy. For the Mid-Hudson Region, this export expense is about $4.303 billion for 2010 (see Table 5.4). Reducing the amount of energy the Mid-Hudson Region imports by just 3 percent would leave an additional $129 million per year in the Region's economy.

[116] USEIA, 2012. State Electricity Profiles. http://www.eia.gov/electricity/state/
[117] NYSERDA, 2012. Monthly Average Price for Residential Natural Gas.
[118] NYSERDA, 2012. Energy Prices and Weather.
[119] Ibid.
[120] NYSERDA, 2012. Patterns and Trends: New York State Energy Profiles: 1996-2010 (page 45).

5.1.4 Household Fuel Use

About 85 percent of the Region's households use either fuel oil or utility supplied natural gas for space heating. Yet, the breakdown in fuel source varies widely across the Region's counties. For example, natural gas predominates in Rockland County, serving 89 percent of Rockland residents. In Westchester and Orange County, fuel oil and natural gas use is roughly equal (see Table 5.5).

Fuel oil predominates in four of the Region's counties, with at least six out of ten households in Dutchess, Putnam, and Ulster using oil for space heating. For these homes in particular, energy efficiency is a big money saver, in light of rising fuel oil prices.

Table 5.4 Estimated Energy Dollar Exports, 2010

Location	Estimated Energy Expenses Exported Out of NYS	Estimated energy $ exported per capita
Dutchess	$535,625,063	$1,825
Orange	$770,790,850	$2,010
Putnam	$237,369,863	$2,391
Rockland	$545,023,868	$1,816
Sullivan	$211,171,723	$2,785
Ulster	$449,771,121	$2,479
Westchester	$1,553,694,648	$1,625
Region	**$4,303,447,137**	**$2,133**

Source: NYSERDA, 2012: New York State Energy Profiles: 1996-2010 (Energy Fast Facts) and US EIA, 2010. State Profile and Energy Estimates.

Table 5.5 Energy Use for Mid-Hudson Region by Household, 2010

Location	Total occupied households	Fuel Oil or Kerosene	Natural Gas	Electricity	Bottled tank or LP Gas	Wood, other[1]
Dutchess	106,934	58,243	27,171	13,745	3,912	3,863
Orange	124,627	44,976	57,561	12,372	5,305	4,413
Putnam	34,727	23,012	3,107	6,500	935	1,173
Rockland	98,207	2,900	85,845	7,354	1,017	1,091
Sullivan	31,599	19,161	1,219	4,408	3,771	3,040
Ulster	68,581	36,502	13,733	7,461	5,761	5,124
Westchester	344,475	153,556	153,495	28,318	4,958	4,148
Region	**809,150**	**338,350**	**342,131**	**80,158**	**25,659**	**22,852**
	100%	42%	42%	9%	3%	3%

[1] Wood other includes households that use wood, other, no fuel, coal or coke or solar.
Source: Adapted from NYSERDA, 2012. NYS Energy Profiles: 1996-2010.

5.1.5 Electric Generation in the Mid-Hudson

The seven counties of the Mid-Hudson Region are host to nearly 50 licensed electric generation facilities that feed the grid. These facilities vary tremendously in fuel type and name-plate capacity, ranging from 1.3 MW of nuclear (Entergy's Indian Point 2) to 0.2 MW of hydropower (Central Hudson's Montgomery West dam). Just two facilities, Entergy's Indian Point 2 and 3, represent collectively 41 percent (2.3 MW) of the Region's nameplate capacity. Electric generation is powered by a variety of fuel sources, presented by the NY Independent System Operator (NYISO) zone below[121]:

Just two facilities, Entergy's Indian Point 2 and 3, represent collectively 41 percent (2.3 MW) of the Region's nameplate capacity.

- Zone G: 78 percent of the electricity generated within Zone G (most of the Region except Westchester) relies on fossil fuel (steam turbines using oil or gas) which total 2424 MW name plate capacity.
- Zone H: 97.5 percent of the electricity generated within Zone H (northern and central Westchester) relies on nuclear fuel (2 steam turbines at Indian Point with 2,062 MW name plate capacity)
- Zone I: Nearly 100 percent of the electricity generated within Zone I (southern Westchester) relies on low head hydro dam from New York City water supply (at only 1.8 MW name plate capacity)

Electric generation infrastructure in the Mid-Hudson Region is aging. No new generation facilities have been licensed since 1993. Among the oldest facilities are hydropower sites dating from the 1920s, a number of which underwent renovation in recent years, e.g. Central Hudson's Dashville, High Falls and Sturgeon facilities.

In the most recent Reliability Needs Assessment (RNA), the NYISO indicates that unless certain measures are taken, the current electric system will violate resource adequacy criteria (the ability of the system to reliably meet electricity demand) beginning in 2020.[122] Deficiencies will exist in the Mid-Hudson Region and other downstate regions. The needs could be satisfied with the addition of generation and transmission capacity in these geographic areas.

Nuclear Power Generation

The Mid-Hudson Region is home to Indian Point, one of NYS' major nuclear power complexes. At present, nuclear power supplies a large portion of NYS' electricity, estimated at over 25% in 2010 (in GWh—see source below). While nuclear power plays a significant role in NYS' present-day energy economy, the future of nuclear power is a subject of contentious debate. Because of the lack of consensus both within the Region and at the State level, the planning Consortium has not taken a stance on this issue. Ultimately, State and Federal decision-making will exert a tremendous influence on the future of nuclear power in the Region.

Source: NYSERDA, 2013. Energy Statistics. http://www.nyserda.ny.gov/Energy-Prices-Data-and-Reports/Energy-Statistics-and-Weather-Data/Energy-Statistics.aspx

[121] NYISO, 2012. Load and Capacity Data "Gold Book". www.nyiso.com

[122] NYISO, 2012. Reliability Needs Assessment. www.nyiso.com/public/about_nyiso/fundamentals_of_planning/reliability_planning/index.jsp

Variable Power Demand

Power demand is not constant—it varies over the course of the day and the year. Utilities must manage their power generation and distribution to meet the changing demand. During peak periods, utilities may even be required to cycle on 'peaking plants' to generate supplementary power. The variability of demand has impacts on fuel use, GHG emissions, and cost for consumers.

On a typical weekday with low heating or cooling load, the peak load occurs in early evening, resulting from residential dinnertime load. This "supper bump" is typical. Therefore, increasing efficiency of residential loads is important in managing the base load. If every dishwasher that runs at 8 pm starts at 3 am instead, the savings will add up for the over 800,000 households in the Region. Shifting electricity usage from peak to off-peak helps create more balanced load profiles, thereby lowering costs.

5.1.6 Energy Efficiency Participation Rates

NYS has set a goal of achieving a 15 percent reduction in energy use through energy efficiency improvements by 2015. In the Mid-Hudson Region, current participation in existing NYSERDA programs for both the residential and commercial/industrial sectors is modest, with some signs of recent increases.

For example, homeowner participation in residential energy efficiency programs has begun to climb, in part due to the Green Jobs, Green New York (GJGNY) program, which provides free or low cost energy assessments (see Figure 5.3). Communities that have launched the Energize New York program, in which outreach to homeowners is coupled with the state's GJGNY assessment incentives and low interest finance options, have experienced a significant increase in the number of homes upgraded (see Table 5.6)

For the commercial, institutional and industrial sector, NYSERDA reports relatively steady participation in the Existing Facilities Program, New Construction Program, and Industrial & Process Efficiency Program. Under these NYSERDA programs, in 2010 and 2011 about 300 different projects were completed annually in the Mid-Hudson Region, for a total of 75 million kilowatt-hour savings (see Table 5.7).

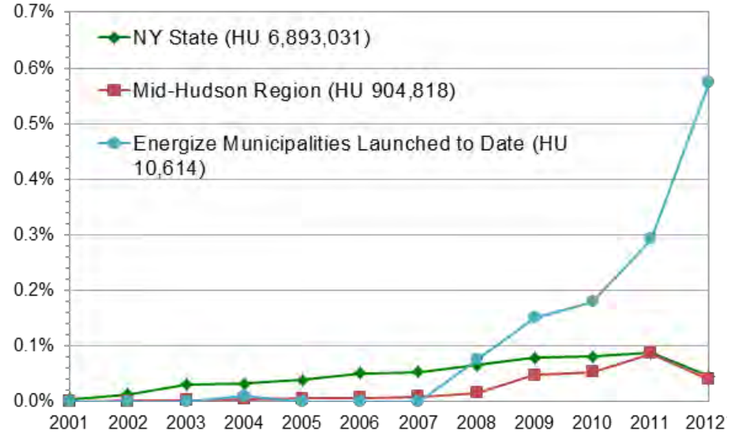


Figure 5.3 Annual percent of home energy upgrades by geography: 2001-2012

Case Study: EnergizeNY

The EnergizeNY program began in earnest in October 2010. In two full years since its launch, homeowners in the northern Westchester municipalities targeted by the program have invested $2,846,329 in home energy efficiency upgrade improvements. This investment has generated 22.77 job years in that time period, representing 8 job years per $1 million of home upgrades.

In EnergizeNY's first 12 months, 67 home upgrades were completed, creating 6.66 job years of contractor work. In the second 12 months through October 2012, participation shot up with 162 home upgrades being completed, creating 16.11 job years of contractor work.

The average upgrade undertaken yielded an investment of $12,429 per home. In short, every ten homes upgraded at that average investment created one full year of employment for one person.

Table 5.6 Energize NY impact on job creation

Installation Year	Year 1	Year 2	Year 3
Homes upgraded	67	162	229
$ dollars invested	$832,769	$2,013,560	$2,846,329
Job years created	6.66	16.11	22.77
Jobs / $1million invested	8.00		
Average $ invested / home	$12,429		
Home upgrades needed to reach $1million invested	80.45		

Source: NYSERDA and Energize NY, 2012.

Table 5.7 Mid-Hudson Participation in NYSERDA's Commercial Sector Energy Efficiency Programs

	Installation Year			
	2010		2011	
NYSERDA Program	Number of Projects	Sum of kWh savings	Count of Project Number	Sum of kWh savings
EFP	266	26,898,913	273	14,946,592
IPE	14	10,049,602	14	17,632,185
NCP	20	4,177,393	24	2,144,041
Total	**300**	**41,125,908**	**311**	**34,722,817**

Source: NYSERDA, 2012; EFP = Existing Facilities Program, NCP= New Construction Program, IPE = Industrial & Process Efficiency Program

5.1.7 Renewable Energy Potential

Solar Energy

New York State's solar resource dwarfs other energy resources, finite and renewable. According to the National Renewable Energy Laboratory[123], rooftop photovoltaic (PV) potential alone in NYS has the technical potential of 25 gigawatts (GW) in capacity and 28,420 GW hours (GWh) in generation potential. Extrapolating from this, the Mid-Hudson region's potential capacity exceeds 3,000 MW from rooftop PV alone. The potential other forms of solar energy are also significant.

Solar energy is the only fuel delivered free of charge directly into every part of the Mid-Hudson Region. Solar PV and thermal technology are now mature and extremely flexible, allowing solar energy to be converted for use on site at the residential, commercial, and utility scale. An additional benefit of PV is its potential for 'peak shaving': typically its maximum generation coincides with warm-weather peak electrical demand.

Solar applications including solar hot water, building heating, passive solar, and daylighting also have significant potential. For example, current mature technologies for domestic hot water could supply 60-70 percent of the hot water requirements of typical households in the Region.

Wind Power

Opportunities for wind generation exist at greater than 1 MW small and large wind farms, onsite or distributed energy wind turbine projects of 1MW or less, and small wind installations at 5kW and more. A 2005 study of wind resource in Sullivan County and a second wind study in 2012 confirm the potential for 336 MW of wind generated electricity/year at the wind farm level, and an additional 14 MW at onsite and small wind installations.[124] Similar opportunities exist in counties of the Mid-Hudson Region with similar open areas such as Dutchess, Putnam and Ulster counties.

Hydropower

Hydroelectric power generation is a well-established form of renewable energy. In the Mid-Hudson Region, several small hydropower (1-5 MW) sites have been in operation since the early 1900s, proving the longevity of this technology. Several new sites are already in preliminary development. Windsor Machinery Co. Inc. owns, operates and maintains 3 MW of hydro in the Hudson Valley: Wappingers Falls Hydroelectric, Salisbury Mills Hydroelectric and Wallkill Hydroelectric. Central Hudson owns and operates three hydroelectric facilities: Sturgeon Pool, Dashville, and High Falls. Combined, these facilities have 23 MW of renewable energy capacity. The hydroelectric stations are small, local stations, which use renewable energy to provide about two percent of their customers' total electric energy needs. Central Hudson is in the process of completing upgrades to the dam at the Sturgeon Pool Hydro facility, originally constructed in 1922-23. The dam is operated and utilized for hydropower generation, and can produce 15 MW combined from three turbines.

There is potential to generate hydropower from new dams, as well as from existing dams that do not currently have energy generation technology installed but could be retrofitted.[125]

Biomass

Large parts of the Mid-Hudson Region are covered with forests and open fields with grasses and other biomass that can be used as fuel. There is potential for some biomass energy development, although actual sustainable resource potential has not been assessed as part of this Plan.

5.1.8 Environmental Justice Considerations

Access to affordable and clean energy is a major EJ issue in the Mid-Hudson Region. Low-income communities in the Region are significantly affected by price volatilities in the energy market. As a result many people are forced to make hard decisions about where in their budgets to cut in order to afford to get to work and keep their homes warm in winter. As discussed earlier, prices have risen steadily for all fuel types over the last decade. Prices for fuel oil (critical for heating, especially in the northern communities in the Region) have risen by over 40 percent in less than a year. This volatility makes it difficult for families to budget appropriately as their bills may change month to month based on the price of these commodities.

The Plan seeks to address these issues first and foremost by promoting energy efficiency, which can help reduce the need for heating and cooling in buildings as well as fuel use for transportation. The 2010 NYS Energy Conservation Construction Code will assure new affordable housing utilizes high-performance building practices[126] and that energy retrofits to existing housing stock are encouraged. Additionally, increasing access to various modes of transit reduces dependence on private automobiles. Renewable energy technologies can provide a hedge against rising fuel costs.

[123] NYISO, 2012. Load and Capacity Data "Gold Book". www.nyiso.com

[124] Sullivan Alliance for Sustainable Development, 2013. Wind Power Basics. http://sullivanalliance.org/wind-power/

[125] US DOE, 2012. Powering up America's Waterways. http://energy.gov/articles/powering-america-s-waterways

[126] NYSDOS, 2010. Energy Conservation Construction Code. http://www.dos.ny.gov/dcea/energycode_code.html

Power plant siting has also been a major issue in NYS. Power plants often emit pollutants into the air that have negative health effects on the communities surrounding them.[127] In an effort to ensure that the siting of these plants is done fairly and equitably, the NYSDEC has recently enacted regulations to ensure that EJ issues are considered during the siting process.[128] It is critical that the development of new power plants does not unfairly impact poorer or minority communities within the Region.

5.2 Climate Change and Energy

5.2.1 GHG Emissions

Energy-related GHG emissions are typically divided into stationary (i.e. emissions from sources that are immobile such as power plants and boilers), and mobile (i.e. emissions from combustion of fuel to power vehicles). Mobile source emissions were discussed in Chapter 4.

Stationary energy consumption includes direct emissions from the combustion of natural gas, coal, kerosene, distillate, motor gasoline and other fuels, as well as indirect emissions from electricity consumption. Direct emissions from residential, commercial, and industrial activities in the Region are considered Scope 1. Indirect emissions from the consumption of electricity are considered Scope 2.

Electricity generated in the Region is distributed through the electrical grid overseen by the NYISO, a non-profit independent entity that is responsible for ensuring the reliability of NYS' electric system and the proper functioning of its wholesale energy market. Because the electricity generated in the Region does not uniquely serve the Region's consumers—the electrical grid crosses regional borders—emissions from electricity generated within the Region are not included in the regional totals. In its place, Table 5.8 below includes Scope 2 emissions, which are estimated based on the amount of electricity used by consumers in the Region regardless of where the electricity was generated. This helps avoid double counting. Table 5.9 presents the breakdown of GHG emissions by fuel source and sector.

Table 5.8 Stationary Fuel Consumption GHG Emissions by County, 2010

		Emissions (MTCO2e)			
Location	Scope	Residential	Commercial	Industrial	Total
Dutchess	1	449,020	436,741	323,686	1,209,447
	2	230,451	217,156	193,993	641,600
Orange	1	580,673	532,981	152,457	1,266,111
	2	257,596	290,759	55,423	603,777
Putnam	1	151,562	89,045	88,234	328,841
	2	109,322	63,509	11,460	184,291
Rockland	1	553,786	292,862	283,896	1,130,545
	2	206,622	242,919	42,375	491,916
Sullivan	1	125,926	65,803	7,033	198,762
	2	84,923	70,100	9,643	164,665
Ulster	1	307,725	222,462	82,795	612,982
	2	143,531	127,457	17,495	288,483
Westchester	1	1,621,317	1,374,545	310,486	3,306,348
	2	793,731	827,019	113,856	1,734,606
Region	**1**	**3,790,010**	**3,014,440**	**1,248,587**	**8,053,037**
	2	**1,826,175**	**1,838,920**	**444,244**	**4,109,338**
	Total	**5,616,185**	**4,853,360**	**1,692,830**	**12,162,375**

Source: Attachment I: Regional GHG Inventory

[127] American Lung Association, 2011. Toxic Air. http://www.lung.org/assets/documents/healthy-air/toxic-air-report.pdf

[128] NYSDEC, 2012. Recently Adopted Environmental Justice Regulations. http://www.dec.ny.gov/regulations/79626.html

Table 5.9 2010 Stationary Fuel Combustion GHG Emissions by Fuel (MTCO2e)

Fuel	Residential	Commercial	Industrial	Total	Percent of Total
Electricity	1,826,175	1,838,920	444,244	4,109,338	34%
Natural Gas	1,886,714	1,613,889	751,311	4,251,915	35%
Fuel Oil	1,727,143	1,351,430	186,680	3,265,253	27%
Propane	158,986	46,411	6,247	211,645	2%
Coal or Coke	9,419	714	178,240	188,373	2%
Other Petroleum	0	0	124,394	124,394	1%
Other/Not specified	7,747	1,996	1,714	11,457	0%
Region	**5,616,185**	**4,853,360**	**1,692,830**	**12,162,375**	**100%**

Source: Attachment I: Regional GHG Inventory

Emissions also result from energy supply processes include electricity transmission and distribution (T & D) losses, natural gas T & D losses, and the use of sulfur hexafluoride (SF6) in the utility industry. These are presented in Table 5.10 below.

5.2.2 Climate Change Vulnerability

The Mid-Hudson Region has a reliable electricity and gas supply and distribution system; however, weather-related stressors can damage equipment, disrupt fuel supply chains, reduce power plant output levels, and increase demand beyond the system's operational capacity. Table 5.11 summarizes the potential effects of climate change on energy infrastructure and demand in the Mid-Hudson Region.

The Mid-Hudson Region is home to many major electric power plants including Roseton Generating Station, Danskammer Generating Station (closed in 2012), Lovett Generating Station (closed in 2008), Indian Point Energy Center and Bowline Generating Station. These facilities are located along the Hudson River, making them vulnerable to the effects of climate change, although effort has been taken to protect these facilities from the impacts of storm surge and flooding.

The Region's generation, transmission and distribution system may be impacted by climate change due to increased prevalence of extreme weather (wind, storms, heat and flooding), which could damage energy supply, transmission and distribution. Flooding, sea level rise, and coastal storms may threaten generation facilities along the Hudson River as well as fuel storage facilities. Nor'easters bringing more ice versus snow in the winter could result in widespread power outages. Sagging transmission lines from extreme heat can also

Table 5.10 2010 Emissions from Energy Supply Activities (MTCO2e)

Location	Electricity T & D Emissions	Natural Gas T & D Emissions	Utility SF6 Emissions	Total	Percent of Total
Dutchess	33,877	60,996	8,885	103,757	12%
Orange	31,879	98,779	8,361	139,020	17%
Putnam	9,731	15,337	2,552	27,619	3%
Rockland	25,973	135,283	6,812	168,068	20%
Sullivan	8,694	1431	2,280	12,405	1%
Ulster	15,232	20,518	3,995	39,744	5%
Westchester	92,929	233,031	19,925	345,886	41%
Region	**218,315**	**565,374**	**52,811**	**836,500**	**100%**

Source: Attachment I: Regional GHG Inventory

Table 5.11 Summary of Energy Related Climate Effects in the Mid-Hudson Region

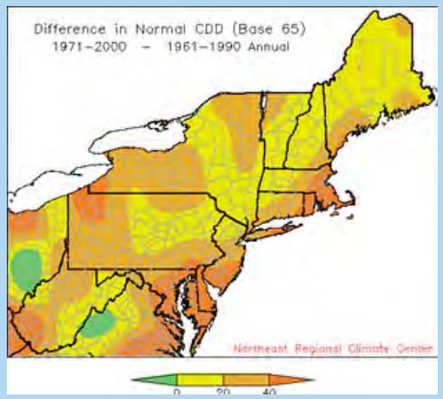
Asset	Climate Impact	Climate Effect	Description
Generation, Transmission and Distribution	Severe storms; Extreme heat	Reduced grid reliability	Power outages from severe storms; Brownouts and blackouts from spikes in demand during extreme heat events
	Drought; Warmer winters	Reduced production capacity	Lower stream flows in the late summer may reduce hydropower production (an important energy source in the Region); Less water availability for cooling
Demand	Extreme heat; Warmer winters	Increased demand in the summer; Reduced demand in the winter	Increased demand in the summer for cooling is projected to outpace the decrease in demand in the winter for heating

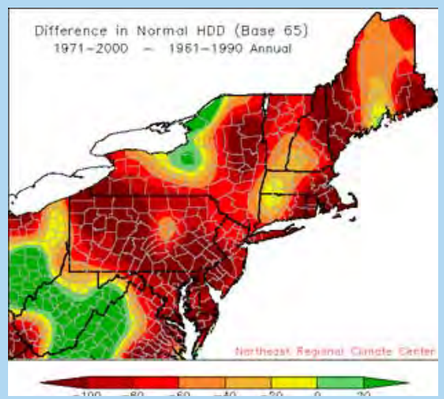
result in downed wires. Extreme heat may cause transformers to fail if they are not rated for the increase in temperatures. Natural gas supply could be vulnerable due to increased frost heave risk.

Energy demand is also likely to rise due to climate change. Demand due to cooling in the summer will increase and demand for heat in the winter will decrease; however the increase demand in the summer is projected to outpace the decrease in demand in the winter.

Measuring Climate Change: Trends in Heating and Cooling Degree Days

Heating and cooling degree days are a standardized means of measuring the day's temperature relating to the energy demands of air condition and heating. These maps above show the difference in Heating Degree Days (HDD) and cooling degree days (CDD) between two 30 year time periods (1971 to 2000 and 1961 to 1990). CDD have increased during this time period while HDD have declined. Further supporting this claim, NYSERDA reports that between 1970 and 2007, the number of HDD declined by 46.3 days per decade.





5.3 Objectives

The Mid-Hudson Region must take action to reduce real and perceived risk to the Region's energy infrastructure. Achieving a truly sustainable energy system is, in part, about reducing risk, controlling costs, and investing in the local/regional economy. Mitigating risk—by updating the Region's buildings, industrial facilities, and electrical grid—will create thousands of jobs, strengthen the local economy, and reduce the Region's dependence on fossil fuels and imported energy. As such, the Plan's energy objectives are:

EN1: Become Radically Less Energy and Fossil Fuel Intensive While Strengthening the Regional Economy

- Reduce the amount of energy needed to produce each dollar of regional economic product. The less energy needed, the lower the operating costs for local businesses. Each dollar diverted from energy expenses becomes available for business development and innovation.
- Increase building efficiency and ensure that new construction meets strict energy performance standards. In the Mid-Hudson Region, the vast majority of households and businesses heat with fossil fuels; reducing demand for heating and cooling and switching to alternative fuel sources is needed to meet overall GHG reduction and energy intensity goals.

EN2: Expand Renewable Generation Exponentially as an Energy Source across the Region

- Capitalize on the diverse array of well-established renewable energy sources, including wind, solar, geothermal, hydro, biomass, and the potential for tidal.
- Develop new renewable generation to improve energy security, energy resilience, and continuity for the local energy delivery infrastructure, reducing the large amount of energy dollars exported outside the Region and NYS.
- Reduce air pollution and other environmental impacts by replacing fossil fuel generation with cleaner technologies.

EN3: Improve the Resilience of the Energy Delivery System throughout the Region

- Reduce the risk of interruption in energy delivery. This can include simple steps, such as burying utility lines in denser communities to limit debris-related damage. Offering a reliable, affordable source of energy will help attract business investment.
- Use full-cost lifecycle accounting when investing in infrastructure, to ensure that the costs of operations and maintenance, business interruption, and other economic liabilities are considered.
- Develop community energy districts to help manage energy supply, distribution, and use at a more local scale. This will increase supply diversity, energy efficiency, demand response capacity, and energy storage, all of which are attractive for private sector investment and increase resiliency of the energy system.
- Expand the Region's role as an energy leader in the deployment of high technology and service business models. By developing local expertise in smart grid applications, new renewable technologies, and related fields, local resilience will increase and reduce risk of energy interruption.

5.4 Indicators

Table 5.12 presents a series of sustainability indicators for the energy focus area. These indicators should be used by local government and by regional institutions to track performance in achieving the objectives listed in Section 5.3. The data sources and calculations methodologies for each metric can be found in Appendix B.

5.4.1 Metrics and Targets

Table 5.12 Indicator Inventory: Tier 1 Indicators

Objective	Metric	Current Value (2010)	Target 2020	Target 2035	Target 2050
EN1: Become radically less energy and fossil fuel intensive while strengthening the regional economy					
1a. Reduce energy intensity	Regional energy consumption (MMBtu) per capita[129]	157.2	133.6 (-15 %)[130]	110.1 (-30%)	78.6 (-50%)
1b. Reduce stationary fossil fuel consumption	Stationary fossil fuel use (MMBtu) per capita[131]	80.2	68.2 (-15%)	56.1 (-30%)	40.1 (-50%)
1c. Reduce stationary fuel consumption GHG emissions	Stationary fuel consumption GHG emissions (MTCO2e)	12,162,375	10,336,019 (-15%)[132]	7,297,425 (-40%)	4, 256,831 (-65%)
EN2: Grow renewables exponentially as an energy source across the Region					
2a. Increase installed renewable generation capacity	Installed capacity (MMBtu) per capita[133]	0.382	1.15 (+200%)	8.02 (+2000%)	76.79[134] (+20000%)
EN3: Improve the resilience of the energy delivery system					
	See Tier 2 Indicators				

[129] Attachment 1: GHG Inventory. Energy Use from: Residential Fuel, Commercial Fuel, Industrial Fuel, Electricity, Natural Gas, On Road, Off Road, Marine, and Rail fuel totals. Population assumed to be 2,290,851 (US Census, 2012)

[130] Electric demand growth (from NYISO) alone increases this by 5% through 2020 (an average of one-half percent per year for ten years). The targets for energy intensity assume 5% population growth per decade and 5% drop in energy use per capita per decade as a starting point

[131] Attachment 1: GHG Inventory: Energy Use from: Residential Fuel, Commercial Fuel, Industrial Fuel, Electricity, Natural Gas

[132] This assumes a reduction in fossil fuel use per capita, 5% population growth per decade, and fuel switching to cleaner fuels and renewables

[133] The renewable generation capacity (2011 NYISO Gold Book) at current value includes Hydro (actual) and PV (estimated) as follows: [Hydro + PV installed = 875,214 MMBtu] for 2010. Since Hydro is dominant and mature, the targets reflect primarily non-Hydro renewables

[134] Given the target of reducing energy intensity to roughly 80 MMBtu/capita by 2050, the target value for growing renewables is calibrated to reach roughly the same 80 MMBtu/capita by 2050, matching the energy intensity with renewable generation capacity

5.4.2 Metric Limitations and Tier 2 Indicators

Regarding the objective of increasing the resilience of the energy delivery system, Category 1, 2, 3, 4 & 5 resource adequacy criteria data—which utilities submit to the North American Electrical Reliability Corporation (NERC)—were not made available to the planning team. These data—or alternative metrics on reliability of electricity supply—are needed to track progress in meeting EN3.

Table 5.13 below lists proposed Tier 2 indicators and which objective they would help track. Should accurate data sources become available in the future, or be provided to the planning team, these metrics will be useful for local governments making decisions regarding the implementation of this Plan.

Table 5.13 Tier 2 Indicators

Objective	Metric
EN1, EN2	Regional employment in clean energy and energy efficiency
EN1, EN2	Public literacy about energy-related topics (metric to be defined)
EN3	Resource Adequacy Criteria (NERC-NYISO)

5.5 Initiatives for Implementation

The Mid-Hudson Region must make dramatic improvements in how it generates, delivers, and uses energy for NYS to meet its commitment to reduce GHG emissions by 80 percent below 1990 levels by 2050, and to meet the urgent reduction targets that science tells us are necessary to prevent catastrophic climate change. As such, the Region's energy strategy:

- Outlines specific proposals that will help achieve ubiquitous energy efficiency, control, storage and distributed generation, enabling deep penetration of renewable energy
- Recommends methods for improving grid reliability and energy security using competition and local community aggregation/empowerment
- Seeks to motivate the private sector to finance demand side opportunities and engage energy consumers to achieve efficiency and savings

Table 5.14 Initiatives for Implementation

	EN1 Decrease Energy and Fossil Fuel Intensity	EN2 Grow Renewables	EN3 Increase Resilience
High-Priority Initiatives			
Expand Energy Efficiency Programs	✖		✖
Create Community Energy Districts	✖	✖	✖
Expand Distributed Generation and Renewable Energy Production	✖	✖	✖
Medium-Priority Initiatives			
Increase Demand Response Participation	✖		✖
Develop Energy Storage Capacity		✖	✖
Develop Innovative Project, Financing, and Policy Models	✖`	✖	✖

Table 5.15 Mid-Hudson Household Energy Costs & Savings Projections

	Estimated Household Utility Costs/Year	Annual Savings with Modest Energy Upgrades
	$2,750	5.0%
Location	**Total Utility Costs All Households**	**Total Potential Savings All Households**
Dutchess	$309,612,000	$15,480,600
Orange	$366,699,000	$18,334,950
Putnam	$103,002,000	$5,150,100
Rockland	$284,061,000	$14,203,050
Sullivan	$89,250,000	$4,462,500
Ulster	$202,497,000	$10,124,850
Westchester	$1,021,131,000	$51,056,550
Region	**$2,376,252,000**	**$118,812,600**

Source: Household counts from US Census, 2010. ACS.

In Table 5.14, a series of initiatives are presented—these are described in detail in Section 5.5. A preliminary ranking was completed to establish priority. High priority initiatives are those that impact multiple Plan focus areas while also scoring well against other prioritization criteria described in Chapter 3. Medium priority initiatives are those that do not have as broad an impact or score as highly.

Wherever possible, example projects or case studies have been given that typify the efforts needed to achieve the Plan's objectives. Note that examples provided are not intended to be comprehensive, but are simply ideas submitted during the planning process with sufficient information to illustrate the concepts being proposed. A List of Project Ideas containing all ideas submitted during the planning process can be found in Appendix C. Additional Resources to help individuals, local governments, or organizations with implementation can be found in Appendix D.

In Chapter 9, a series of strategic priorities for the Region are described, drawing from recommendations that arose in discussion among multiple Working Groups. These strategic priorities necessarily include initiatives that impact the Energy focus area.

5.5.1 Expand Energy Efficiency Programs

Energy efficiency is a strong driver of economic development for two reasons: (1) efficiency measures often pay for themselves while reducing future operating costs and (2) implementation is a proven jobs-creator with immediate results.

Residential and Commercial Potential

Residential energy use can be reduced by at least 20-30 percent for the average consumer, through weatherization and envelope improvements, upgrading and maintaining heating, cooling and ventilation systems, replacing old appliances, introducing smart metering and controls, and by changing occupant behavior. Even greater efficiencies are possible in new construction or major renovation projects.

The Mid-Hudson Region's households spend $2.18 billion on utilities per year for non-transportation related energy (see Table 5.15). If the residential sector installed common energy upgrades (e.g. air sealing and insulation) on a wide scale sufficient to achieve just 5 percent regional savings, that action alone would save $109 million annually. Energy savings like this are especially important to those with limited disposable income, who may spend upwards of 10 percent of their income on residential energy.

> Energy efficiency alone in both the residential and commercial sectors could easily make available $230 million per year or more in private capital for job retention and creation in the Region.

In the commercial sector, the Mid-Hudson Region's businesses spend $2.37 billion on utilities per year. For larger commercial and institutional entities, annual energy bills can run into the hundreds of thousands of dollars (or more). A modest 5 percent energy savings through common efficiency measures (lighting, controls, etc.) would yield $118 million per annum in savings that can be reinvested locally.

Energy efficiency alone in both the residential and commercial sectors could easily make available $230 million per year or more in private capital for job retention and creation in the Region.

Industrial Potential

Especially in larger industrial and facilities, production and other business processes are major energy users. The Mid-Hudson Region has significant Information Technology and biomedical industries, which are major energy users and have a critical need for a reliable energy supply. For example, data centers are extremely energy intensive in terms of cooling and temperature stabilization requirements. As these industries are targeted for growth in the REDC's economic development strategy, care should be taken to ensure that energy efficiency is given priority in designing or retrofitting new facilities.

Voluntary Programs

At present, numerous voluntary energy efficiency programs exist in the Mid-Hudson Region. Many are sponsored by State agencies or by utilities. As described in Section 5.1.6, these programs have met with varying degrees of success. Their continued impact and expansion is critical to meeting this Plan's energy objectives. Successful energy efficiency programs typically combine readily-available financing with compelling business terms and strong outreach and engagement. A major outreach and engagement initiative is needed to generate support, interest, and participation in existing energy efficiency programs; as well, new financing mechanisms and resources are needed to increase the feasibility of making more capital-intensive retrofits.

Strengthening Codes and Ordinances

Strict energy codes are needed to ensure new buildings and major renovations are energy efficient. It is much easier to design a new building from the ground up to be highly efficient, rather than retrofit an existing one. This does not mean existing building should be demolished and replaced with new structures—see the callout box on Life Cycle Analysis in Buildings.

The 2010 Energy Conservation Construction Code of NYS has been revised under the 2009 US DOE guidelines. This comprehensive code establishes minimum requirements for buildings using prescriptive and performance-related provisions, and helps make possible the use of new materials and innovative techniques that conserve energy.

To the extent that the NYS energy code sets minimums, local jurisdictions may adopt standards that exceed the state 'floor.' The NYS standards are based on the American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) standards, but often run a cycle behind. Therefore, municipalities or counties that want to use a reliable standard before it has been adopted state-wide may refer to the most recent ASHRAE national standard recommendations.[135]

Retrofit or Rebuild: Lifecycle Analysis in Buildings and the Importance of Green Operations

Recent lifecycle analysis research led by the Preservation Green Lab, published in 2012, suggests that "building reuse almost always yields fewer environmental impacts than new construction when comparing buildings of similar size and functionality." This is largely due to the tremendous amount of resources and energy required to extract, manufacture, and install the materials and equipment comprising a building.

Lifecycle analysis—which seeks to understand the entirety of environmental impacts associated with a good, service, structure, etc. over its lifetime—has placed new emphasis on the importance of managing and maintaining existing infrastructure and buildings. Engaging facility managers and other operations and maintenance staff is critical to reducing operating costs and extending the life of a building and its equipment. In addition to energy and water efficiency retrofits, building owners should consider programs like the Leadership in Energy Efficiency and Environmental Design: Existing Building Operation & Maintenance program, which takes a lifecycle perspective in evaluating and rating building operational impacts.

Source: The Preservation Lab, 2012. The greenest building: quantifying the environmental value of building reuse. http://www.preservationnation.org/information-center/sustainable-communities/sustainability/green-lab/lca/The_Greenest_Building_lowres.pdf

[135] ASHRAE: www.ashrae.org

Case Study: The Town of Greenburgh

The Town of Greenburgh in Westchester County amended its local code to add new energy conservation requirements, which were more restrictive than the adopted statewide mandatory energy construction code. Greenburgh's local law requires that all new homes constructed in the town comply with the NYS 'Energy Star-Labeled Homes' requirement. The NYS Energy Star Program provides several methods of making a home at least 15 percent more energy efficient than required by the state energy code. These include more effective insulation, higher performance windows, more efficient heating and cooling equipment, tightening the building envelope to reduce air infiltration, and the use of various energy efficient products. The Greenburgh approach is a strategic one since it applies only to one and two-family dwellings and multi-family buildings of three stories or less - the same buildings covered by the residential provisions of the state code.

In addition, local jurisdictions should review their building codes to ensure that ultra-high performance construction is not prohibited or discouraged by current code requirements (e.g. through prohibitions against building shading devices, or requirements for building heating systems).

Example Projects

Expand Energize New York

Expanding the EnergizeNY program from Northern Westchester to all seven counties of the Mid-Hudson Region will help accelerate residential and commercial energy efficiency programs. The EnergizeNY model of community based outreach, messaging, direct property owner support, useful tools and leveraged local leadership has proven successful since its launch in 2010. An expanded program will have positive regional impacts in the areas of job creation, community development, economic growth, energy independence, GHG reductions and more. These effects will be felt far beyond the energy sector while using private sources of capital to facilitate the scaled up demand for energy improvements.

Notably, the EnergizeNY program is financially self-sufficient by 2016 from the fees and other ancillary revenues derived from the financings initiated and processed by the program. The EnergizeNY program will leverage any public program funds for the bridge period 2013-2016 with private program funding.

Expanding the EnergizeNY program to all seven counties for the period 2013 through 2016 could realistically yield an economic impact of $82,728,424 invested in home energy upgrades. This projection is based on the actual participation increases seen to date in northern Westchester County, extrapolated to the housing stock of the rest of the Region. This investment permanently reduces homeowner's expenses, by lowering the export of energy dollars, and keeping those dollars in the local economy. This $82 million creates 661 direct jobs over the three years, or gainful employment for 220 persons per year.

Expand NYC CoolRoofs to Westchester and Rockland Counties

The NYC CoolRoofs program[136] helps promote roof retrofits or recoats to reduce the urban heat island effect. The urban heat island effect results in higher summer temperatures in denser urban areas, due largely to the abundance of dark, hard surfaces that absorb, rather than reflect, solar radiation. By adding green roofs or using light-colored roof coatings, buildings can help mitigate the urban heat island effect while also reducing cooling loads.

Adopt Legislation Mandating Energy Audits and Upgrades in Large Buildings

Recently, NYC adopted legislation—referred to as the Greener, Greater Buildings Plan—requiring large buildings to undertake mandatory energy audits and retrofits. This landmark legislation has tremendous potential to reduce GHG emissions, energy use, and air pollution in NYC. While the built environment in much of the Region has little in common with NYC, there are some larger municipalities with significant multifamily and large commercial stock, particularly in Westchester County. In these municipalities, similar legislation should be seriously considered.

[136] NYC Cool Roofs: http://www.nyc.gov/html/coolroofs/html/home/home.shtml

5.5.2 Create Community Energy Districts

There are many energy-related projects which can be undertaken by individual site or building owners, regardless of whether a neighbor does the same or not. This individualistic approach has predominated and produced only the modest participation levels seen in most state-wide energy efficiency and other energy programs.

> Community Energy Districts (CEDs) will stimulate private investment, helping to achieve energy resilience and economic development, with very modest levels of public investment.

It is time for a different approach. Community Energy Districts (CEDs) will stimulate private investment, helping to achieve energy resilience and economic development, with very modest levels of public investment. A CED aggregates supply and demand opportunities within a specific neighborhood or cluster of facilities. Energy districts have proven highly effective at both raising participation rates and lowering costs by delivering economies of scale to each neighboring building owner. While quite flexible, CEDs, by definition, pool the interests of a diverse set of co-located property owners and operators.

Each district could incorporate one or more of the following resources and strategies: energy generation, energy efficiency, demand response, energy storage, electric vehicle charging, or collective energy purchase. Each district would tailor the mix of resources and strategies in a manner that creates synergistic value for the particular mix of energy consumers within the district. While CEDs will make each strategy more cost-effective, and will enable supply continuity, private investment, and the security of supply that allows for business retention and entry, the strategies that a CED will deploy are also often viable outside a CED.

Benefits from CEDs include:

- Economic (to both the CED and broader Region): economies of scale; sale of excess power to grid; earnings from ancillary services, energy and capacity for storage and demand response (DR); better returns for renewables when coupled with storage or DR; better returns for storage or control systems when coupled with renewables; reduced transmission losses/charges; deferred or avoided capital investments for the transmission and distribution system; reduced fuel costs and energy price volatility (if coupled with renewables); enhanced price elasticity (end users can reduce load when cost is high); and more options for co-generation facilities.
- Environmental: reduced CO_2, NO_2, SO_X, and particulate emissions
- Demonstration/Education Opportunities: CEDs are replicable and can be centers of local education about benefits of smart grid, distributed generation, renewables, control systems, storage technologies, energy efficiency and clean energy technologies.
- Grid Reliability (both local and system-wide): System-wide reliability as a balancing resource; ability to contain disruptions and limit cascading outages; reduced power interruptions (possibility of CED operating when the rest of grid is down); 'safe-havens' for essential services when rest of grid is down; less grid congestion.
- Power Quality: reduced variability of voltage and frequency levels; potential to provide voltage support by injecting reactive power into local distribution system; avoids damages or failure to equipment.

Microgrids

Microgrid development is, in some cases, a logical result of a CED. A microgrid is a localized grouping of electricity generation, energy storage, and consumers that typically operate connected to a traditional centralized grid, but can also operate independently, if necessary. Microgrids are a critical tool to enable local business districts to collaborate in curbing electricity costs and capture value from the electricity markets that are inaccessible to most without the shared investment in a microgrid. Microgrids, with their ability to operate in sync with the power system, yet with a duplication of the supply infrastructure, offer a critical opportunity to ensure reliability through diversity, and to attract business to the Region that requires an absolutely reliable supply of power.

Comprehensive CEDs will emerge from initiatives that have already been designed and are ready to be implemented. For CEDs to have a major impact, replication is critical, and so initial demonstration projects should seek to create processes to work with utilities and NYISO to enhance energy storage and DR revenues, as well as energy savings, beyond what has been achieved by other efforts across the nation. A key feature to achieving replicable outcomes will be to develop contract templates that anyone in the Region can access, for each relationship between counterparties, consistent with state regulatory frameworks, such as the Home Energy Fair Practices Act, utility data access, net metering and tariff structures/formulation and NYISO registration procedures.

Example Project

Mid-Hudson Regional CED Project

A Consortium of actors has come together to spearhead this initiative, which consists of the development of a minimum of four CEDs, in diverse locations in the Region. Each will incorporate an education center, showing generation and consumption of energy in real-time, and assembling a working archive with step-by-step process documents, contractual and marketing templates, peer-to-peer sharing opportunities, and more. District outreach to the public will include events, a kiosk hosted by a local institution (such as a school, library, city hall, or chamber of commerce) and an online portal that will link districts and encourage replication.

Each district will include some or all of the following components, tailored to each site's local interest and business communities: metered distribution loops, distributed renewable generation, distributed storage, electric vehicle charging stations, distributed co- generation, often enriched by co-location (e.g. the returns for renewable generation are enriched by storage and/or demand response).

5.5.3 Expand Distributed Generation and Renewable Energy Production

NYS and the Region must continue to ensure a reliable electricity system infrastructure, supported by adequate supply. The continuity of grid reliability can be achieved in two essential ways:

- Centralize sources of generation, and build out a more robust transmission and distribution system
- Develop more local resources closer to the end users (distributed generation)

Decentralizing energy generation capacity is essential for at least two key reasons:

- Build out can outpace any centralized generation capacity, given the four to six year siting and permitting hurdles for major traditional power generation sites
- Grid and pipeline constraints in the Mid-Hudson Region require well-coordinated, decentralized solutions that put power generation close to sites of power demand

Distributed generation includes renewable energy systems, co-generation, and small power production, which can include the following components: combined heat and power, waste heat recovery and district energy. These systems are logical for independent development or for inclusion in CEDs.

The benefits of distributed generation include:

- Increased electric system reliability
- Reduced peak power requirements
- Provision of ancillary services, including reactive power
- Improvements in power quality
- Reduced land-use impacts and rights-of-way acquisition costs
- Reduced vulnerability to terrorism and improvements in infrastructure resilience

In addition, co-generation is more efficient than producing electricity or steam alone, resulting in reduced carbon emissions, better air quality, and lower operating costs. Many parts of the Region have access to natural gas, which can provide a reliable fuel source for distributed co-generation of heat and power.

The diverse renewable energy resources available in the Mid-Hudson create an ideal platform for a balanced, decentralized regional energy portfolio. Solar PV and solar thermal are especially abundant in Ulster and Dutchess counties where Central Hudson has met and voluntarily raised its net-metering cap twice. Wind installations in Sullivan County have been

> ...a variety of well-placed storage systems and a smart grid to modulate, renewables can meet much of the Region's energy needs, while strengthening its economy, mitigating climate change and assuring reliability.

> In 2009, the NYISO became the first grid operator in the nation to implement federally-approved market rules that enabled storage systems to participate in the markets as frequency regulation providers, delivering reserve capacity that helps grid operators maintain the balance between generation and load.
>
> Energy storage capacity makes the variable hourly output of renewables more valuable, while also offering the capability of 'load leveling' during otherwise expensive peak demand spikes for all non-load following power generators (including nuclear, solar, and wind).

highly successful, well-incentivized and supported by technical assistance and education. Ulster, Orange and Dutchess have a multitude of low-head and medium-sized hydroelectric plants, and the Hudson River estuary has the potential for highly productive, as yet unharnessed tidal energy, if it can be implemented without compromising its aquatic ecology. Biofuels derived from food and other organic waste can be utilized to generate energy, as can a variety of agricultural feedstocks, which can be grown in the more rural areas of the Region[137]. Ground-source geothermal heat pumps utilize year-round cool temperatures near the earth's surface for highly efficient heating and cooling. With a variety of well-placed storage systems and a smart grid to modulate, renewables can meet much of the Region's energy needs, while strengthening its economy, mitigating climate change and assuring reliability.

Improvements to solar PV technology now also make it possible for distributed solar installations to provide sophisticated grid services, such as reactive power management and low-voltage ride through controllable by utilities or NYISO. Like energy efficiency, DR, and storage, solar can reduce peak demand. It is important to remember that the main effect of net-metered solar power is to reduce loads behind the meter thereby reducing stress on the energy distribution system and allowing current central plant and grid capacity to suffice while more load is served with greater reliability.

Renewable energy resources already in place with the most immediate potential for attaining short term goals include solar, wind and hydroelectric. Renewable energy resource targets are presented in Table 5.16.

Example Project

SUNY New Paltz Bio-Mass and Photovoltaic Systems

The SUNY New Paltz Sustainability Plan proposes consideration of Bio-Mass and PV projects, which include the creation of a biomass boiler system and expanding the existing PV system already in place at the college. These projects, if built, could significantly decrease the amount of energy consumed by the institution and its overall GHG emissions.

Table 5.16 Renewable Energy Resource Targets: 2016-2050[1]

Target year	2016	2020	2025	2035	2050
New Generation Capacity (PV, Wind, All Renewables) (MW)[1]	500	1,000	2,000	5,000	10,000
New Energy Supply (MWh per Year)[2]	60,225,000	120,450,000	240,900,000	602,250,000	1,204,500,000
MMBtu/yr Equivalent[3]	205,547,925	411,095,850	822,191,700	2,055,479,250	4,110,958,500
Energy Supply (MMBtu/cap)[4]	90	179	359	897	1,795

[1] The 2016 targets are attainable based on existing federal tax credits and other fiscal drivers that would spur large scale private sector investment.
[2] The energy supply targets (MWh/yr) assume a generic derating factor of 13.75% multiplied by the installed generation capacity and the number of hours per year (8760).
[3] The MMBtu conversion is calculated by multiplying the MWh/yr generation capacity by 3.413
[4] Based on MHR population of 2,290,851 (2010).

Estimated campus GHG reduction for a full biomass system is 20-50 percent, and potentially 45 percent via a greatly expanded PV system. This project could also provide a useful model for other large businesses or intuitions to follow if they wish to limit their own greenhouse gas emissions and decrease their energy bills. Assuming the project is pursued and successful; SUNY New Paltz will show that large power consumers can utilize alternative energy generation effectively.

5.5.4 Increase Demand Response Participation

Demand Response programs pay customers to temporarily reduce electricity consumption in response to supply conditions. Developing local DR resources will (a) create jobs and strengthen businesses throughout the Region, (b) encourage the development of upstate wind energy, (c) reduce regional and state-wide environmental impact, (d) reduce the need for imported fossil fuel, (e) ensure that the Region and NYS are in the vanguard for clean technology, and (f) prove an ultimately more reliable infrastructure than the current, more centralized infrastructure. At present, participation in DR program is low, especially for small- and medium-sized enterprises. Outreach is needed to larger consumers. Small- and medium-sized consumers may need to aggregate loads through a CED framework or micro-grid to take advantage of DR programs, in the absence of statewide enabling legislation.

Example Project

NWEAC DR Program

NWEAC has begun a process with Con Edison in Mount Kisco, New York, to install meters on the low and medium voltage distribution system. These meters are cost-effective, because three high-quality meters will capture the real-time consumption of an entire 10 MW distribution loop. When installed, these meters will allow all consumers inside the loop to participate in DR programs for which they are currently ineligible because individually, they are too small. The Mount Kisco location has planned the installation of four separate multi-vehicle charging stations, each of which will be able to charge vehicles dynamically, earning money through demand response provided.

At the same time, distribution loop customers have installed roughly 100 kW of rooftop solar, and will match this installation with battery back-up. This particular site has newly installed rooftop area that can accommodate as much as five MW of solar; the demonstration project has the clear potential to scale with private sector funding, in the wake of this pilot.

5.5.5 Develop Energy Storage Capacity

Energy storage amplifies the value of both traditional generation and newer, distributed, renewal generation, while enhancing grid reliability as well. Energy storage includes a diverse set of technologies divided into those that store energy for use as electricity or for thermal capacity.

Electric energy storage technologies include pumped hydro, compressed air, flywheels and batteries, and can be applied to both stationary sources and to the transportation sectors, e.g. plug-in electric vehicles for vehicle-to-grid deployment. Thermal storage technologies can be very effective when integrated into combined heat and power or waste heat reduction installations to heat or cool buildings, or industrial or agricultural processes.

The Region could capitalize on the existing commitment by NYS to the New York Battery and Energy Storage Technology collaborative.

The Mid-Hudson Region has abundant locations that will serve as demonstration and deployment sites for all kinds of energy storage applications from batteries to fly wheels, and thermal storage to capacitor banks.

Example Projects

Sustainable Operations for Safety (SOS)

As proposed by Hudson River Sloop Clearwater and Solar Advantage Solutions, the SOS project looks to install PV systems with sufficient battery storage to power emergency services in 7 to 10 pilot municipalities in the Mid-Hudson Region. These projects will address climate resilience by assuring reliability in an emergency, while providing distributed renewable energy to significantly reduce the participating municipalities' energy costs in non-emergency day-to-day operations. This project will essentially create an electricity island that can come off the larger disrupted transmission and distribution system by switching to local generation or stored energy instantly if needed.

Net Zero Energy District Education Center

As proposed by the Sullivan Alliance for Sustainable Development, the Net Zero Energy District Education Center project would set up a net zero energy district in the Human Services Complex in Liberty, NY. This district would utilize a net of zero energy, meaning that it would produce all the energy it consumed, and thereby be able to work off the grid—this will require the rollout of energy storage technology, and would help to demonstrate the viability of many alternative energy sources in the Region. The Human Services Complex in Liberty exemplifies many of the same issues and challenges faced by other government facilities, making it the perfect pilot.

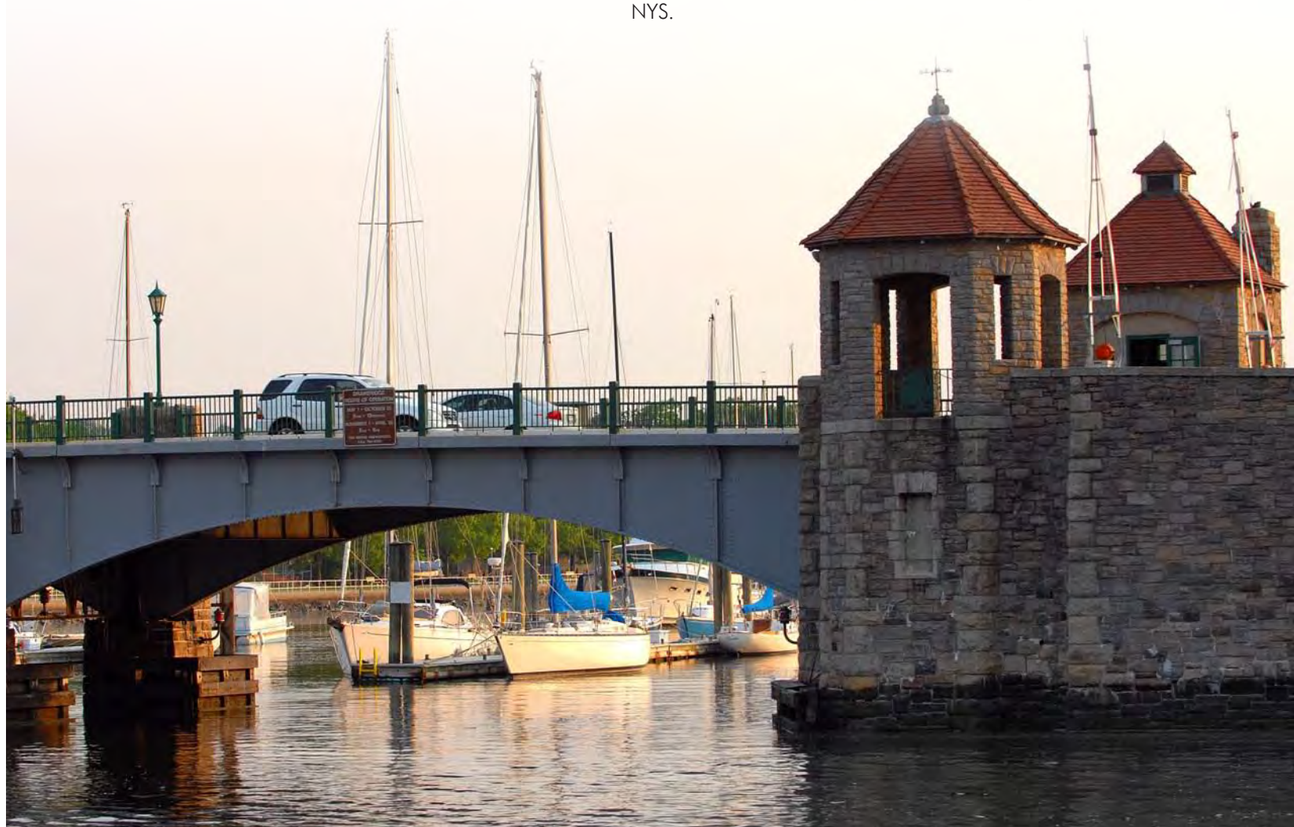
5.5.6 Develop Innovative Project, Financing, and Policy Models

The complexities of the energy sector can make individual leadership and innovation challenging. Despite this reality, the Mid-Hudson Region is home to many innovators who have pushed pilot projects and other concepts to fruition, helping demonstrate the potential to transform the NYS energy economy. These efforts to establish ground-breaking pilots, new approaches to financing, and innovative local and state policies need to be continued, but with broader regional support and sharing. By publicizing results, sharing legal documents and agreements, engineering designs, balance sheets, and more, the Mid-Hudson Region's leaders can spawn widespread transformation of the NYS energy economy.

In parallel with the broader governance strategy developed in this Plan (see Chapter 10), a regional center and repository for energy innovation should be established as part of a regional sustainability center or CED. The purpose of the center would be to share lessons learned from:

- Regional CED pilots
- Micro-grid pilots
- Energy efficiency programs such as EnergizeNY
- Innovations from outside of NYS:
  - Crowd-sourced financing for renewables
  - District-scale utilities
  - Demand response for small and medium consumers
  - Community Choice Aggregation
  - Energy Efficiency Certificates
  - Feed-In Tariffs

The goal of the center would be to reduce barriers to project implementation and to help establish the business and policy case for enabling policy mechanisms that have transformative potential for the Region and NYS.



6 Materials Management

How our society uses materials has a fundamental effect on the economy and the environment. Inefficient and wasteful use of materials not only challenges the capacity of the earth—air, water, land, minerals, and other resources—but also the accessibility and affordability of the materials that we as a society rely on to function.

For the Mid-Hudson Region, our goal is to shift from the status quo, where much of the material used in the Region is shipped to other parts of NYS or the US for disposal, to a future where the Region is self-sufficient in materials management, ultimately achieving a 'zero waste' outcome. Our plan centers on developing regional solutions to maximize the value of materials and extend their useful lifecycle, to:

- Reduce waste generation
- Decrease the impact of materials transportation for disposal/recovery
- Increase reuse, recycling, composting
- Enhance local market creation for improved materials recovery outcomes

To achieve these objectives, we must:

- Expand organics recycling
- Increase material reuse
- Promote product stewardship and Environmentally Preferable Purchasing
- Pilot new technologies
- Implement transportation improvements
- Facilitate inter-county cooperation
- Change policy to improve local management capacity

Materials management seeks to understand how society uses materials in an effort to change behavior, create smart policy, and implement programs to fulfill needs and ensure prosperity while using less material, reducing toxic waste and exposure to hazardous substances, and recovering and reusing or recycling as much of the material consumed as possible.

For the Mid-Hudson Region, the goal is to shift to a future where the Region is largely or completely self-sufficient in materials management, and ultimately achieve a 'zero waste' outcome

The Mid-Hudson Region materials management strategy is intended to be consistent with the vision set by the NYSDEC's sustainable materials management strategy, *Beyond Waste*.[138] The goal is to shift the focus on materials management from 'end of pipe' waste disposal to a more comprehensive perspective that addresses the entire materials lifecycle. For the Mid-Hudson Region, the goal is to shift to a future where the Region is largely or completely self-sufficient in materials management, and ultimately achieve a 'zero waste' outcome (see callout box). This requires a significant reduction in the quantity of waste generated as well as the introduction of new management solutions.

Zero Waste

The heart of sustainable materials and waste management lies in the concept of Zero Waste. As defined by the Zero Waste International Alliance: "Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use."

6.1 Baseline Conditions

6.1.1 Materials Management Roles and Responsibilities

Responsibility for materials management is shared by multiple parties. The role of NYS is to provide oversight and assistance to local municipalities so that they may adhere to their solid waste management obligations as directed under NYS law. New York State itself operates under a framework of federal guidance, which sets regulations and establishes guidelines governing activity in the sector to ensure some degree of national consistency.[139] New York State accomplishes its objectives through the NYS Solid Waste Management Plan, funding, permitting, and approval of local plans and facility applications.

In the Mid-Hudson Region, each county serves as a formal Solid Waste Management Planning Unit, providing oversight, guidance, and in some cases running facilities and other infrastructure and services.

Local municipalities are traditionally responsible for implementation of materials management programs. Activities are typically run directly by local government or via contract with third-parties. In some cases a public authority is established to implement materials and solid waste management within a political or geographic area. Efforts to address materials management on a regional level are ongoing as exemplified by the Hudson Valley Regional Council (HVRC). The HVRC has a Solid Waste Committee consisting of solid waste professionals from all seven counties. Information about the Committee and its activities can be found on the HVRC website.[140]

The materials management landscape is complex due to the mix of both public and private-sector actors, as well as inter-county and inter-regional export and import of materials, making it difficult to speak in general terms about the Region. Data and trends collected from state and local actors are presented below.

6.1.2 Material Definitions and Flows

As defined by the NYSDEC in Beyond Waste, and for the purposes of this Plan, municipal solid waste (MSW) includes "materials generated by the residential, commercial and institutional sectors." Other material streams such as industrial (by-products of factories, mills, mines, etc.), construction and demolition (C & D—debris generated during the construction and demolition of buildings and infrastructure), and biosolids (residual, semi-solid material left from industrial wastewater or sewage treatment processes) are not considered MSW in this Plan. Regional solid waste types discussed in this Plan are described in greater detail in Table 6.1; please note that this is not a comprehensive list of every type of solid waste.

Obtaining county level information on materials streams other than MSW is difficult due to the multiplicity of private actors and the (sometimes) limited monitoring capacity and regulation at the county level. For those reasons statewide estimates from the NYSDEC are used for benchmarking and comparative purposes. Table 6.2 presents NYS' 2008 solid waste stream quantities broken down by method of disposal. As shown in Table 6.2, the largest material stream in

[138] NYSDEC, 2010. Beyond Waste. http://www.dec.ny.gov/chemical/41831.html
[139] US EPA, 2013. Wastes Laws and Regulations (http://www.epa.gov/epawaste/laws-regs/index.htm)
[140] Hudson Valley Regional Council: www.hudsonvalleyregionalcouncil.org

Table 6.1 Regional Solid Waste Types

Waste Types	Description	Typical Method of Collection	Destination
Asbestos	Any, material, object, product or debris that contains asbestos	◆ Private	◆ Landfill—Out of Region
Biosolids	Stabilized organic solids derived from wastewater treatment processes	◆ Municipal ◆ Private	◆ Landfill—Out of Region ◆ Incineration ◆ Reuse Application
C & D	The solid inert component of the waste stream arising from the construction, demolition or refurbishment of buildings or infrastructure	◆ Private	◆ Landfill—Out of Region ◆ Materials Recovery Facility
Hazardous	Any unwanted or discarded material (excluding radioactive material), which because of its physical, chemical or infectious characteristics can cause significant hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed	◆ Private	◆ Landfill—Out of Region
Industrial	Waste stream arising from commercial, industrial, government, public or domestic premises (not collected as Municipal Solid Waste), but does not contain Listed Waste, Hazardous Waste or Radioactive Waste	◆ Municipal ◆ Private	◆ Landfill—Out of Region ◆ Incineration ◆ Materials Recovery Facility
MSW	Waste and recyclable materials stream arising from domestic premises including items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, batteries.	◆ Municipal ◆ Private	◆ Landfill—Out of Region ◆ Incineration ◆ Materials Recovery Facility
MSW-Green and Yard Waste	Subset of MSW; biodegradable waste including landscape debris (grass clippings, autumn leaves, hedge trimmings, woody debris, etc.) as well as domestic and commercial food waste.	◆ Municipal ◆ Private	◆ Materials Recovery and Composting Facility ◆ Left in place or composted on site ◆ Landfill—Out of Region
MSW-Pharmaceutical Waste	Subset of MSW; includes expired, unused, spilt, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer required and need to be disposed of appropriately. The category also includes discarded items used in the handling of pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubing, and drug vials.	◆ Municipal ◆ Private	◆ Landfill—Out of Region ◆ Incineration
Universal/ Household Hazardous Waste (HHW)	Subset of MSW and hazardous waste; which includes widely generated materials such as paints, batteries, pesticides, mercury-containing equipment, and bulbs (lamps)	◆ Municipal ◆ Private	◆ Landfill—Out of Region ◆ Materials Recovery Facility

Table 6.2 Materials and Waste Management in NYS, 2008

	MSW		Industrial		C & D		Biosolids		Total	
	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%
Recycle/ Compost	3.7	20	1.4	39	7.2	55	0.9	47	13.1	36
Landfill	6.0	33	2.1	60	4.1	32	0.3	17	12.5	34
Combustion	2.5	14	<0.1	1	<0.1	0	0.4	24	3.0	8
Export for Disposal	6.1	33	<0.1	0	1.7	13	0.2	12	8.0	22
Total	**18.3**	**100**	**3.5**	**100**	**13.0**	**100**	**1.8**	**100**	**36.6**	**100**

Source: NYSDEC, 2010. Beyond Waste.

NYS is MSW, which makes up 50 percent of the total and of which 20 percent is recycled. The second largest stream is C & D waste, at 36 percent of the total, 55 percent of which is recycled. It is assumed that the Mid-Hudson Region has a similar profile; however, data availability is limited, particularly for non-MSW materials.

It should be noted that combustion rates are likely higher for the Mid-Hudson Region due to the fact that two of the seven counties (Westchester and Dutchess, accounting for 54 percent of the population) combust a large proportion of their MSW.

As shown in Table 6.3, estimates based on 2009 Planning Unit Annual Recycling Reports show that the Region overall is generating less waste per capita and recycling a greater percentage of its materials compared with NYS. With moderate effort, the Region can likely perform far better than the NYS average. However, to meet the NYSDEC's Beyond Waste goals of 1.7 pounds/person/day by 2020, and this Plan's MSW recycling rate goal of 50 percent, the Region will require a 54 percent reduction in per capita disposal and an 8 percent increase in the recycling rate. This will require significant collaboration among the Mid-Hudson counties.

Please note that large variations between reported county values shown in Table 6.3 may in part be due to discrepancies in how the counties define and measure MSW generation and recycling rate. Furthermore, materials that are generated outside of the Region but brought to a Mid-Hudson facility may cause inflated values—such as in Rockland County which has a service area that extends into NJ and other counties in NYS.

Materials Accounting

Each County has a very precise measure of the waste that they directly manage (and weigh). This waste includes municipal solid waste as well as portions of many other waste streams. Annually, each County is required to send a report to the NYSDEC documenting waste disposed and waste diverted at planning unit facilities. Unfortunately, these reports do not provide a clear and consistent picture of all activity in the County, as not all waste is managed directly by the planning unit.

For example, based on their 2009 NYSDEC report, Sullivan County's reported percent of material recycled is 10 percent. Sullivan County only included the quantity of materials handled at County management facilities in this report. If private sources and haulers are taken into account, then the percent of the waste stream diverted from landfills in Sullivan County is more likely around 38 percent. This figure is estimated based on discussions with private haulers, large commercial facilities, and other information collected by the County. This latter value (38 percent) is used in the County's Long-term Solid Waste Management Plan since it is more indicative of recycling behavior across the entire County, rather than simply reflecting the subset of material handled directly by the County itself.

Flow Control

Flow control refers to the ability of local governments to mandate, through laws or other regulations that all locally-generated solid waste be delivered to designated facilities. This concept of the diversion of municipal solid waste (MSW) to certain designated areas can be an effective tool to promote environmental benefits on a regional and local basis by cleanly disposing of its non-recyclable trash without threatening recycling or 'zero-waste' efforts.

Flow control regulation is both a complex and hotly contested constitutional issue. Under the Commerce Clause of the United States Constitution, Congress was granted the power to regulate commerce among the states— i.e., the power to regulate interstate commerce. And while the clause contains no language that prohibits states from enacting laws that regulate interstate commerce, the United States Supreme Court has long held that the Commerce Clause contains just such a "negative" command; a command rooted in the Supremacy Clause— i.e., in the understanding that where Congress' power is absolute, conflicting state regulation must give way to that power. Because flow control arguably regulates products moving in interstate commerce, a debate has raged on as to whether local flow control regulations violate the Commerce Clause.

To date, the United States Supreme Court has only addressed the issue twice: first, in the matter of C&A Carbone, Inc. v. Town of Clarkstown, 511 U.S. 383 (1994), where it invalidated Clarkstown's Flow Control regulations on the grounds that it was motivated by local economic protectionism and gave a competitive advantage to local private business at the expense of out-of-state business; and then again, thirteen years later, in United Haulers Association, Inc. v. Oneida-Herkimer Solid Waste Management Authority, 550 U.S. 330 (2007), where it seemingly switched course and upheld a flow control law on the grounds that the challenged regulations favored only local government and not local private business. While, in many ways, Carbone and United Haulers raised more questions than answers with respect to the underlying constitutional issue, the basic principle borne from the cases is that local regulation that requires all MSW to be delivered to a privately owned facility is unconstitutional. Thus, a municipality could not, for example, enact a law that required its residents and businesses to take all waste to a privately owned facility. Nevertheless, the constitutionality of flow control regulations that require the delivery of MSW to publicly owned facilities has been upheld.

Table 6.3 Regional Statistics

Location	Population[1]	Per Capita MSW Disposal Rate[2] (lb/person/day)	Recycling Rate[3] (Percentage)
Dutchess[4]	297,488	2.8	29
Orange[5]	372,813	3.8	38
Putnam[6]	99,710	3.3	29
Rockland[7]	311,687	5.6	34
Sullivan[8]	77,547	3.1	38
Ulster[9]	182,493	4.8	41
Westchester[10]	949,113	3.2	52
Region[11]	**2,290,851**	**3.7**	**42**
NYS[12]	19,378,102	4.1	35

[1] Source: NYS Data Center; 2010 Census
[2] Note/Source: Per Capita MSW Disposal Rate excluded recycled and C & D materials. All values, with exception of Putnam county (see note 6) are from 2009 Planning Unit Recycling Reports submitted to NYSDEC.
[3] Note: Recycling Rate is the proportion of MSW diverted from a landfill or incineration. It excludes C & D, miscellaneous waste (textiles, electronics, tires, etc.), biosolids, and metal reported by automobile dismantlers, junkyards and scrap metal processors.
[4] Source: Recycling Rate - Dutchess County Draft LSWMP 2012
[5] Source: Recycling Rate - Orange County LSWMP 2010
[6] Note/Source: Disposal Rate - Materials collected in Putnam County are hauled to transfer stations outside of the county by private haulers; therefore there is currently no reliable disposal and recycling data. Putnam disposal rate value presented in this table is an estimate generated using the average disposal rates of the surrounding Mid-Hudson counties. Recycling Rate - Putnam County 2010 Materials Generation and Recovery Data provided by Planning Unit
[7] Source: Recycling Rate - Rockland County 2011 LSWMP
[8] Source: Recycling Rate - Personal communication from Sullivan County Recycling Unit on December 6, 2012
[9] Source: Recycling Rate - Ulster County 2009 report data (http://www.ucrra.org/recycling/graphstats.htm)
[10] Source: Recycling Rate - Westchester County 2011 Annual Report
[11] Note: Weighted average based on county populations.
[12] Source: NYSDEC, 2010. Beyond Waste Plan. Pg. 93

6.1.3 Common Sustainability Challenges in the Region

Each of the seven Mid-Hudson counties has identified challenges to meeting statewide goals for sustainable materials management. The challenges have been categorized into the six broad themes described below.

Organic Materials Management

The southern more urbanized counties have disproportionately large organic components in their solid waste streams due to disposal of yard waste. For example, Westchester County estimates that up to 29 percent of their waste stream comprises organic yard waste.

Organics management can be improved by first reducing the amount of organic material that is sent to the curb for collection and disposal. This can be accomplished by composting or reusing yard debris and other organic material on-site.

After collection, organics management can be improved through recycling or composting of the material at a central or larger-scale facility. Removing organics from the waste stream (either at the source or after collection) has multiple benefits such as reducing the volume of waste to be landfilled and reducing GHG emissions from transport of waste and anaerobic decomposition at landfills. Other organics, such as food scraps and biosolids from wastewater treatment plants also make up a large proportion of the regional waste stream. Often organics are sent to landfills or incinerated; however, there are existing municipal organics composting programs in the Region such as those operated by Westchester County (estimated to collect and compost nearly two-thirds of yard waste disposed), the Rockland County Solid Waste Management Authority (RCSWMA), and the Ulster County Resource Recovery Agency (UCRRA), which can be used as model programs that can be expanded or replicated to improve organics recovery regionally.

Transport and Disposal (T & D) Costs

With no operating landfills in the Region, all landfill-destined waste is exported as either solid waste or as incinerated residual ash. Export requires moving huge volumes of material long distances, which results in significant GHG emissions and air pollution. Every ton of MSW and C & D material that is reduced, reused, recycled, repaired or composted locally will represent a reduction in the environmental and fiscal impact of T & D. The cost of export represents a large portion of community operating budgets and continues to rise. For example, in Ulster County, T & D costs have increased by 12 percent from 2009 through 2011 (from $51/ton to $57/ton).[141] According to the UCRRA, the increase in T & D costs was primarily attributed to rising fuel costs which varied between $8 and $13 per ton during that time period, whereas all other major cost factors such as hauler fees and landfill disposal fees stayed roughly the same.

With no operating landfills in the Region, all landfill-destined waste is exported as either solid waste or as incinerated residual ash. Export requires moving huge volumes of material long distances, which results in significant GHG emissions and air pollution.

Regulatory Enforcement

There are multiple municipal and state laws mandating the separation of materials and prohibiting the disposal of recyclables in MSW and C & D waste streams; however, as summarized in *Beyond Waste:* "Although most municipalities did adopt the requisite local source separation laws or ordinances before the statutory deadline of September 1992, in some cases, local laws still lack fundamental and important provisions such as requiring source separation in all generating sectors and providing for enforcement. In many cases where the laws include enforcement provisions, municipalities have not effectively used them, particularly for commercial and institutional generators."

Westchester County, which has the highest recycling rate in the Region (52 percent), attributes much of its success to its recycling enforcement program which was instituted in 2008, the first enforcement program of its kind in NYS. This exemplifies the opportunity to take successful locally-implemented programs and replicate them throughout the Region to meet materials management objectives.

Post-Consumer Product Market

Many materials can be reused or reprocessed into useful products; however, the development of a viable, large-scale market for these materials continues to remain a challenge at all levels. Inter-county coordination may be able to help improve the Region's access to post-consumer markets, by allowing for the aggregation of materials streams among other benefits.

Programmatic Funding

Many counties lack the necessary funding to support staff or make the capital investment to initiate more effective materials management programs.

Data Collection and Management

Inconsistent definitions, tracking mechanisms, reporting, and data management render materials accounting very difficult. While individual counties may have good programs—for example, Westchester and Rockland County have very robust material accounting systems—the different approaches used by each individual county makes regional-scale reporting and tracking difficult.

The challenges identified by county staff and other stakeholders are summarized in Table 6.4. Note that this is not an exhaustive listing.

[141] UCRRA, 2012. Personal communication.

Table 6.4 Regional Challenges

Location	Organic Materials Management	T & D Cost	Flow Control	Regulatory Enforcement	Post-Consumer Product Market	Programmatic Funding	Data Collection and Management
Dutchess		✖	✖	✖			Regional Challenge
Orange				✖			
Putnam	✖		✖	✖			
Rockland	✖	✖			✖		
Sullivan				✖		✖	
Ulster		✖	✖			—	
Westchester		—					

✖ Directly Identified as a challenge by County staff — Identified as a challenge by County stakeholders

Table 6.4 helps identify which challenges, if addressed, could bring the greatest benefit to the Region as a whole. The two most commonly cited challenges were regulatory enforcement and T & D cost, which are directly reflected in the objectives noted in Section 6.3.

6.1.4 Regional and County Infrastructure

The Mid-Hudson Region has no active public landfill. However, there are numerous private and public facilities used to manage materials in the Region, including recyclables handling and recovery facilities (RHRFs) and materials recovery facilities (MRFs), resource recovery facilities (RRFs—also known as a waste-to-energy plants), composting facilities, and transfer stations. Closed landfills are also important as the maintenance, monitoring, and in some cases remediation continue to be a cost and environmental burden for many counties.

> As a regional best practice example, Rockland County operates a HHW collection facility available to the public five days a week and alternately on Saturdays and Sundays. This level of service is uncommon in NYS, and is exemplary for the Region.

6.1.5 Universal Waste, Household Hazardous Waste, and Pharmaceutical Waste Management

Universal waste, HHW, and pharmaceutical waste pose significant environmental and public health threats when improperly managed.

NYS legislation provides standards and regulations for the handling, transport and disposal of universal waste generated by institutions and commercial facilities. Generators are required to ensure the proper handling, transportation and disposal of universal waste. In many cases, institutions will contract with an independent commercial hauler for universal waste collection and disposal.

To address the potential hazards posed by HHW, communities in the Region have organized programs to collect, package and transport HHW to hazardous waste treatment, storage, recycling or disposal facilities. HHW programs reduce environmental threats by providing a collection and management system, informing residents about how to properly manage HHW and, most important, how to avoid using hazardous products at home. As a regional best practice example, Rockland County operates a HHW collection facility available to the public five days a week and alternately on Saturdays and Sundays. This level of service is uncommon in NYS, and is exemplary for the Region.

For pharmaceutical waste, some communities and pharmacies in the Mid-Hudson Region and across NYS have voluntarily established take back programs for unused and unwanted pharmaceuticals. Some communities and counties, such as Rockland County, have included pharmaceuticals in their HHW collection events, while pharmacies and certain other communities have established stand-alone pharmaceutical take back events.

As pointed out in Beyond Waste, these HHW and pharmaceutical programs have been very successful and popular with New Yorkers; however they are also expensive—thus limiting their public reach and frequency. For these reasons, pharmaceuticals and the products that become HHW become key targets for product stewardship.

6.1.6 Environmental Justice Considerations

Materials management has historically been at the heart of the EJ debate. Public concern over the injustice of siting landfills and hazardous waste facilities in areas with disproportionately high populations of low-income or minority residents led to the rise of the EJ movement.[142] While at present there are no active landfills in the Region, other waste management facilities, hazardous materials storage facilities, and infrastructure can present a risk to surrounding communities. For example, while waste-to-energy facilities meet or exceed the strictest federal standards set by the US EPA and employ strict pollution controls to achieve superior environmental performance, there is still a GHG impact, and transfer stations and material recovery facilities can generate noise, odors, and high volumes of truck traffic.[143]

The Plan seeks to address these issues foremost by reducing overall waste volumes. However, the Region's ultimate materials management goal—to eliminate the export of material for disposal—will require the development of new infrastructure, including organics management facilities. These facilities need to be sited in a way that takes EJ into consideration.

6.2 Climate Change and Materials Management

6.2.1 GHG Emissions

According to the NYSDEC, there are no active MSW landfills in the Mid-Hudson Region as of December 30, 2011.[144] However, landfills may still emit GHGs for several decades after closure because as organic matter decays it produces methane (CH4). Closed landfill facilities in the Region include Al Turi Landfill & Landfill Gas to Energy Facility and Sullivan County Landfill. Closed landfills in the Region emitted 39,648 MTCO2E in 2010.[145]

In addition to emissions from closed landfills within the Region, waste exported from the Region for landfill disposal also generates GHG emissions. These emissions were calculated based on the volume of waste produced. See Table 6.5 for a breakdown of emissions by county.

Note that emissions from composting are not included. Emissions from the collection and transportation of waste are included in overall transportation emissions (see Chapter 4). Transportation emissions are significant and comprise a major part of T & D cost.

The GHG emissions noted in Table 6.5 should be reviewed with care. For example, Westchester and Dutchess County incinerate much of their solid waste—these emissions are not included in the figures above, but rather in electrical generation emissions noted in Chapter 4. As well, the county-level data used in these calculations derive from a draft version of this Plan. While the net effect on regional totals is minimal (less than 10%) the differences at the county-level are significant. Counties are encouraged to develop their own GHG calculations using best available data and the methods described in *Attachment 1*. County-level inventories should also seek to evaluate T & D and incineration emissions independent of the larger regional inventory.

Table 6.5 Landfill GHG Emissions by County

Location	MSW CH_4 Emissions (MTCO2e)	C & D CH_4 Emissions (MTCO2e)	Total CH_4 Emissions (MTCO2e)	Percent of Total
Dutchess	22,657	227	22,883	7%
Orange	104,404	1,728	106,133	30%
Putnam	7,609	—	7,609	2%
Rockland	88,824	8,066	96,890	28%
Sullivan	24,497	932	25,430	7%
Ulster	32,368	3,835	36,203	10%
Westchester	44,014	11,044	55,057	16%
Region	**324,372**	**25,832**	**350,204**	**100%**

Source: Attachment I: Regional GHG Inventory

[142]NRDC, 2013. The Environmental Justice Movement. http://www.nrdc.org/ej/history/hej.asp
[143]NSWMA, 2013. Managing Solid Waste Facilities to Prevent Odor. http://www.environmentalistseveryday.org/docs/Odor-Report.pdf
[144]NYSDEC, 2011. Active Municipal Solid Waste Landfills. http://www.dec.ny.gov/docs/materials_minerals_pdf/mswlist.pdf
[145]See Attachment I: Regional GHG Inventory

Table 6.6 Materials Management-related Climate Effects in the Mid-Hudson Region

Asset	Climate Impact	Climate Effect	Description
Collection Infrastructure	Flooding and Storm events	Increased debris	The volume of solid waste substantially increases after natural disasters, which stresses existing solid waste facilities. Debris resulting from flooding and storm events can also be hazardous, complicating the disposal of post-storm/ flooding debris. Vegetative debris can accumulate in streams and catch basins thereby exacerbating localized flooding. The volumes can be so significant that they persist for many months after a storm.
	Flooding; Sea level rise; Storm events	Disruption to transportation/ collection	Transportation infrastructure damage caused by climate change effects can impede solid waste collection procedures. This can include downed power lines, which block roads. Fuel shortages can also impact collection.
Processing/ Disposal/ Storage Facilities	Flooding; Sea level rise; Storm events	Damage to solid waste storage facilities and waste-to-energy plants	Some solid waste storage facilities including landfills and industrial storage areas are located along rivers and in other low-lying areas that may be vulnerable to flooding, sea level rise, and storm surge. If damaged, these types of facilities have the potential to release contamination thereby affecting nearby ecosystems, residents, and businesses. If these facilities rely on electricity to function, their operations can be disrupted due to power outages.
	Increasing average temperature; decreasing snowfall	Improved anaerobic processes	Certain management options such as composting and bio-digesters may experience an increase in waste processing efficiency as a result of increased ambient temperatures and reduced snowfall.

6.2.2 Climate Vulnerability

Materials management infrastructure and processing, disposal, and storage facilities may be subject to various impacts due to climate change. Table 6.6 summarizes some of the impacts and effects on the Mid-Hudson Region's materials management systems and facilities.

Debris Management

Natural hazards that occur in the Northeast have the potential to produce large amounts of debris. Past disasters in the US have generated debris volumes equivalent to 5 to 15 times the annual waste generation of the affected communities.[146;147] Existing materials management facilities often become overwhelmed with debris proposed for recycling, incineration, composting, or disposal. While individual counties have debris management plans in place, there is an opportunity to increase regional-scale coordination. Table 6.7 details the types of debris and challenges presented by various natural disasters.

Additionally, natural disasters can impact hazardous material storage facilities, releasing oil and other hazardous materials into the natural environment. The hazardous materials can contaminate debris, complicating disposal efforts.

A large portion of disaster debris consists of vegetative matter. Fallen trees have the potential to disrupt transportation and leave residents without power. For example, the total number of tree crews required to clear tree debris in Orange and Rockland counties following Hurricane Irene and Tropical Storm Lee ranged between 25 and 70 per day over an eight day period.[148] These figures are certain to be exceeded by Hurricane Sandy. The quantity of tree crews deployed in all of NYS by electric utilities following Hurricane Irene and Tropical Storm Lee in 2011 is shown in Figure 6.1.[149]

[146]Brown, C., M. Milke, and E. Seville, 2011. Disaster Waste Management: A Review Article.

[147]US EPA, 2008. Planning for Natural Disaster Debris.

[148]Orange and Rockland Utilities, Inc., 2011. Report on Preparation and System Restoration Performance for Hurricane Irene August 28, 2011 through September 3, 2011 and Tropical Storm Lee September 5, 2011 through September 8, 2011.

Table 6.7 Summary of Debris Types and Challenges of Natural Disasters

Natural Disaster	Example of Debris	Challenges Faced
Hurricanes	C & D materials, damaged automobiles and boats, furniture, fallen trees, sediments, hazardous materials, and other debris	Hurricanes can result in large amounts of vegetative debris, which is usually the most voluminous debris stream. Hurricanes also leave behind large amounts of displaced sediments.
Tornadoes	C & D materials, automobiles, vegetative debris, furniture, hazardous materials, and other materials	Tornadoes inflict damage on structures and infrastructure resulting in projectile materials.
Floods	Personal property, C & D debris, damaged automobiles, trees, sediments, hazardous materials, and sandbags	Floods can destroy roads and bridges, impacting a community's ability to clean up debris. People must dispose of large amounts of food-damaged household items.
Wildfires	Ash, charred wood waste, mixed metals, C & D materials, hazardous materials, and damaged personal property	Wildfires typically leave less debris than other types of disasters, but the remaining debris is often mixed together. Loss of groundcover can lead to mud slides.
Winter Storms	Vegetative debris, C & D debris	Heavy snow and ice can cause many broken trees and branches, and the collapse of roof structures. Icy roads can impede debris removal.

Source: US EPA, 2008. Planning for Natural Disaster Debris.

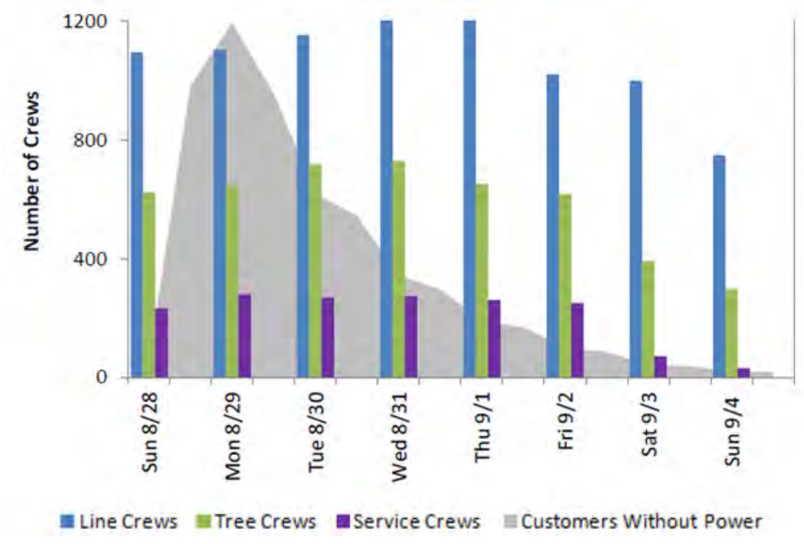


Figure 6.1 Number of Crews Deployed in NYS Following Hurricane Irene and Tropical Storm Lee

Materials Management Facilities

Flooding can cause damage to infrastructure such as landfills, industrial storage areas, and agricultural waste retention ponds. The resulting damaged facilities have "significant potential to contaminate floodwaters with petroleum and other noxious substances, causing odors and pathways for disease and affecting nearby ecosystems, residents and businesses".[150] Additionally, this can render non-hazardous materials hazardous, reducing reuse and recycling efforts while increasing disposal costs.

According to a regional spatial analysis, there are five inactive landfills located in the existing 100-year floodplain and one additional landfill in the projected 2080 floodplain. With sea level rise and increase frequency of extreme weather, these landfills may be vulnerable to further flooding and storm surge impacts.

6.3 Objectives

The Mid-Hudson Region benefits from a well-developed, professionalized materials management system, resulting in recycling rates that exceed the NYS average and a per capita MSW disposal rate below the NYS average. However, the Region is heavily reliant on facilities located in other states or in other parts of NYS for waste disposal, and has much potential for waste minimization and improved materials reuse and recovery. As part of realizing a future where the Region is self-sufficient in materials management, ultimately achieving a 'zero waste' outcome, the Plan includes the following objectives:

> The Mid-Hudson Region benefits from a well-developed, professionalized materials management system, resulting in recycling rates that exceed the NYS average and a per capita MSW disposal rate below the NYS average. However, the Region is heavily reliant on facilities located in other states or in other parts of NYS for waste disposal

MM1: Reduce the Volume of Solid Waste Generated

- Create policies and programs that will reduce the overall amount of waste generated, with the long-term objective of achieving zero waste. Reducing the amount of waste generated will reduce the amount of material disposed, saving money, reducing GHG emissions and fuel use, and avoiding environmental impacts associated with material extraction and processing.

MM2: Increase the Proportion of Material Diverted from Landfills and Incinerators via Reuse, Recycling, Composting, and Other Organic Recycling Methods

- Maximize the useful lifespan of materials and increase recycling rates. This will help reduce the environmental impacts associated with producing new goods and materials. This will also reduce GHG emissions from landfills.
- Reuse and recycle materials locally so that new industries can develop and jobs can be created. The materials management sector has great potential as a source of local jobs.
- Educate the Region's residents to increase reuse and recycling rates.

MM3: Reduce T & D Cost

- Create local or regional management and disposal options. By keeping material local, transportation costs and associated energy use and GHG emissions can be reduced.
- Incentivize regional efforts to achieve reduction goals so that counties combine resources and expertise to solve materials management problems.
- Aggregate waste streams to create a more attractive market for recyclables and compost, generating new revenues.

[149]NYS Department of Public Service, 2012. Utility Performance Report Following Hurricane Irene and Tropical Storm Lee.
[150]Sea Level Rise Task Force, 2010. New York State Sea Level Rise Task Force Report to the Legislature.

6.4 Indicators

Table 6.8 presents a series of sustainability indicators for the materials management focus area. These indicators should be used by planning units, municipalities, and private operators to track performance in achieving the Region's materials management objectives. The data sources and calculations methodologies for each metric can be found in Appendix B.

6.4.1 Metrics and Targets

Table 6.8 Indicator Inventory: Tier 1 Indicators

Objective	Metric	Current Value	Target 2020	Target 2035	Target 2050
MM1: Reduce solid waste generated					
Decrease MSW disposal rate	Per capita MSW disposal (lbs/person/day)	3.7 (2009)	1.7	0.5	0.3
MM2: Increase the proportion of materials diverted					
2a. Increase recycling	Recycling Rate (%)	42 (2011)	50	75	95
2b. Reduce GHG emissions	GHG emissions (MTCO2e)	350,204	Reduce by 20%	Reduce by 50%	Reduce by 80%
MM3: Reduce T & D cost					
	See Tier 2 indicators				

6.4.2 Limitations and Tier 2 Indicators

As discussed in *Beyond Waste*, data collection and subsequent reporting on materials and waste volumes has been a constant challenge in NYS and nationally. Data for the Tier 1 indicators were provided primarily by the individual county planning units or NYSDEC. The level of accuracy of MSW generation and disposal volumes varies per county due to disparities in flow control efforts, management structure and monitoring methods. For the most part, the strongest and most consistent data has been from municipally collected residential materials; the weakest is from planning units dominated by private collection. Known limitations are provided below:

MM1: Per capita MSW disposal rate (lbs/person/day)

- MSW is only a proportion of the total waste stream. Collecting reliable data is difficult for commercially- and institutionally-generated materials and streams such as C & D, biosolids, and industrial waste. This indicator can only be construed as a proxy.
- This indicator can be used as a (poor) proxy for T & D costs, in the sense that less waste disposal results in lower T & D costs.
- MSW generation rates, and therefore disposal rates, are susceptible to outside factors such as the state of the economy and regional population trends.

MM2: Recycling Rate (%)

- As noted by the planning units, variation exists in how each unit defines which materials streams are included in the recycling rate, such as C & D materials, compost, etc.
- The recycling rate does not account for materials that are reused or recycled via informal methods such as thrift stores, internet exchange sites, and building material reuse centers. Nevertheless such informal methods are significant and critical to the sustainability of the materials management sector.

MM2: GHG Emissions

- GHG emissions data have significant limitations, as noted earlier in the Chapter.

MM3: T & D Costs

- Data were not provided by all Planning Units.

To enhance the monitoring and evaluation of the goals and indicators set forth by this plan, local planners could benefit from county-level data such as those listed in Table 6.9.

Table 6.9 Tier 2 Indicators

Objective	Metric
MM1	Tons of annual solid waste (MSW + Biosolids + Industrial + Commercial + C & D) generation by county
MM2	Proportion of total waste salvaged/ reused (by waste type)
MM2	Ash generation by county
MM3	Annual T & D cost per ton
MM3	Total energy consumption associated with T & D
MM3	Proportion of MSW exported from the Region

6.5 Initiatives for Implementation

Meeting the Region's materials management objectives will require a lifecycle perspective that seeks to reduce waste before it is created, use materials with minimal environmental and health impacts, maximize the effective life of products through careful maintenance and reuse, recycle waste into new materials and products, and ensure the environmentally responsible disposal of any waste streams created.

A comprehensive series of initiatives has been proposed (see Table 6.10) and is described in detail in Section 6.5. A preliminary ranking was completed to establish priority. High priority initiatives are those that impact multiple Plan focus areas while also scoring well against other prioritization criteria described in Chapter 3. Medium priority initiatives are those that do not have as broad an impact or score as highly.

Wherever possible, example projects or case studies have been given that typify the efforts needed to achieve the Plan's objectives. Note that examples provided are not intended to be comprehensive, but are simply ideas submitted during the planning process with sufficient information to illustrate the concepts being proposed. A List of Project Ideas containing all ideas submitted during the planning process can be found in Appendix C. Additional Resources to help individuals, local governments, or organizations with implementation can be found in Appendix D.

In Chapter 9, a series of strategic priorities for the Region are described, drawing from recommendations that arose in discussion among multiple Working Groups. These strategic priorities necessarily include initiatives that impact the Materials Management focus area.

Table 6.10 Initiatives for Implementation

	MM1: Reduce Waste Generated	MM2: Increase Waste Diversion	MM3: Reduce T & D Costs
High-Priority Initiatives			
Expand organics recycling	✖	✖	✖
Increase material reuse		✖	✖
Medium-Priority Initiatives			
Promote product stewardship and Environmentally Preferable Purchasing	✖	✖	✖
Pilot new technologies		✖	✖
Implement transportation improvements			✖
Facilitate inter-county cooperation	✖	✖	✖
Change policy to improve local management capacity	✖	✖	✖

6.5.1 Expand Organics Recycling

Organics recycling seeks to prevent introduction of or remove organics from the waste stream and reprocess the material for beneficial reuse. Projects can include efforts to encourage small-scale composting, in situ organics management, or larger-scale county or regional composting schemes. At present, infrastructure for recycling plastics, metal, glass, and paper/cardboard are relatively well-developed in the Region. Expanding organics recycling infrastructure will increase the proportion of the Region's waste that can be diverted, and in some cases can help create a valuable and much-needed soil amendment. To be successful, recycling programs need to be paired with robust education and outreach initiatives.

> Expanding organics recycling infrastructure will increase the proportion of the Region's waste that can be diverted, and in some cases can help create a valuable and much-needed soil amendment. To be successful, recycling programs need to be paired with robust education and outreach initiatives.

Example Projects

Onsite Organics Recycling

A program developed in Westchester County called *Love 'Em and Leave 'Em* (LELE) has the potential to significantly reduce costs, energy use, and GHG emissions due to grass and leaf removal. LELE promotes mulch mowing of leaves and grass which can eliminate or significantly reduce the need to collect and dispose of these materials. It also allows for *in situ* decomposition, which provides multiple benefits including reducing the need for fertilization.

LELE has existing public outreach material, growing 'brand' recognition, an established landscaper training program, 'How To' videos on its website and on YouTube, and a well-developed toolkit of resources that can be adapted by other groups and municipalities. To implement this project, an additional 'train the trainers' component would be developed. This more extensive training program, to be conducted in locations throughout the Region, would train key persons in the concepts and methods of onsite mulching, enabling them to provide a local program of trainings and demonstrations, promoting the LELE initiative.

Organics Recovery Facility

UCRRA is currently piloting an organics recovery facility to remove food and yard material from the waste stream and convert it into compost to be sold for use as an agricultural soil amendment. This project will evaluate the feasibility of expanding the operations of the facility to serve larger parts of the Mid-Hudson Region.

Regional Composting Opportunities at NYS Correctional Facilities

The NYS Department of Corrections operates organics composting programs at some prisons in the Mid-Hudson Region. Previously, farms were also operated at prisons. These farms produced milk, meat, and agricultural products either for direct consumption by inmates or for community groups in support of sustainable agriculture. Composting at prisons save resources by managing materials on site using low-cost inmate labor on abundant open space away from people. This project proposes expanding existing on-site prison composting operations to accept community-generated organic waste.

Alternative Fuel Generation Project

This initiative would begin with a feasibility study to investigate siting a pilot co-generation facility for anaerobic bio-digestion to process food and yard waste into compost, while producing renewable natural gas. The study will identify the best sites and GHG reduction potential of compressed natural gas (CNG) fueling stations. The study would examine the cost-benefits, infrastructure availability, delivery systems, market, economic values, and environmental values and help determine a plan for replicating the bio-digestion facilities and CNG fueling system throughout the Region.

Increasing Regional Household Composting Rates through Training, Education, and Outreach

The regional network of Cornell Cooperative Extension (CCE) associations is proposing to implement a household composting assessment and outreach project for the Mid-Hudson Region. CCE will first assess the level of knowledge about composting methods and habits of Mid-Hudson Valley residents, and identify barriers to composting through a social science survey. Working with the Cornell Waste Management Institute and county waste coordinators, CCE will then recommend various policy options to increase composting rates, and develop targeted training for residents. CCE will also provide training through its Master Gardener Program, and develop a new master Composter Program. This project will improve composting rates and reduce the use of energy to haul or incinerate biodegradable waste. This project can be replicated throughout NYS through close collaboration with Cornell University and regional Extension networks.

The rapid spread of invasive species, particularly the Emerald Ash Borer, may impact the way organic waste (in particular woody waste) is managed in the Mid-Hudson Region. Currently, Orange and Ulster counties are in the NYSDEC Emerald Ash Borer quarantine zone. This restricts "the movement of ash logs or wood (such as tree trimmings), ash nursery stock and all firewood out of the respective counties, unless done under a Compliance Agreement from NYS Department of Agriculture and Markets." This demonstrates the need to develop local markets and disposal/reuse facilities for woody biomass and other organic waste within the Region.

6.5.2 Increase Material Reuse

Projects are needed to reduce the volume of waste sent to landfills by facilitating the valued reuse of materials. These can include commercial or non-profit initiatives to reuse building materials and other products. Existing initiatives include the New Paltz Reuse Center, PC Renew in Rockland County, and more. Development

Case Study: Zero Waste Events

A stellar example of a Zero Waste event is Clearwater's Great Hudson River Revival, an annual two day music and environmental event held in Westchester County's Croton Point Park attended by approximately 15,000 attendees. For the past three years, The Clearwater Festival has collected and delivered compostable materials to commercial compost facilities, diverting it from Westchester County's waste stream. For 2012, there was a team of 92 volunteers who staffed 16 Zero Waste stations throughout the Festival educating attendees on which bin to deposit their materials: Compostables, Recyclables or To-Be-Trashed. Zero Waste stations were in public areas, behind the scene vendor areas and performer hospitality areas. At the end of the event, recyclables and residual materials were processed by the Westchester County system while over 5 tons of biodegradable materials were composted by WeCare Organics on behalf of RCSWMA.

The next step is to work with urban planners to incorporate the Zero Waste concept into the urban streetscape by making recycling and composting available in the Region's urban centers.

Education and Outreach: A Key to Sustainable Materials Management

A key to achieving the Plan's objectives is educating and informing the public about the critical role they can play in improving materials management outcomes. Behavioral and organizational change is critical to this Plan's success. Education and outreach initiatives should seek to:

Inform individuals and organizations about opportunities to recycle, reuse materials, prevent waste, etc.

Educate individuals and organizations about how to recycle, what can be recycled, how to compost, etc.

Promote the benefits of sustainable materials management, including the potential to create jobs, lower costs, and reduce environmental impacts

Encourage individuals and organizations to rethink their purchasing practices and to seek materials with lower life-cycle impacts, less packaging, or that meet other environmental criteria

In addition to general education and outreach programs, specialized training programs can be useful in creating knowledgeable experts who can implement sustainable materials management practices at a larger scale. An example is the Master Composter/Recyclers program in Westchester County, run by the Sheldrake Environmental Center in Larchmont. More on this topic can be found in Chapter 9.

of new infrastructure and programs needs to be paired with targeted education and outreach and/or legislation to ensure success.

Example Project

Building Material Reuse Facility

A Building Material Reuse Facility (B-MRF) has been proposed to facilitate reuse of building materials and reduce C & D debris exported to landfills. The facility would receive materials primarily from contractors that are rehabilitating or demolishing structures, although they would be open to the public. The B-MRF facility would capitalize on the emerging trend of 'deconstruction', which is a process of dismantling buildings in a manner that conserves the function/use of the existing materials, furniture, appliances, etc., thus allowing for their reuse. The B-MRF would target higher-value materials that may be sold and reused and would not focus on materials typically processed and recycled at C & D debris facilities—an existing example is the Build It Green program in NYC.[151]

6.5.3 Promote Product Stewardship and Environmentally Preferable Purchasing

Product Stewardship is "the act of minimizing health, safety, environmental and social impacts, and maximizing economic benefits of a product and its packaging throughout all lifecycle stages. The producer of the product has the greatest ability to minimize adverse impacts, but other stakeholders, such as suppliers, retailers, and consumers, also play a role. Stewardship can be either voluntary or required by law."[152]

Product stewardship initiatives are particularly critical for minimizing the generation and impacts of Universal Waste, HHW, pharmaceutical waste, and other specialized forms of waste. The components of successful product stewardship are essentially threefold: responsible manufacturing, informed consumer purchasing, and effective legislation.

For manufacturers, product stewardship includes the development of products with low toxicity, minimizing the use of disposable packaging, and implementing take-back programs for proper reuse, recycling, or disposal of the product. Take-back programs can make it easier for consumers to properly dispose of materials, including HHW.

Pay-As-You-Throw

As described in Beyond Waste, "more than 400 communities in NYS employ some form of volume-based pricing. These programs charge residents for waste collection and recycling services based on the volume of waste generated. When properly structured, the full system costs (including recycling, composting and waste prevention programs) are included in waste disposal fees, while recycling and composting collections are provided for free. This gives residents an incentive to reduce their waste and recycle more." These properly structured volume-based pricing programs are known as Pay-As-You-Throw (PAYT) programs. PAYT is currently instituted by many communities in the Mid-Hudson Region; however, there is room to expand as illustrated by Ulster County, which estimates that only 20 percent of the population utilizes town transfer stations with the PAYT Program.

[151] Build It Green NYC : http://www.bignyc.org/

For retailers and consumers, product stewardship entails making informed purchasing decisions, based in part by the supplier or product's environmental performance, and ensuring the product is sent to the proper disposal facility. To assist in guiding their decisions, retailers and consumers can use resources like the US EPA's Environmentally Preferable Purchasing (EPP).[153] It is critical that EPP be incorporated into procurement processes, especially for larger entities such as corporations, institutions, and local governments.

The third component of product stewardship comes in the form of legislative policies which limit the production of certain products such as mercury filled thermometers, and mandate take back and proper disposal of material such as electronic waste (e-waste). Efforts in NYS to expand and develop product stewardship legislation are ongoing. The New York Product Stewardship Council (NYPSC) supports efforts to implement product stewardship legislation. More information about NYPSC's activities and initiatives, including relevant legislative actions in NYS, can be found on their website.[154]

Example Projects

Shopping Center/Retail Procurement Initiative

Targeting the numerous large shopping centers within the Mid-Hudson Region, this project seeks to maximize the use of EPP and packaging reduction approaches. The project would include the following phases:

- **Phase 1**: Conduct a feasibility study to identify economic and logistical barriers to EPP and recycling/packaging reduction; evaluate and propose techniques and methods that reduce the use of packaging and increase the use of recyclable materials.
- **Phase 2**: Develop an association/task force/entity to engage shopping centers in a commitment to EPP.
- **Phase 3**: Conduct reporting to assess use of EPP methods among participating centers.

At present, it is unknown who would finance the initial study.

New Forms of Waste Working Group

New industrial activities, new products, and other processes generate increasingly complex materials that can require specialty facilities to manage sustainably. A working group should be established that includes

[152] Product Stewardship Institute. Reducing Economic, Environmental, Health, and Safety Impacts from Consumer Products. http://www.productstewardship.us/displaycommon.cfm?an=1&subarticlenbr=231

[153] EPA. Environmentally Preferable Purchasing. http://www.epa.gov/epp/

[154] The New York Product Stewardship Council: http://www.nypsc.org/

representatives from each Planning Unit, NYSDEC, US EPA, local industry, retailers, and scientists to 'think forward' with regard to the potential for waste to be generated by new technologies and industries. Pollution avoidance is cost avoidance, and as has been experienced with various emerging technologies in the past (e.g., the growth of personal computers and cellphones, fluorescent lights, pharmaceuticals, etc.), the environment and the economy would best be served by anticipating new technologies and planning for cradle-to-grave materials management. There is already significant collaboration amongst these parties—the Hudson Valley Regional Council, NYSDEC Region 3, or US EPA Region 2 could help steer this initiative.

6.5.4 Pilot New Technologies

The materials management sector is rapidly evolving as new technologies come online. The Mid-Hudson Region has many companies actively working to develop, test, and deploy new materials management solutions. Conversion technologies using thermal, hydrolysis, digestion, chemical, and mechanical processes can convert residual waste into fuel and other valuable products. Pilot and demonstration opportunities can help identify and evaluate new solutions while also supporting local business start-ups.

Case Study: Taylor Biomass

Taylor Biomass is in the process of constructing a 21 MW biomass gasification plant in Montgomery, NY. The Montgomery plant will be co-located with Taylor Recycling Facility and will expand the facility's capability to accept wood waste and C&D debris, as well as MSW. The biomass plant will deploy a unique, indirectly heated gasification process. Electricity produced at the plant will be enough to power 23,000 private residences. It is also expected to have $384.4 million economic impact, and provide 82 permanent jobs and 318 temporary construction jobs over the next 18 months. Taylor Biomass signed its initial feedstock agreement with the city of Newburgh, approximately 15 miles from the Montgomery facility. Since then, the company has approached 41 municipalities, including the Port Jervis council. Vice President for Business Development James Rollins estimates the company can save Port Jervis approximately 20 percent of the annual costs of waste disposal, translating to roughly $40,000.

Example Project

New Technology Demonstration Program

In partnership with a local university, this proposal seeks to conduct a new technology demonstration project. The demonstration project would solicit proposals from technology providers to complete a side-by-side trial of new demonstration-scale materials management solutions. This would provide a proving ground for local clean technology start-ups as well as an opportunity to public evaluate the costs and benefits of new technologies for use at a larger-scale in the Mid-Hudson Region.

6.5.5 Implement Transportation Improvements

Transportation improvements address the process of collecting and delivering solid waste. Waste collection requires significant quantities of energy and generates air pollutants including GHGs. Efforts may include optimization of routes and vehicle sizing, modifications to collection frequency, and development of new infrastructure to enable more efficient transportation. In addition to optimizing for efficiency, new infrastructure should be sited with consideration of environmental justice impacts.

Example Project

Intermodal/Rail Transfer Station

The project would evaluate potential sites for an intermodal transfer station to facilitate the distribution of MSW, recyclables, biosolids, ash, and/or other materials by rail. Currently, most materials are distributed by motor vehicles, sometimes at distances of several hundred miles per trip. This mode of transport has considerable environmental impacts, with fiscal impacts increasing as petroleum costs escalate. At present, it is unknown who would finance or lead this study.

6.5.6 Facilitate Inter-County Cooperation

Inter-county cooperation includes projects that are related to the sharing of resources and information, as well as the development of programs and processes that extend beyond county boundaries. To a degree, inter-county cooperation is already occurring as exemplified by HVRC's Solid Waste Committee, and Orange County and RCSWMA's service areas extending beyond their county and state borders. Many of these existing efforts can be built upon and learned from.

One critical step for inter-county cooperation is the adoption of consistent materials accounting methodologies and definitions, such as those provided in Appendix A of Beyond Waste. Additionally, the adoption of consistent and uniform labels to be used in marking different waste receptacles can help increase recycling and waste diversion efforts. Counties could collaborate to develop a standard and then implement this standard throughout the Region.

Additionally, the Mid-Hudson Region's counties' Emergency Management Departments should coordinate and conduct regional debris management planning in preparation for future large scale natural disasters.

Finally, by seeking to aggregate recycling streams, it may be possible for the counties to access and profit from recycling markets that may not be as viable when approached at the scale of an individual facility or planning unit. This can provide a source of jobs and can potentially improve the economics of recycling and materials management more generally.

Example Project

Integrated Solid Waste System Feasibility

To address integrated solid waste management through the Region, this initiative would begin with a feasibility study to examine the present status of solid waste management, including private and public actors, and the regional feasibility of implementing various management solutions. An informed consent engagement exercise would bring all stakeholders together to come up with a system whereby the solid waste generated in the Region is handled locally.

The study should evaluate private and public waste transfer facilities, MRFs, C & D reuse and recycling, local recycling end markets, public and private yard waste, food waste and sewage sludge composting facilities, HHW and Universal Waste facilities and programs, public reuse facilities and private reuse businesses, and education and outreach needs. Infrastructure and legislation considered by the study should include but is not limited to:

- Construction of one or more landfills for residuals disposal
- Rail and water transportation solutions
- Material bans, deposits fees, and producer responsibility mandates

At present, it is unknown who would finance or lead this study.

6.5.7 Change Policy to Improve Local Management Capacity

Policy can address areas where the social and political environment is critical to the development of projects, either by permitting or incentivizing activities or removing barriers to implementation. For example, the social environment may include public perception and behavior; the political environment may include the adoption, enforcement or repeal of regulation.

Example Projects

C & D Debris Legislation

This proposal seeks to develop a model ordinance or local law requiring demolition debris recycling and reuse, for subsequent consideration by planning units or municipalities. Cook County, Illinois, recently enacted such an ordinance which required contractors to recycle 70 percent of commercial C & D debris.[155] Residential C & D is treated separately under the law, requiring 5 percent reuse and 70 percent recycling. The environmental and economic benefits of diverting C & D debris from landfills to reuse are readily apparent. Increasing reuse and recycling of C & D can create new jobs in reuse/processing as well as marketing of materials.

Transitioning from Not In My Back Yard (NIMBY) to Yes In My Back Yard (YIMBY)

The Hudson Valley Regional Council is an existing consortium of the Mid-Hudson Region counties that examines administrative benefits and regional solutions to challenging issues in government. The Region requires new MSW infrastructure if it is to transition toward self-sufficiency. A possible solution to the NIMBY position of MSW facility siting may be to conduct regional opt-in contests to determine who may actually want to proactively host MSW facilities in their communities (YIMBY), in exchange for a host community benefit.

Pay-as-you-throw

As described in Beyond Waste, "more than 400 communities in NYS employ some form of volume-based pricing. These programs charge residents for waste collection and recycling services based on the volume of waste generated. When properly structured, the full system costs (including recycling, composting and waste prevention programs) are included in waste disposal fees, while recycling and composting collections are provided for free. This gives residents an incentive to reduce their waste and recycle more." These properly structured volume-based pricing programs are known as Pay-As-You-Throw (PAYT) programs. PAYT is currently instituted by many communities in the Mid-Hudson Region; however there is room to expand as illustrated by Ulster County, which estimates that only 20 percent of the population utilizes town transfer stations with the PAYT Program. The benefits of PAYT have been well documented.[156]

[155] Illinois Environmental Law Blog. Cook County Approves New Reuse and Recycling Requirements for Construction and Demolition Waste. http://illinoisenvironmentallaw.com/permits/cook-county-approves-new-reuse-and-recycling-requirements-for-construction-and-demolition-waste/

[156] US EPA, 2012. Pay as You Throw. http://www.epa.gov/osw/conserve/tools/payt/

7 Agriculture and Open Space

The Mid-Hudson Region has a vibrant agricultural economy and abundant open space, which helps preserve the rural, pastoral character of parts of our Region while also providing a source of employment, driving tourism, and contributing to our quality of life. At the same time, agricultural land is under pressure from development, and many farmers struggle to make a profit. Open space in many parts of the Region is fragmented and faces pressure from invasive species, climate change, and other threats. Given these realities, our plan for agriculture and open space in the Mid-Hudson Region is to:

- Increase agriculture and silviculture activities in the Region
- Improve access to sustainable acgriculture and silviculture training and technologies
- Increase intra-regional consumption of food and fiber
- Reduce energy use and GHG emissions from farm and farm-related activities
- Strengthen the economic viability of agriculture and silviculture in the Region
- Increase open space
- Protect wildlife and maintain biodiversity

To achieve these objectives, we must:

- Protect prime farmland and facilitate access to land for farmers
- Protect priority conservation areas
- Increase energy efficiency and renewable energy in agriculture
- Strengthen food infrastructure networks
- Expand urban agriculture
- Promote sustainable agriculture education and training and facilitate transfer of knowledge

The Plan seeks to achieve two distinct yet-related goals in the Agriculture and Open Space focus area, which both pertain to maintaining the rural character of the Region:

1. Expand sustainable agriculture and 'working landscapes'
2. Protect valuable open space

In the context of the Plan, the term sustainable agriculture means an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- Satisfy human food and fiber needs
- Enhance environmental quality and the natural resource base upon which the agricultural economy depends
- Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
- Sustain the economic viability of farm operations
- Enhance the quality of life for farmers and society as a whole

Furthermore, the Plan aims to maintain open space and forests and ensure that parts of the Region retain a rural character. For the purposes of the Plan, open space is defined as "land which is not intensively developed for residential, commercial, industrial or institutional use. Open space can be publicly or privately owned. It includes agricultural and forest land, undeveloped coastal and estuarine lands, undeveloped scenic lands, public parks and preserves. It also includes water bodies such as lakes and bays."[157] It is important to note that this Plan distinguishes agricultural lands as a distinct subset of open space in that is it an intensive use of land and is an infrastructure asset to the business owner (i.e., farmer) much like an industrial building is an asset to a manufacturer. This chapter focuses on agriculture in terms of land use, the agricultural industry, and then separately addresses open space.

For the purposes of the Plan, the definition of a farm is based on that of the USDA Agriculture Census, which considers farms to be agricultural businesses with gross annual receipts of one thousand dollars or more. The USDA Agriculture Census definition has been used for the purpose of data collection and analysis. However, it is important to recognize that not all farm activity is included in this definition, such as farms whose owner's sole occupation is not farming and where gross receipts are at or below the $1,000 mark. Similarly this figure may also exclude urban farms and gardens which contribute to regional food production and supply, but do not have income levels above the defined threshold. Anecdotal information suggests these farms are an important part of the agricultural fabric of the Region, but data are sparse and incomplete.

The preservation of open space, including farmland and forestland, contributes to sustainability by protecting the environment, supplying valuable ecosystem services, and providing opportunities for food production, employment and recreation. Preserving working farms provides a fresh food source for the Mid-Hudson Region and the NYC metro area and reduces the need for rural residents to travel long distances to buy fresh food.

Directing rural and suburban growth into village centers also protects open space from development. This helps maintain ecosystem services such as water filtration, carbon sequestration, flood mitigation, and biodiversity.

7.1 Baseline Conditions

7.1.1 Agriculture

The Mid-Hudson Region's agricultural activity includes the following:

- Dairy
- Fruits
- Vegetables
- Nursery
- Greenhouse crops
- Animal agriculture
- Silviculture[158]

The Mid-Hudson Region's agricultural economy has a number of distinct advantages:

- **Access to markets:** The Region serves as an important source of fresh, high quality, local food for the NYC metro area.
- **Direct marketing:** The Region sells a large part of its farm production through direct sales, exceeding the NYS average; direct sales can increase profit margins for farmers.
- **Local food movement:** A strong local food movement drives increased demand for the Region's products.
- **Value-added products:** A strong market for regional farm products provides the opportunity for higher receipts at the farm as well as increased employment and a greater economic impact.
- **The Region's soils and climate:** Local geography is well-suited to agricultural production.
- **Diversity of products:** The Region produces a wide diversity of agricultural products, allowing it to serve the broader needs of local populations and high-value markets.
- **The NYC drinking water supply watershed:** NYC's Department of Environmental Protection has determined that agriculture is a preferred land use in its watersheds, helping promote and preserve agricultural activity.

As shown in Figure 7.1 and presented in Table 7.1, in 2007 the seven counties of the Mid-Hudson Region contained 2,321 farms operating on 323,154 acres of farmland.[159] These farms account for 4.5 percent of farmland in NYS and 6 percent of total land in the Mid-Hudson Region.

Farmland in the Region is under pressure from competing land uses. Approximately 27 percent of the prime farmland soils in the Region (including prime farmland if drained) and 18 percent of the soils of statewide importance have been developed for non-agricultural purposes and are no longer usable for farming (see Figure 7.2). It is critical that efforts be taken to preserve and protect farmland soils, as soil is a finite resource that is virtually impossible to substitute.

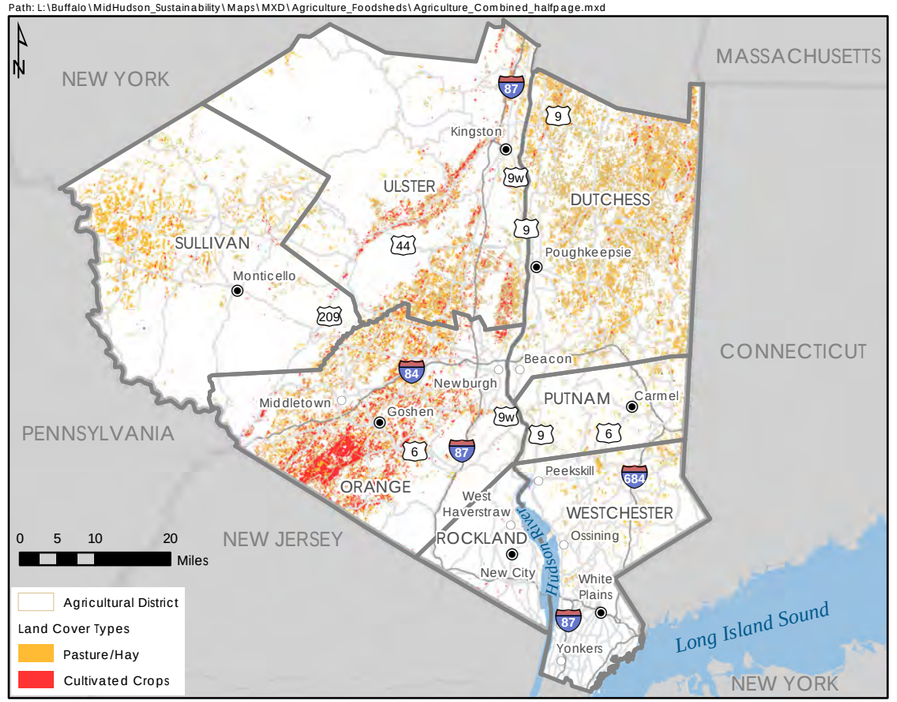


Figure 7.1 Agricultural Land Cover

[157] New York State Open Space Plan, 2009. http://www.dec.ny.gov/docs/lands_forests_pdf/osp09complete.pdf

[158] Silviculture is the art and science of controlling the establishment, growth, composition, health and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis http://www.fs.fed.us/forestmanagement/silviculture/index.shtml

[159] Data for farm numbers and acres are from the USDA's 2007 Census of Agriculture. For the purposes of the Census of Agriculture, a farm is counted if it has $1,000 or more in annual sales. This Census is voluntary and may not reflect the true number of all types and sizes of farms. The Census is, however, the best available information and has a consistent methodology over time which facilitates analysis of trends.

Table 7.1 Agricultural Land Use				
Location	Land In farms (Acres)	% of total land	Harvested Cropland (Acres)	Agricultural Districts (Acres)
Dutchess	102,360	19.9	37,961	179,454
Orange	80,990	15	38,677	166,365
Putnam	5,635	3.6	870	4,501
Rockland	213	<0.1	(D)*	(D)*
Sullivan	50,443	7.9	21,198	161,765
Ulster	75,205	10.1	26,776	65,668
Westchester	8,521	2.6	1,763	6,517
Region	**323,154**	**11.1**	**127,245**	**584,271**

*(D) = withheld to avoid disclosing results for a single farm
Source: 2007 Census of Agriculture, Rockland County Comprehensive Plan

Despite efforts to maintain agriculture through the creation of Agriculture Districts, Census of Agriculture statistics show an approximate 16 percent loss of farmland between 2002 and 2007.

Agricultural Districts are designated as part of a statewide program intended to curb the conversion of agricultural land to non-farm use by providing a series of benefits to the properties they contain thereby reducing pressure to sell the land for non-farm development. Per the NYS Department of Taxation and Finance, these districts also:

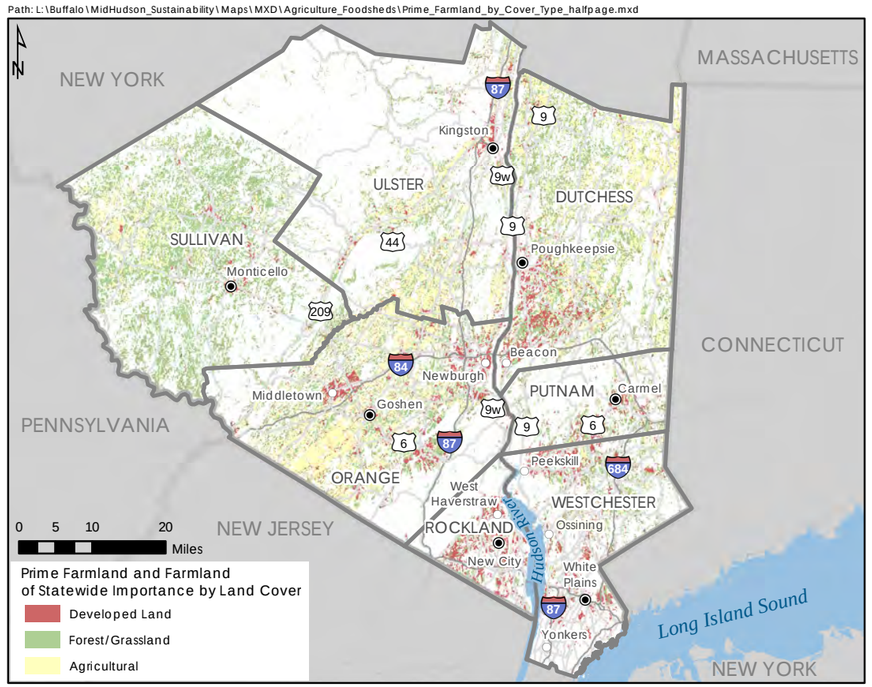


Figure 7.2 Prime and Statewide Important Farmland Soils by Land Cover

- Limit unreasonable local regulation on farm practices
- Modify public agencies' ability to acquire farmland through eminent domain
- Modify the right to advance public funds to construct facilities that encourage development
- Require state agencies to modify administrative regulations and procedures to encourage continuing farm businesses
- Provide *Right to Farm* provisions for protection from private nuisance suits for land in agricultural districts and parcels receiving agriculture assessments outside districts[160]

These protections require that agricultural properties within the district be encumbered for a period of five years or be subject to a payment for conversion to non-agriculture use.

Agricultural lands within and outside of designated agriculture districts are eligible to receive a tax preferential agricultural assessment; however, the encumbrance period is eight years for those properties not located within an agriculture district. Under either scenario, eligibility for the agriculture assessment is based on a combination of criteria involving both land quantity and gross revenue and must be applied for and met separately from the agriculture district qualification. For lands under agricultural production of greater than seven acres gross receipts must be greater than $10,000. Land under seven acres are eligible for the preferential tax treatment; however, gross receipts must be greater than $50,000 for the property to qualify.

Table 7.2 Agricultural Economy: Crops and Dairy, 2007		
Location	Crop Sales	Dairy Sales
Dutchess	23,408,000	9,004,000
Orange	51,180,000	14,800,000
Putnam	1,299,000	(D)*
Rockland	(D)*	0
Sullivan	2,088,000	7,468,000
Ulster	58,859,000	2,642,000
Westchester	5,517,000	(D)*
Region	**142,351,000**	**33,914,000**

Source: 2007 Census of Agriculture
D* Withheld by USDA to avoid disclosing data for individual operations.

Agricultural Economy

The number of farms and total land area occupied by farming in the Region continues to decline, while the total market value of products sold in the Region increases (see Table 7.2). Incomes varied widely among counties, with some counties averaging net losses (see Table 7.3). While overall net income did not increase significantly from 2002 to 2007, average net income per farm operator did. Harvested cropland decreased over that period. The total number of farms decreased across all sectors (see Table 7.4). This means that while the number of farmers and acres of farmland dropped, the value of agricultural goods increased.

Table 7.3 Net Agriculture Cash Income and Value of Land, Buildings, and Equipment			
Location	Net Cash Income: County Totals	Net Cash Income Per Operator: Average Per Farm	Total Value of Land, Buildings and Equipment
Dutchess	-$5,825,000	-$8,879	$631,563,472
Orange	$4,669,000	$7,273	$483,076,020
Putnam	-$1,588,000	-$22,051	$83,320,288
Rockland	$1,083,000	$51,549	$15,408,723
Sullivan	$2,414,000	$7,474	$202,352,323
Ulster	$14,316,000	$28,575	$346,210,409
Westchester	$297,000	$2,803	$282,252,760
Region	**$15,366,000**	**$66,744**	**$2,044,183,995**

Source: 2007 Census of Agriculture

[160] New York State Department of Taxation and Finance, 2012. Agricultural Assessment Program Overview. http://www.tax.ny.gov/research/property/assess/valuation/ag_overview.htm

Table 7.4 Mid-Hudson Agricultural Economy: All Farm Types, 2007			
NAICS Category	Farms (2002)	Farms (2007)	Sales (2007)
Oilseed and grain farming	96	22	$7,671,000
Vegetable and melon farming	429	216	$38,308,000
Fruit and tree nut farming	334	170	$46,945,000
Greenhouse, nursery, and floriculture	468	206	$85,271,677
Other crop farming	1031	529	$5,570,000
Sugarcane farming, hay farming, and all other	1030	529	N/A
Beef cattle ranching and farming	350	176	$5,677,000
Cattle feedlots	59	20	N/A
Dairy cattle and milk production	307	125	$33,914,000
Hog and pig farming	32	12	$213,000
Poultry and egg production	170	122	$29,831,000
Sheep and goat farming	189	88	N/A
Animal aquaculture and other animal	1246	635	N/A
Region	**4711**	**2321**	

Source: 2007 Census of Agriculture

The breakdown of agricultural receipts by activity type is presented in Table 7.3.

In general, sales figures vary widely year-to-year due to variations in production and prices, making it difficult to characterize. Despite this, farm operations contribute significantly to the local economy as they tend to spend within their community and utilize $.29 in services for every $1.00 earned in taxes.[161] Based on research by Cornell University; the total gross economic impact of farming in the greater Hudson Valley in 2007 was $810 million.[162] The agriculture and forestry sector has one of the highest job multipliers of any industry in NYS.[163]

> ...farm operations contribute significantly to the local economy as they tend to spend within their community and utilize $.29 in services for every $1.00 earned in taxes.

The impact of agriculture on the Region's economy is greater than may appear because agriculture includes activities far beyond farming. The broader agricultural infrastructure consists of:

- Support services: veterinarians, fuel and feed suppliers, equipment repair services
- Processing: cleaning, freezing, packaging, and more
- Aggregation: bulk buyers that need large quantities of product, in many cases more than any individual farm can provide
- Storage: to keep perishable fruits, vegetables, and meats fresh
- Slaughter facilities
- Distribution

> The agriculture and forestry sector has one of the highest job multipliers of any industry in NYS.

The Local Food Movement in the Mid-Hudson Region

Nationwide, the local food movement has led to an increase in the demand for locally grown agriculture. The Mid-Hudson Region has taken advantage of this increase in demand by expanding direct marketing and other local sales efforts in the Region and to the NYC metro area. Demand is strong—in 2007, the New York Industrial Retention Network conducted a survey of food manufacturers that found that there was an interest in increasing the amount of locally grown ingredients in their products.[164]

An abundant variety of locally grown food is directly available from the Region's 76 municipal markets. Municipal markets usually run on a weekly or biweekly basis and offer goods from many vendors, including those who sell fresh produce, crafts and canned or prepared foods. Farmer's markets usually offer goods from a single vendor and are open on a daily basis. Table 7.5 shows the number of municipal and farmer's markets in the Region.

While demand is strong, small and medium sized farms have a difficult time getting their products to the distributors and processors needed in order to sell their goods locally.[165] This limits the ability of small and medium sized farms to break into lucrative markets like that of NYC. According to the 2007 Census of Agriculture, small and medium sized farms make up the majority of farm operations in the Region.[166] This then greatly impacts the economic viability and sustainability of agriculture in the Region.

One of the more widely supported methods for helping bridge the gap between distributors, processors, and small and medium farms is through the use of Food Hubs. Food Hubs are businesses or organizations that actively manage the aggregation, distribution, and marketing of source-identified food products from local producers to strengthen their ability to satisfy wholesale, retail, and institutional demand.[167] In the Mid-Hudson Region, there are two such food hubs and in NYC there are three.[168]

Challenges Facing Agriculture in the Region

Agriculture continues to thrive in the Mid-Hudson Region, despite considerable challenges. Action is needed to sustain the industry, for example:

- Counties and municipalities need to continue to implement planning policies that help curb infringement on agricultural landscapes on a regional level
- New methods are needed so that landowners, land trusts, and agencies work together to protect land from development and help farmers access needed resources
- Investment in infrastructure needs to be sustained to expand value-added processing and facilitate market access
- Farm businesses need support through policies and programs that enhance their economic viability
- Increased integration is needed between agriculture and processors and retailers of food products
- Facilitating access to land for new farmers

Additionally, while proximity to NYC brings opportuni-

Table 7.5 Farmer's Markets in the Region				
Rank	Location	Households Served Per Farmer's Market[1] (households/market)	Number of Municipal Markets[2]	Number of Farm Markets[2]
1	Dutchess	1,298	15	34
2	Orange	2,040	16	35
3	Putnam	1,615	5	6
4	Rockland	7,428	4	4
5	Sullivan	3,309	7	12
6	Ulster	3,967	9	35
7	Westchester	13,414	20	12
	Region	**3,785**	**76**	**138**

Source:
[1] US Census, 2010. ACS.
[2] County Tourism Offices of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester Counties, 2012.

[161] American Farmland Trust, 2011. Planning for Agriculture in New York. http://www.farmland.org/documents/PlanningforAgriculturePDF.pdf
[162] Glynwood, 2010. State of Agriculture in the Hudson Valley. http://www.glynwood.org/files/2011/02/State_of_Ag_2010.pdf
[163] Cornell University, 2012. Agriculture-Based Economic Development in NYS: Trends and Prospects. http://dyson.cornell.edu/outreach/extensionpdf/2012/Cornell-Dyson-eb1211.pdf
[164] NYS Department of Agriculture and Markets, 2011. From Farm to Factory: Linking New York State Producers and New York City Food Processors. http://www.agriculture.ny.gov/ap/ftf/fsmipnyfarm-to-factory-final-report.pdf
[165] USDA, 2012. Regional Food Hub Resource Guide. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5097957
[166] CREEO, 2011. Agriculture Supporting Community in the Mid-Hudson Region Discussion Brief. http://www.newpaltz.edu/crreo/crreo_brief_5_summer_2011.pdf
[167] National Good Food Network, 2013. Food Hub Center. http://www.ngfn.org/resources/food-hubs
[168] USDA, 2012. Regional Food Hub Resource Guide.

ties for marketing farm products, it is accompanied by factors that do not favor agricultural businesses, and can be barriers to the entry of new, often young farmers:

- The high costs of business—supplies, labor, land, taxes
- Competition for labor
- Pressure from land development for non-agricultural uses

Finally, intergenerational transfers are a challenge. The average age of farmers in the Region has been increasing. This reflects a trend of children of farmers seeking employment outside of agriculture due to:

- Disparate earning potential
- Difficult working conditions
- The high level of capital investment required to start or continue a farm business
- The inherent risks to agriculture from weather
- Fluctuations in demand and prices for farm products

7.1.2 Open Space

Table 7.6 Mid-Hudson Region Forested Area by County, 2005-2010

Location	Acres of Forest
Dutchess	292,392.09
Orange	270,847.85
Putnam	83,633.90
Rockland	33,604.18
Sullivan	395,867.26
Ulster	551,936.90
Westchester	130,782.72
Region	**1,759,064.92**

Source: US Forest Service, 2013.[169]

Much of the Region's preserved land and large, natural open spaces are located in a greenbelt through the Hudson Highlands in southeast Orange and northwest Putnam counties, in the Catskill Forest Preserve of northwest Ulster and Sullivan counties, and along the Shawangunk Ridge in Ulster, Sullivan and Orange counties.[170] These lands, combined with the agricultural land discussed above, contribute to the Region's rural character and natural beauty.

According to Scenic Hudson, the Region has 618,100

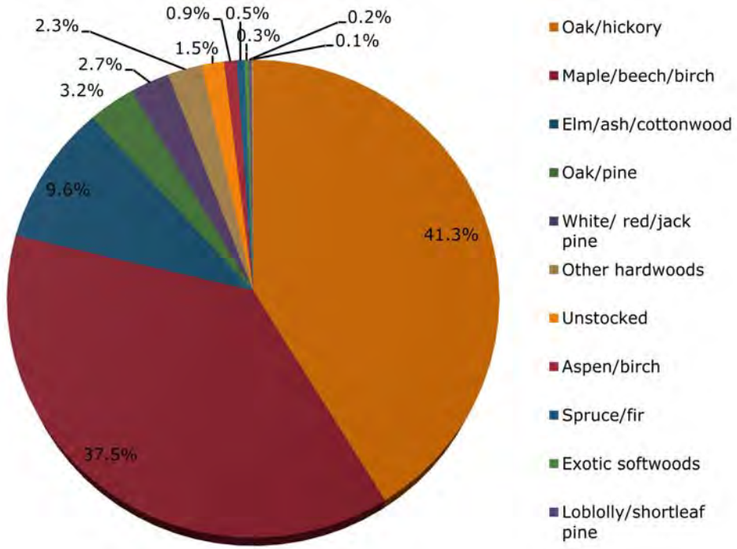


Figure 7.3 Mid-Hudson Region Forestland by Forest Type, 2005[171]

[169] US Forest Service, 2013. Forest Inventory and National Analysis Program: http://fia.fs.fed.us/tools-data/default.asp
[170] Scenic Hudson., 2012. Protected Land.
[171] US Forest Service, 2013. Forest Inventory and National Analysis Program.

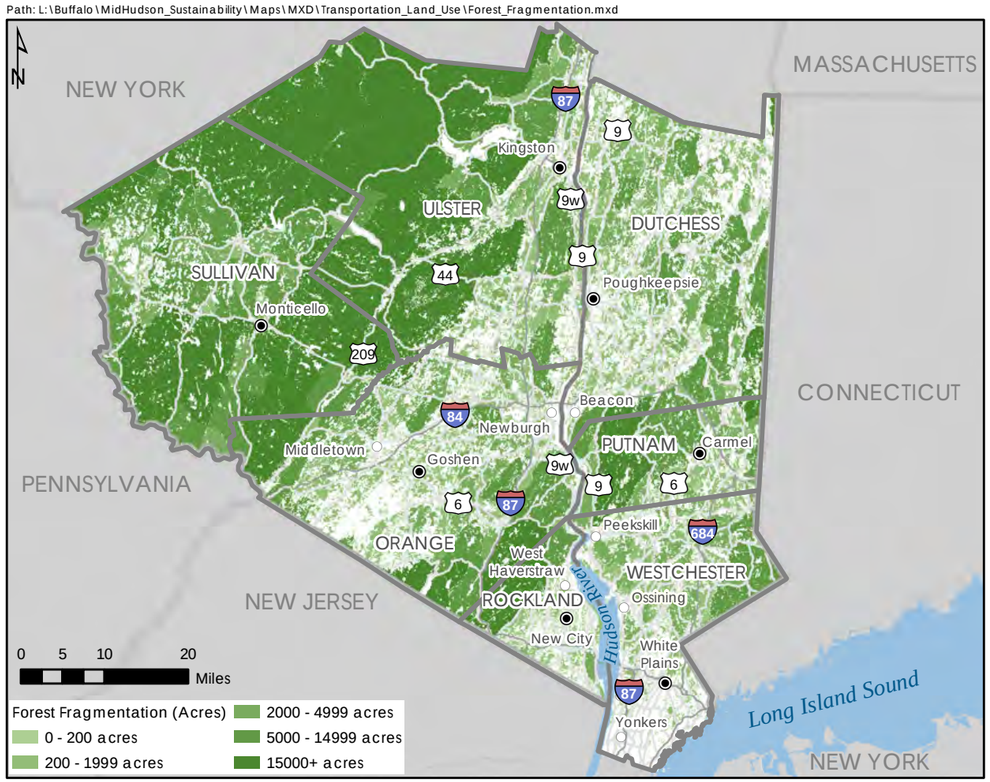


Figure 7.4 Forest Fragmentation

acres of preserved land, representing 21 percent of total land area. This land is protected from development either through public ownership of its development rights or through land conservation easements, which restrict certain uses on the land.[172]

According to US Forest Service data, total forest land in the Region is approximately 1.8 million acres, or 62 percent of total land area (see Table 7.6). As noted in Chapter 4, estimating regional forest cover can be challenging due to inherent data and methodological limitations, which give widely divergent results. Forests in the Region are primarily mixed deciduous—the canopy species composition is presented in Figure 7.3.

As shown in Figure 7.4, the Region's forests range from large, contiguous patches in the Catskill Mountain Preserve and the Hudson Highlands greenbelt, to small, disconnected patches in the south and east. The average size of a contiguous patch of forest in the Region is only 33.6 acres, largely due to fragmentation in the more developed areas. In Ulster County, where there are proactive measures to conserve forest in the Catskill and Shawangunk areas, the average patch size is 79.6 acres .[173]

> The average size of a contiguous patch of forest in the Region is only 33.6 acres, largely due to fragmentation in the more developed areas. In Ulster County, where there are proactive measures to conserve forest in the Catskill and Shawangunk areas, the average patch size is 79.6 acres.

Large patches of connected forests provide essential

[172] Ibid.
[173] NYSDEC, 2012. Forest Fragmentation.

habitat, helping conserve biodiversity while also providing multiple ecosystem services (stormwater retention, pollutant mitigation, etc.). Larger forests are also better able to handle the impacts of fires, floods, and wind damage. Forest fragmentation, particularly in the south and east parts of the Region, presents challenges for biodiversity and ecosystem resilience, as does the increasing encroachment of roads and utilities into forests throughout the Region.

> Since methane from manure and digestion is an inevitable product of livestock, methane production is unavoidable without eliminating the livestock industry altogether.

In addition to providing valuable habitat, forests also have a number of economic and recreational benefits. For example, forest-based manufacturing and forest-related recreation and tourism produced over 8.8 billion dollars for the NYS economy in 2005.[174] Hunting is a popular pastime in the Region, generating economic benefits and a source of food. Maple syrup production is another example of an economic benefit of forests. In 2012, NYS produced more maple syrup than any state in the US except Vermont.[175]

> Note that although the agricultural sector is a source of GHG emissions, emissions per acre are significantly less than those associated with other land uses such as residential, commercial, and industrial development.

Table 7.7 Agriculture GHG Emissions by Source (MTCO2e), 2010

Location	Enteric Fermentation	Manure Management	Agricultural Soils	Total	% of total
Dutchess	16,432	2,690	13,192	32,315	22
Orange	21,003	4,673	15,111	40,787	27
Putnam	8,176	882	3,785	12,844	9
Rockland	8,176	882	6,163	15,222	10
Sullivan	12,221	2,315	5,347	19,883	13
Ulster	8,389	1,052	6,205	15,645	10
Westchester	372	20	12,801	13,193	9
Region	**74,769**	**12,515**	**62,603**	**149,887**	**100**

SOURCE: Attachment I: Regional GHG Inventory

7.1.3 Environmental Justice Considerations

Access to healthy food is a central EJ concern. In some areas, low-income communities may not have access to a variety of healthy food, creating 'food deserts'.[176] This can lead to higher rates of obesity and related health issues.[177] As noted earlier, according to USDA mapping analysis, certain parts of the Region have been identified as potentially containing food deserts.

Additionally, access to open space is not always equitable.[178] A lack of access to open space can have significant health effects on a community including increasing the risk of obesity as well as reducing mental well-being.[179] While the Region does have abundant open space, certain communities do not have direct access or are not able to afford transportation to reach these areas.

The Plan seeks to address environmental justice issues. Food marketers can work directly with producers to bring local goods and healthy food into low-income areas via farmer's markets and direct marketing initiatives. Additionally, increasing the amount of open space in the Region can help improve access to parks and recreational areas.

[174] North East State Foresters Association, 2007. The Economic Importance and Wood Flows from New York's Forests, 2007.
[175] USDA, 2007. National Agricultural Statistics Service County Profile. www.agcensus.usda.gov
[176] Reuters, 2009. Access to Healthy Food Worse in Poor Areas. http://www.reuters.com/article/2009/01/21/us-access-healthy-idUSTRE50K5NW20090121
[177] Science News, 2008. Lower Income Neighborhoods Associated with Higher Obesity Rates. http://www.sciencedaily.com/releases/2008/02/080207163807.htm
[178] Trust for Public Land, 2006. The Benefits of Parks. http://www.eastshorepark.org/benefits_of_parks%20tpl.pdf
[179] WHO 2007. Tackling Obesity by Creating Healthy Residential Environments. http://www.euro.who.int/__data/assets/pdf_file/0012/98697/E90593.pdf

7.2 Climate Change, Agriculture, and Open Space

7.2.1 GHG Emissions

Agriculture

The agriculture sector in the Mid-Hudson Region generates non-carbon dioxide GHG emissions from enteric fermentation in livestock, livestock manure management, and agricultural soil management (through fertilizer application). Among these, the largest single source is from enteric fermentation.

Livestock emit GHGs as a by-product of digestion. Enteric methane (CH4) is generated during digestion by grazing animals, especially by ruminants such as dairy and beef cattle. Methane is also generated by manure. The amount of methane produced is a function of the type of animal, the type of feed the animals eat, and how the manure is stored and handled. Since methane from manure and digestion is an inevitable product of livestock, methane production is unavoidable without eliminating the livestock industry altogether.

Agriculture emissions are approximately 149,887 MTCO2e (see Table 7.7). Orange County, with the greatest population of dairy and beef cows, generates the most emissions in the Region, accounting for 27 percent of agriculture emissions. Note that although the agricultural sector is a source of GHG emissions, emissions per acre are significantly less than those associated with other land uses such as residential, commercial, and industrial development.

Please note that the figures in Table 7.7 do not include GHG emissions associated with energy use on farms, nor do they include emissions generated during processing or transportation of agricultural goods. These emissions are included in the energy and transportation sector GHG emissions. By increasing consumption of local agricultural goods within the Region, transportation emissions can be reduced.

Table 7.8 Summary of Climate Impacts Related to Food Systems and Agriculture

Asset	Climate Impacts	Climate Effect	Description
Farmland	Sea level rise; Flooding	Crop loss from flooding	More farmland in the Region may suffer increasing damage from flooding
	Increase annual average temperature	Pests / Invasive species	Warmer temperatures could allow invasive species and destructive pests to expand their range and have longer breeding seasons.
		Increased irrigation demand	A warmer climate will lead to higher evaporation rates and a longer growing season—two factors that may increase the need for irrigation.
Animal Agriculture	Extreme heat	Heat Stress and Reduced Productivity	More extreme heat events will increase heat stress in cows, lowering their productivity.
	Increase annual average temperature; Extreme heat; Drought; Flooding	Changes in feed availability and price	Longer growing seasons could increase feed production and drive down prices. However, heat stress, late summer drought, and heavy precipitation could decrease yields and drive up prices.
Produce	Extreme heat; Increase annual average temperature	Changes in fruit and vegetable yield; Longer growing season	Many of the high-value crops that currently dominate the Region's agricultural economy such as apples, cabbage and potatoes, could experience a decline in yield and quality as a result of climate change.
Farmers	Variability in the system	Crop and monetary losses	Variation in the climate system will cause growing seasons to fluctuate year to year; production will be difficult to predict. This will increase risk and impact the economic viability of agriculture.

Source: Attachment II: Climate Change Vulnerability Assessment

Open Space

Changing land use patterns unavoidably affect GHG emissions. The harvest of trees affects GHGs through the reduction of the carbon storage capacity of the ecosystem. Forests and many wetland systems act as carbon sinks, removing carbon from the atmosphere and sequestering it for a long time. Emissions due to land use change are discussed in Chapter 4.

7.2.2 Climate Change Vulnerability

Agricultural Vulnerabilities

Climate change has the potential to alter local and global food systems. NYSERDA notes that "farmers will be on the front lines of coping with climate change, but the direct impacts on crops, livestock, and pests, and the costs of farmer adaptation, will have cascading effects beyond the farm gate and throughout the state's economy."[180] Table 7.8 summarizes the climate impacts and effects related to food systems and agriculture expected in the Mid-Hudson Region.

[180] NYSERDA, 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State.

> NYSERDA notes that "farmers will be on the front lines of coping with climate change, but the direct impacts on crops, livestock, and pests, and the costs of farmer adaptation, will have cascading effects beyond the farm gate and throughout the state's economy."

Food Prices

Despite the emphasis on local food production, the vast majority of food consumed in the Mid-Hudson Region comes from other parts of the US and the world. While NYS could experience improvements of some aspects of agricultural conditions because of climate change, much of the US' food production may suffer. In a global economy this may lead to a sharp increase in food prices worldwide. Figure 7.5 shows how prices have already risen in the last decade.

A higher cost of food can place a financial burden on low-income families and individuals. Based on data from the 2008-2010 American Community Survey, approximately 7 percent of households in the Region receive Food Stamp/Supplemental Nutrition Assistance Program (SNAP) benefits. According to a recent SUNY New Paltz report, three in twenty Ulster county residents at times lack adequate food to meet basic nutritional needs.[181] If food prices rise, these statistics will also change.

While prices may increase, a warmer climate may provide benefits to local food production. A warmer climate will lengthen the growing season, increase production and may even expand the variety of crops that can be grown. Types of food produced will need to adjust as the climate shifts. Agriculture may be impacted due to increased frequency and severity of extreme weather—this is especially true of farms lying in floodplains.

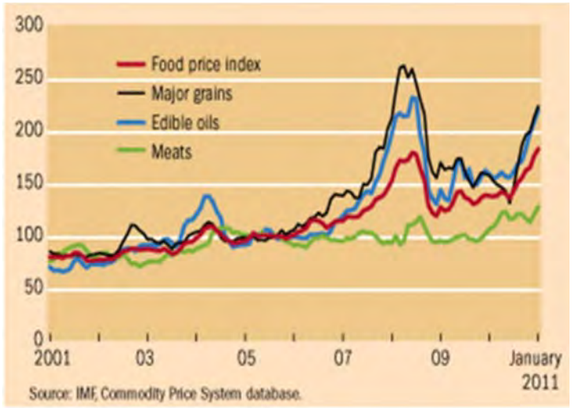


Figure 7.5 Food Prices (2001-2010) from International Monetary Fund 2011

Open Space Vulnerabilities

Table 7.9 summarizes potential climate impacts to open space in the Mid-Hudson Region.

Land on either side of the Hudson River is often preserved as open space for both recreational opportunities and ecosystem and habitat preservation. As sea level rise and flooding encroaches on these areas, they will be squeezed between the rising river and development on the other side. This could limit waterfront access and impact important natural areas.

Changes in temperature and precipitation can impact the suitability a particular area for certain ecological communities. Due to a warming climate, the Mid-Hudson Region could see an increase in species more typical of southern climates. Warmer temperatures will increase the primary productivity (the amount of energy converted into biomass that supports the food chain) in some natural systems, while causing heat stress for plants and animals in others. Warmer temperatures

[181] CRREO 2012. Food Insecurity in Ulster County. www.newpaltz.edu/crreo/crreo_hunger.pdf

Table 7.9 Summary of Open Space Related Climate Effects

Asset	Climate Impact	Climate Effect	Description
Natural Habitat and Biodiversity	Increased temperature; Altered precipitation patterns	Shifts in species habitat and range; Change in forest composition; Spread of invasive species; Reduced water quality	Temperature and water level fluctuations decrease the availability of habitats while causing shifts in bloom dates and pollination opportunities in plant communities. These disruptions in natural communities may alter the ecosystem services they provide. Species composition will likely change; this could increase invasive species. Species unable to migrate may become extinct. Forest composition is likely to change with implications for economically vital species such as sugar and red maple. Warmer water temperatures result in decreased water quality and diminished habitat for cold water species.
	Extreme heat and weather	Damage to habitat	Additional stress on habitats could impact the ability of species, communities, or habitat to recover. Species already vulnerable from non-climate stressors would be especially impacted.
	Reduced Snow Cover	Damage to habitat; Trophic cascades; Altered food web structure	Small mammals depend on snow cover for insulation and protection from predators. A decline in small mammals impacts predator populations but benefits large herbivores by reducing competition for vegetation.
	Flooding; Sea level rise	Damage to wetlands, shoreline, riparian areas	Inundation, changes to in salinity, and more frequent flooding can alter habitat suitability of wetlands. Loss of tidal wetlands reducing their capacity to dampen storm surges and sequester carbon. Inundation and more frequent flooding will cause land owners to harden shorelines, eliminating valuable shoreline habitat.

could also have negative effects on aquatic systems, as discussed in Chapter 8.

Reduced snow cover in winter has negative implications for small mammals that depend on the insulation and protection provided by the snow. These small mammals are an important part of the food chain; if their population declines, so may their predators'. Vegetation typically consumed by these small mammals will flourish. Reduced snow cover will also expose more plants for grazing in the winter, benefiting the deer population.

Rising sea levels and flooding could also inundate or damage critical wetland areas.

It is likely that the Region will experience a change in composition of the forests stands and the species they support. Among the trees expected to decrease are sugar maple and coniferous trees. The loss of the sugar maple could impact maple syrup production.

It is likely that the Region will experience a change in composition of the forests stands and the species they support. Among the trees expected to decrease are sugar maple and coniferous trees. The loss of the sugar maple could impact maple syrup production.

Because maple syrup production depends on alternating freeze/thaw days to induce sap flow, warm years can cause this process to begin earlier and last for a shorter period of time.[182] In 2012, maple syrup production in NYS decreased by 36 percent from 2011 due to warmer temperatures.[183]

Forests and agricultural landscapes in the Mid-Hudson Region are also likely to face invasive species, pests, and pathogens whose ranges are currently constrained by colder winter temperatures. One example of such a species is the hemlock wooly adelgid (native to parts of Asia). As of 2012, the hemlock woolly adelgid was found throughout the Region except for a few pockets in Sullivan County. This particular pest thrives in a warmer climate and can decimate hemlocks.

7.3 Objectives

The Mid-Hudson Region has a vibrant agricultural economy and abundant open space, which helps preserve the rural, pastoral character of parts of our Region while also providing a source of employment, driving tourism, and contributing to our quality of life. At the same time, agricultural land is under pressure from development, and many farmers struggle to make a profit. Open space in many parts of the Region is fragmented and faces pressure from invasive species, climate change, and other threats. Given these realities, the Plan includes the following objectives:

AO1: Increase Agriculture and Silviculture Activities in the Region

- Use land use policies, programs, and investments, to maintain and expand agriculture and silviculture activities in the Mid-Hudson Region. Agriculture and silviculture activities provide multiple economic and environmental benefits, including jobs and access to local food for the Region and nearby NYC. Land that remains in agriculture or managed forest provides scenic, recreational, and/or tourism benefits. Numerous studies, including those by Glynwood[184] and the American Farmland Trust[185], have documented the importance of agriculture to the Region.
- Minimize conversion of agricultural land to non-agricultural uses.
- Bring underutilized land into agricultural production where it can be done without clearing productive forest land.
- Prevent the loss of prime agricultural soils and soils of statewide importance.

[182] NYSERDA. 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State.
[183] USDA, 2007. National Agricultural Statistics Service. www.agcensus.usda.gov
[184] Glynwood, 2010. The State of Agriculture in the Hudson Valley.
[185] American Farmland Trust, 2003. At a Crossroads: Agricultural Economic Development in the Hudson Valley

AO2: Improve Access to Sustainable Agriculture and Silviculture Training and Technologies

- Increase the adoption of sustainable agricultural and silvicultural practices to improve water quality, conserve soil resources, and reduce exposure to potentially harmful chemical compounds.
- Enhance access for farmers to affordable training programs and facilities and up-to-date technology. Sustainable farming practices may include:
  - Residue management including mulch tillage and no-tillage
  - Comprehensive nutrient management plan implementation
  - Agricultural energy management programs
  - Use of new technology such as GPS-guided variable rate fertilization and pest management systems
  - Crop rotation and use of cover crops

AO3: Increase Intra-Regional Consumption of Food and Fiber

- Increase access to local foods by promoting direct marketing, CSAs, farmer's markets, and other market access programs.
- Increase consumption of local food to support the Region's economy, lower farm transportation costs and associated GHG emissions, thus enhancing the viability of farm activity and reducing environmental impacts.

AO4: Reduce Energy Use and GHG Emissions from Farm and Farm-Related Activities

- Increase feed conversion efficiency
- Improve manure management
- Enhance local market penetration
- Implement energy efficiency retrofits and best practices
- Expand energy production using agricultural waste products, solar, wind, and other renewables

AO5: Strengthen the Economic Viability of Agriculture/Silviculture in the Region

- Use a mixture of policy initiatives, targeted investments and incentives, as well as educational outreach to protect against the encroachment of populated areas and corresponding increases in property taxes
- Increase access to value-added facilities and distribution. Investment is needed to create food hubs to serve the small and mid-sized farms of the Region, fostering economic development.

AO6: Increase Open Space

- Maintain working landscapes and protect wetlands, riparian areas, ridgelines, and other valuable natural features in perpetuity to provide environmental, economic, and quality of life benefits while supporting multiple uses.

AO7: Protect Wildlife and Maintain Biodiversity

- Connect existing parcels and create larger patches or corridors of protected land. Reducing landscape fragmentation can help maintain biodiversity and preserve valuable ecosystem services such as stormwater mitigation. Large, contiguous open space also provides valuable recreational opportunities such as hiking, hunting, and cross-country skiing.

7.4 Indicators

Table 7.10 presents a series of sustainability indicators for the agriculture and open space focus area. These indicators should be used by counties and municipalities to track performance in achieving the Region's sustainability objectives. The data sources and calculations methodologies for each metric can be found in Appendix B.

7.4.1 Metrics and Targets

Table 7.10 Indicator Inventory: Tier 1 Indicators

Objective	Metric	Current Value	Target 2020	Target 2035	Target 2050
AO1: Increase agricultural/silvicultural activities					
1a. Increase Farmland	Acres of Farm Land	323,154 (2007)	332,700	342,700	352,000
1b. Increase Number of Farms	Number of Farms	2321 (2007)	2369	2440	2520
AO2: Improve access to sustainable agriculture/ silviculture training and technologies					
	See Tier 2 Indicators				
AO3: Increase intra-regional consumption of food/fiber					
3a. Increase Farmer's Markets	Number of Farmers Markets	138	Same	Increase by 10%	Increase by 20%
3b. Increase Municipal Markets	Number of Municipal Markets	76	Same	Increase by 10%	Increase by 20%
AO4: Decrease GHG emissions from farm activities					
4a. Decrease farm GHG Emissions	GHG Emissions (MTCO2e)	149,887	Reduce by 10%	Reduce by 20%	Reduce by 30%
AO5: Strengthen the economic viability of agriculture/ silviculture in the region					
5a. Grow Farm Economy	Net Cash Farm Income in the Region	$27,320,000	$46,000,000	$71,000,000	$97,000,000
5b. Increase Farmer Income	Net Cash Farm Income per Farmer	$11,770	$20,000	$30,000	$40,000
AO6: Increase open space					
6a. Increase Protected Land	Acres of Land Preserved from Development	618,000 (2012)	700,000	800,000	850,000
AO7: Protect wildlife and maintain biodiversity.					
7a. Increase Forest Path Size	Average Acreage of Contiguous Forest	33.6 (2010)	34	38	45

7.4.2 Limitations and Tier 2 Indicators

The primary source for much of the data presented in this Chapter is the USDA Census of Agriculture. The Census is published every five years—data presented in the Plan come from 2007, as 2012 data are not yet available.

For AO2 and AO3, there are limited available data that would allow for effective tracking of performance. For example, no information is available at the regional scale regarding enrollment or participation in sustainable agricultural education and training programs. For AO3, information is available regarding the number of farmer and municipal markets in the Region; however, little is known about the myriad other ways in which local consumers access locally-produced food products (e.g., through retailers, CSA programs, and more). The number of markets is, at best, a proxy measure for objective AO3.

As noted above, the GHG emissions data does not include many farm-related sources of emissions, such as on-farm energy use, transportation emissions, and more. These emissions are calculated as part of total energy and transportation-related GHG emissions, making it impossible to distinguish the total contribution of the agricultural sector.

Finally, forest fragmentation is better evaluated in terms of the number and size of large contiguous patches of forest in the Region, rather than as a regional average patch size.

Additional metrics that, if available, would facilitate planning and investment decisions are noted in Table 7.11.

Table 7.11 Tier 2 Indicators

Objective	Metric (units)
AO1	Acres of deed restricted farmland
AO1	Annual change in area of prime agricultural soils
AO1	Quantity of timber lost to disease
AO1	Farm employment
AO2	Use of precision agriculture
AO2	Vocational and secondary training programs related to agricultural science and technology
AO2	Extent of sustainable forestry practices
AO1, AO2	Value added production facilities
AO4	Farm fuel consumption
AO4	Farm energy usage
AO4	Quantity of agriculture and forest bi-products used for energy
AO4	Manure storage with covers and capture/flare of methane

Table 7.12 Initiatives for Implementation	AO1	AO2	AO3	AO4	AO5	AO6	AO7
High-Priority Initiatives							
Protect Ag Land and Facilitate Land Access	X		X	X	X	X	
Protect Priority Conservation Areas				X		X	X
Increase Energy Efficiency and Renewable Energy in Agriculture	X	X		X	X		
Medium-Priority Initiatives							
Strengthen Food Infrastructure Networks	X		X	X	X		
Expand Urban Agriculture	X		X	X			X
Promote Sustainable Agriculture Education and Training		X		X	X		X

7.5 Initiatives for Implementation

To achieve the Plan's objectives for agriculture and open space—improve the economic viability of farming, protect open space and farmland from development, reduce energy use in the sector, etc.—a comprehensive series of initiatives has been proposed (see Table 7.12) and is described in detail in Section 7.5. A preliminary ranking was completed to establish priority. High priority initiatives are those that impact multiple Plan focus areas while also scoring well against other prioritization criteria described in Chapter 3. Medium priority initiatives are those that do not have as broad an impact or score as highly.

Wherever possible, example projects or case studies have been given that typify the efforts needed to achieve the Plan's objectives. Note that examples provided are not intended to be comprehensive, but are simply ideas submitted during the planning process with sufficient information to illustrate the concepts being proposed. A List of Project Ideas containing all ideas submitted during the planning process can be found in Appendix C. Additional Resources to help individuals, local governments, or organizations with implementation can be found in Appendix D.

In Chapter 9, a series of strategic priorities for the Region are described, drawing from recommendations that arose in discussion among multiple Working Groups. These strategic priorities necessarily include initiatives that impact the Agriculture and Open Space focus area

7.5.1 Preserve Prime Farmland and Facilitate Access to Land for Farmers

Farmland is under constant pressure from development, with a 16% loss of regional farmland between 2002 and 2007. Programs such as the Agricultural District program described earlier help protect farmland from development. Additional efforts are needed to preserve farmland, in particular in areas with Prime Agricultural Soils or Soils of Statewide Importance. Mechanisms can include purchase of development rights (PDR) and a multitude of other mechanisms.

At the same time as farmland is being lost, new farmers are struggling to access sufficient contiguous land at prices that allow them to set up a profitable farming enterprise. Efforts to protect farmland from development should be pared with programs that match new farmers with suitable land for their proposed farm enterprise.

Example Project

Conserve the Valley's Breadbasket

While the population in the Region is growing, productive farmland continues to vanish, in part because farmers are retiring and a new crop of young farmers cannot afford it. Partnered with land trusts, government and farmers Scenic Hudson is engaged in conserving a 'critical mass' of highly productive farmland in Red Hook—one of the Region's prime agricultural communities. By securing conservation easements on family-owned farms, partnerships enable existing farmers to invest in their operations and put land prices within financial reach of new farmers - in the process of guaranteeing our future food security.

7.5.2 Protect Priority Conservation Areas

Priority conservation areas are those sites that have been identified as having particular strategic value in terms of meeting this Plan's objectives, be it as habitat, flood buffer, natural or cultural heritage, or other use, and thus merit protection from development into an alternative use. The properties are thus high priority for conservation, under the numerous mechanisms available to protect open space (purchase of development rights, permanent easement, zoning restrictions, etc.—see p. 5 of the NYS Open Space Conservation Plan[186] for a more comprehensive listing). An example could be a series of properties that connect large tracts of already protected forest area; through conservation, these properties could serve as a habitat corridor, helping protect biodiversity.

Periodically, NYS updates its Open Space Conservation Plan—the last version was published in 2009. In addition to this plan, each County in the Mid-Hudson Region has its own open space plan, along with corresponding land acquisition programs. Many municipalities within the Region also have open space plans establishing their priority conservation areas.

Example Projects

Black Creek Corridor Climate Change Mitigation and Recreational Access Project

As promoted by Scenic Hudson, safeguarding the lands along this prominent creek and floodplain area will mitigate ecological and property damage from severe flooding.

The Black Creek corridor—located in the Towns of Lloyd and Esopus in Ulster County—contains seven ecologically valuable properties that are currently available for purchase, comprising over 1,300 acres identified in the NYS Open Space Plan.

The Black Creek Corridor consists of approximately 6.5 miles of wetlands, vernal pools, hardwood swamps, waterfalls, dense woods, meadows and rock ledges that are critical breeding ground for migratory waterfowl and potential habitat for several endangered species. The properties are also within the state-recognized Grand Pond/Chodikee Lake Biologically Important Area; NYSDEC recognizes these wildlife habitats as of the highest importance. Other properties are part of the highly-valued Plutarch/Black Creek Wetlands Complex.

Permanent protection of these lands helps to ensure clean drinking water, recreational opportunities for paddlers on the creek and hikers. Conservation of these lands would complement and build upon the State's acquisition and establishment of the Black Creek State Forest in 2011.

Quassaick Creek Multi-Purpose Conservation Corridor

As suggested by the Newburgh Community Land Bank, the Quassaick Creek Multi-Purpose Conservation Corridor is a multi-phase plan that involves developing a 3.1 mile multi-purpose conservation corridor. The plan calls for smart growth strategies to be combined with green infrastructure so as to create numerous demonstrations of sustainability in action, including urban gardening, micro hydropower, and land conservation.

This project is especially important as it can act as a model for future endeavors. Many communities in the Region are built along similar small tributaries and creeks that can serve as the backdrop for beautiful mixed use waterfront property. These areas would hold the promise of creating walkable city centers containing community gardens and cycling paths thus fulfilling smart growth goals while preserving the land from development and maintaining biodiversity and ecosystem services.

Over time, this project will be tracked and its impacts measured so as to provide progress tracking of the different phases over time.

7.5.3 Increase Energy Efficiency and Renewable Energy in Agriculture

Agriculture in the Region represents a large energy consumer. Projects need to increase the efficiency of farm processes as well as develop alternative energy sources that may be used to reduce the reliance of farm operations on the grid. Projects may include energy audits that culminate in recommendations for upgrades in equipment or practices that may lead to higher efficiency. Additionally, projects may focus on

[186] NYS Department of Agriculture and Markets 2009. New York State Open Space Conservation Plan. http://www.dec.ny.gov/docs/lands_forests_pdf/osp09complete.pdf

production or use of alternative fuel sources like pelletized wood that may be burned to provide heat or electrical energy. Facilitating the integration of solar technology into farms is of great importance, as farmland represents a significant quantity of open space. The creation of regional centers for alternative fuel processing may help increase the scale of fuel production. Outreach to help farmers sort through NYS' numerous energy efficiency programs would help increase the use of existing programs throughout the Region.

Example Projects

Energy Efficiency and Renewables Training Center for Farmers

As championed by the Cornell Cooperative Extension, the Energy Efficiency and Renewables Training Center for Farmers would work with farmers through existing networks to increase the rates of energy efficiency and alternative fuel use by farmers in the Region. The Center would work with farmers to help them determine which renewable energy programs would benefit them the most.

Farm Energy Audits and Energy Management Plans

Multiple programs are available to farmers to audit their energy use and to develop alternative solutions to use energy more efficiently. Since December 2010, nearly 300 farmers have been working through the NYSERDA Agriculture Energy Efficiency Program to receive incentives on eligible electric and natural gas energy efficiency projects. Incentives up to 75 percent are available, up to $250,000 per applicant. Energy audits were provided to help identify eligible energy efficiency projects. Some utilities also offer assistance to farmers to upgrade their equipment to improve efficiency and reduce energy costs. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial assistance to farmers to obtain agricultural energy management plans. Funds are also available through NRCS to implement energy saving recommendations identified by the plans. The Rural Energy for America Program (REAP) is administered through USDA Rural Development. REAP offers grants and loan guarantees for energy efficiency and renewable energy improvements.

7.5.4 Strengthen Food Infrastructure Networks

The Region's agricultural economy depends on production and distribution networks to process and deliver food from farm to table. The Region's production and distribution networks are currently inadequate to meet the supply of local agriculture.[187] This especially hurts small and medium sized farms that do not have the capacity to set themselves up as distributors for their goods. One such method for dealing with this is through the creation of food hubs. Food hubs provide an efficient means for small and medium sized farms to get their goods to market. For example, the Farm-to-Table Co-Packers in Kingston repurposed an existing facility (through adaptive reuse) to create a full service contract packaging facility that produces everything from frozen vegetables and soups to jarred pickles and sauces. Their facility has been very successful in working with local farmers to get their product to tables around the Region.

One way to help guide investment in agribusiness is to create 'Agribusiness Opportunity Zones' based on the structure of the former Empire Zone program. These could be developed through partnership with NYS.

Example Projects

Value Added Processing for Regionally Grown Produce

The objective of the Hudson Valley Food Hub—Phase II project is to expand the infrastructure of two successful food processing and distribution firms in order to meet the growing demand for local healthy food grown by NYS Farms and Mid-Hudson Region farms in particular.

This food hub is responsible for aggregating, processing, and distributing multiple products across multiple markets from farms as small as 4 acres to farm cooperatives of thousands of acres. Currently the Farm to Table facility serves over 60 regional farms and over 40 private label customers.

The project proposes to:

1. Expand freezer/cooler capacity and upgrade processing capabilities at Farm-to-Table Co-Packers
2. Purchase warehousing and office equipment to improve product handling and logistical efficiency
3. Purchase trucks and distribution equipment to increase Hudson Valley Harvest's distribution capacity.
4. Invest in Hudson Valley Harvest's NYC sales depot

Food Hub and Training Facility

As promoted by the Friends of Hilltop Hanover Farm & Environmental Center, this training center would help to build and sustain the local food system through the expansion of the existing Westchester Community Col-

[187] Glynwood. Providing Markets for Southeast New York Region Farms in New York City Cultural Institutions. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5062654

lege Agricultural Certificate Program. The program would turn the Hilltop Hanover Farm into a local food hub that would aid in distribution while also providing on-the-job training regarding equipment, resources, and markets to help teach farmers about sustainable agriculture.

This two-year program would aim to train 5-7 farmers per year and provide graduates with the opportunity to work at new satellite farms throughout the Region both as part of their training and post-graduation.

7.5.5 Expand Urban Agriculture

Expanding urban agriculture is a way to connect consumers with the source of their food and educate them about the value of agriculture in the Region. Urban agriculture can provide benefits to surrounding neighborhoods such as making productive use and improving the appearance of blighted properties, providing seasonal employment for residents, and providing fresh food in areas that have limited access to grocery stores.

Using urban land for farming, especially where raising animals, may present challenges. Local land use codes and zoning may not allow some farm activities that may otherwise be compatible with urban residences. For example, many zoning codes restrict poultry farming and other activities. Conversely, where local laws do allow farming, there is potential for conflicts between different uses that would need to be anticipated and resolved.

Although urban agriculture is unlikely to provide a substantial proportion of the Region's food compared to more traditional, larger farms, it may significantly raise awareness of urban residents about farming. Effort needs to be taken to permit and encourage urban farming.

Example Project

Groundwork Hudson Valley Rooftop Farm

With a local developer, Groundwork is exploring the feasibility of building a 10,000 sq. ft. rooftop farm that would utilize Science Barge technologies on a much larger scale (see Case Study). The project would train and employ local residents in hydroponic/aquaponic farming techniques as well as business management and marketing skills. Employees would market and sell produce to local restaurants and retail food stores as well as at our Farmers market. The project would create jobs, support the local economy, and protect the environment.

7.5.6 Promote Sustainable Agriculture Education and Training and Facilitate Transfer of Knowledge

Historically farming has been a trade handed down from generation to generation requiring a lifetime of learning. The farmer population is rapidly aging, which presents a demographic challenge and the risk that crucial knowledge will be lost. At the same time, some sustainable agriculture practices require a shift in the techniques that farmers have spent generations perfecting. Others may require the use of new technology that is complicated or difficult to learn. In order to obtain Region-wide adoption of sustainable agricultural practices it is necessary to provide farmers with access to training programs and facilities, and up-to-date technology, while also ensuring that knowledge is transferred from generation to generation.

Initiatives should focus on helping farmers learn best management practices for sustainable agriculture to help farmers in the Region stay on the cutting edge.

Climate change is a major challenge that will directly impact farmers. Educational programs that provide farmers better information on what they will face as a result of climate change will allow them to be proactive. This is especially important for industries like the maple syrup industry which may be impacted significantly by climate change.

Example Projects

Rapid Response Training and Tools

As promoted by the CCE, the Rapid Response Training and Tools program aims to help farmers adapt to extreme weather and climate change. CCE staff plan to first assess and determine the impacts of extreme weather on agricultural operations and then work to develop specific tools and strategies farmers can use to address those impacts.

One example of a tool already developed is Cornell's Adapt-N Tool for nitrogen management. This tool uses computer modeling and high resolution weather information to provide information on farm-level nitrogen needs. It not only saves the farmers money by noting exactly how much nitrogen fertilizer needs to be applied, but reducing over-fertilization also helps reduce non-point sources of water pollution by reducing nutrients in farm runoff.

Sustainable Livestock Production in the Mid-Hudson Region

As promoted by Glynwood, Inc. and the Urban Design Lab at Columbia University, this project will promote sustainable meat production in the Region through research on land assets, the development and dissemination of on-farm best practices and GHG impact measurement for conventional versus local supply chains. Activities will include 1) analysis of the current extent of livestock production, 2) assessment of potential grazing land using available statistics, 3) lifecycle analyses comparing production, processing and transportation of local, pastured meat versus conventional meat, and 4) an experimental and training program to develop production and marketing best practices for pastured livestock.

Grain-fed livestock production is a major contributor to GHG emissions in the agriculture industry nationally and is a significant contributor to the Region's GHG footprint. Inefficiencies in the processing and distribution of local meats further contribute to GHG emissions and can impact profitability for farmers and distributors.

Case Study: Groundwork Hudson Valley

In considering sustainable food infrastructure networks in the region, it is important to look at the untapped opportunity to connect regional farms to 'food deserts' in distressed urban areas, as well as opportunities to produce food directly within urban centers.

The nonprofit Groundwork Hudson Valley, located in the City of Yonkers, runs a CSA program with Sisters Hill Farms in Dutchess County and also a series of farmers market supplied by Westchester County farmers. These endeavors link regional agricultural producers to families, bolstering the regional economy and reducing GHG emissions by vastly decreasing the distance food travels from producer to consumer. The farmers market has additional community benefits, providing summer jobs to local teens, connecting them with their community and providing job skills and much-needed income.

Groundwork also supports local food production through community gardens and its internationally recognized Science Barge. Groundwork helps manage a network of nine community gardens serving over 250 needy families. Not only are these gardens environmentally sustainable, but they offer welcomed, green oasis of tranquility in densely built communities. The Science Barge is an environmental education center and floating farm that grows over one ton of produce each year in a 1,500 sq. ft. greenhouse, using aquaponic and hydroponic circulation systems powered by wind turbines, solar panels, and biofuels—producing virtually no GHG emissions. Food grown on the Barge helps supply farmers marketsand provides fresh fruits and vegetables to a local shelter, but the Barge is primarily a demonstration project that shows people of all ages how to efficiently produce food for a rapidly growing population without harming or depleting our natural resources.

8 Water

The Mid-Hudson Region benefits from a relative abundance of both surface and groundwater, as compared with other parts of the country. With effective water management our Region can maintain and improve water quality while also competitively differentiating itself from other parts of the country, helping attract investment and grow the economy. Healthy aquatic ecosystems also have clear benefits for the Region's population because they produce clean, safe drinking water and provide opportunities for recreation. To achieve these outcomes, our plan for water is to:

- Increase available water supply by reducing water consumption and improving efficiency of water collection, treatment, and distribution systems
- Reduce energy use and GHG emissions at water and wastewater treatment infrastructure
- Improve the reliability of water treatment and distribution systems and wastewater treatment and collection systems
- Reduce impervious surface cover and connect permeable surfaces to infiltrate and treat stormwater
- Protect habitat and water quality
- Encourage watershed management planning

To achieve these objectives, we must:

- Upgrade infrastructure to achieve water and energy efficiency and mitigate the impacts of climate change
- Strengthen water conservation and reuse using education, audits, and codes
- Implement low impact development and green infrastructure
- Continue to create and support Watershed Management Plans and programs
- Benchmark energy use of water infrastructure

8.1 Baseline Conditions

As noted in the 2011 Regional Economic Development Plan, the Mid-Hudson Region includes "The Catskills, Delaware River, and the Hudson River and its watershed,[188] which provide spectacular scenery and abundant water supplies, and the Long Island Sound, which offers boating, swimming, fishing, and commercial activities." The major watersheds of the Mid-Hudson Region are shown in Figure 8.1, delineated using their Hydrological Unit Code (HUC). [189] The most notable surface water feature in the Region is the Hudson River, which bisects the Region and collects water from a 12,000 square mile watershed.

Benefiting from approximately 40 inches of precipitation annually, [190] groundwater, which provides a critical drinking water supply for many residents, is plentiful.

The Region's water resources exceed demand, even with considerable withdrawals for use within the Region and elsewhere. This positions the Region competitively as a sight for investment and economic development, when compared to many of the water-scarce regions in the US. Much of NYC's drinking water is drawn from the Mid-Hudson Region, specifically from Ulster, Putnam, and Westchester counties. In 2005, over 5 billion gallons of water were withdrawn per day, of which approximately 90 percent came from surface water sources (data include NYC withdrawals).[191]

Despite the Region's excellent resources, the Region faces challenges in the realm of water management. Key challenges include:

- While supply generally exceeds demand, there are local areas where water scarcity, especially in dry weather, is a concern
- Flood risk is significant along the Hudson River and Long Island Sound, in the floodplains of the Hudson Valley, and in upland areas such as the Catskills
- Water quality is impaired[192] in certain water bodies, including the main branch of the Hudson

As noted in the 2011 Regional Economic Development Plan, the Mid-Hudson Region includes "The Catskills, Delaware River, and the Hudson River and its watershed, which provide spectacular scenery and abundant water supplies, and the Long Island Sound, which offers boating, swimming, fishing, and commercial activities.

[188] A watershed is the area delineated by terrain from which all surface and groundwater drains to a single point. Watersheds are also called drainage basins or catchments.

[189] USGS, 2013. How Can My Watershed Address help me Find USGS Data. http://nwis.waterdata.usgs.gov/tutorial/huc_def.html
http://nwis.waterdata.usgs.gov/tutorial/huc_def.html

[190] CRREO, 2010. Outreach Hudson Valley Water: Opportunities and Challenges.

[191] USGS, 2005. Estimated Use of Water in the United States, County-Level Data.

[192] "Impaired" is the term used in Section 303(d) of the Clean Water Act to refer to water bodies where designated uses are not fully supported. Impaired waters contain some form of pollution.

Although sources of impact vary most are related to land use decisions and development, including stormwater runoff. These challenges underscore the need for effective watershed management.

Within the Region, a number of jurisdictions and organizations have prepared watershed management plans[193] or inter-municipal agreements which are in various stages of implementation. A selection of these plans and planning processes is listed in Appendix E.

There is an inherent tension between planning at the regional scale and the home rule land use authority of local government. Most planning and zoning decisions are made by individual municipalities rather than at the watershed scale. The watershed scale is more appropriate for making decisions related to water quality and management. In many cases, municipalities and other entities that do participate in larger watershed management efforts have limited budgets and no authority to implement plan recommendations for the entire watershed.

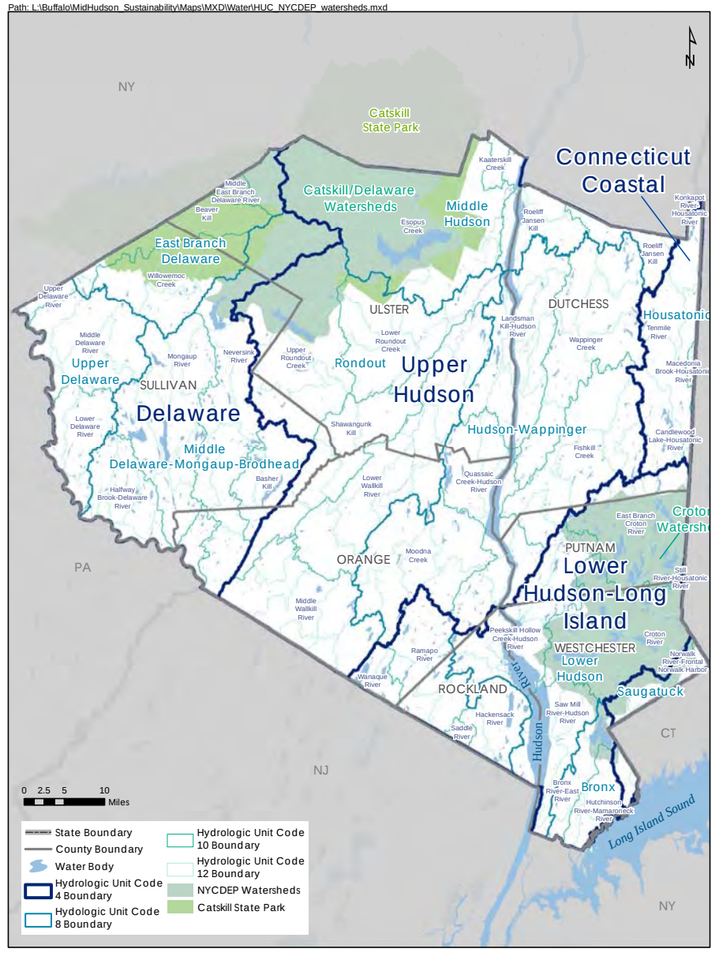


Figure 8.1 Watersheds of the Mid-Hudson Region: Delaware, Upper Hudson, Connecticut Coastal, and Lower Hudson-Long Island

[193] Watershed plans provide a framework for evaluating existing conditions and needs, and prioritizing action items for managing and protecting water resources. Planning from a watershed level rather than a municipal level is more desirable for managing water resources and the impacts of water use on the natural environment; although administratively, more enforcement and planning tools are available to municipal entities than existing watershed entities in the Region. Watersheds usually do not fit neatly within political boundaries, so watershed planning entails collaboration among multiple political entities.

8.1.1 Water Use

Water use is defined as "water that is withdrawn for a specific purpose, such as for public supply, domestic use, irrigation, thermoelectric-power cooling, or industrial processing."[194] Water that is removed from the available supply and not returned to its source watershed is said to have been used consumptively (or consumed).[195] Reduced consumption directly increases the available water supply, can save energy required for treatment, reduce new infrastructure needs, and reduce impacts to stream flows and groundwater resources.

Approximately 70 percent of the Region's population is served by public water systems, with 30 percent of the population on self-supply (typically private groundwater wells).[196] Table 8.1 shows the water withdrawals by sector in the Region. Note that these figures include withdrawals to serve NYC (included as Public Supply).

> Much of the existing infrastructure is old and in need of repair or, in some cases, replacement… In 2008, for example, the Region's clean water and sewer infrastructure investment needs were estimated to be approximately $2.75 billion, with Westchester, Rockland and Putnam's request totaling about $1.4 billion alone.
>
> SOURCE: REDC Economic Development Strategy: http://srdc.msstate.edu/set/files/mid_hudson_ny_ed_strategic_plan_notes.pdf

8.1.2 Water Supply and Wastewater Infrastructure

Water and wastewater infrastructure include water sources (e.g., reservoirs and wells), treatment systems for potable water, potable water distribution systems, wastewater collection systems, and wastewater treatment systems.

The Mid-Hudson Region has well-developed water and wastewater infrastructure, but considerable maintenance is needed to ensure continuing functionality. Over the next 20 years, NYS needs to spend at least $28.7 billion on drinking water treatment infrastructure[197] and $36.2 billion on wastewater infrastructure.[198] Many of these investments are needed to meet regulatory mandates to protect public health, such as the Disinfection Byproduct Rule and the Surface Water Treatment Rule, and are not expected to result in notable energy or water conservation benefits.

The primary funding most municipalities can currently draw upon to implement infrastructure projects are loans from the NYS Environmental Facilities Corporation and municipal bonds, which are another form of borrowing. The USDA Water Environmental Programs provide loans, grants, and loan guarantees for small municipalities with populations under 10,000.[199] However in most if not all cases, grants and loans still require a considerable local match to fully fund the capital improvement. Local revenue generation to pay for the improvement or amortize a municipal bond is subject to property tax limitations that may result in municipal jurisdictions deferring the project, incurring higher repair/replacement costs.

Table 8.1 Water Withdrawals Per Sector (MGD)1

Location	Public Supply	Domestic Supply	Industrial	Irrigation	Livestock	Aqua-culture	Mining	Thermo-electric
Dutchess	22.60	7.62	3.57	1.14	0.18	0.31	3.25	0.00
Orange	33.07	5.75	9.14	1.81	0.36	0.00	0.81	804.15
Putnam	105.23	4.91	0.71	0.44	0.00	0.00	0.09	0.00
Rockland	26.36	0.80	5.51	0.60	0.00	0.00	1.36	972.84
Sullivan	97.68	2.23	0.78	0.59	0.21	5.82	0.44	0.00
Ulster	458.33	6.89	1.43	1.63	0.09	3.33	0.77	0.00
Westchester	30.27	2.24	22.51	2.28	0.01	0.00	0.00	2471.68
Region	**773.54**	**30.44**	**43.65**	**8.49**	**0.85**	**9.46**	**6.72**	**4248.67**
% of Total	**15.1**	**0.6**	**0.9**	**0.2**	**0.0**	**0.2**	**0.1**	**83.0**

Source: USGS, 2005. Estimated Use of Water in the United States, County-Level Data.

194 USGS, 2005. Estimated Use of Water in the US, Circular 1344

195 The amount of water used is typically less than water withdrawn (or water produced, in other parlance). A portion of the water withdrawn will not reach its end users due to losses during storage and distribution (leakage, evaporation, etc.). When water is withdrawn from an available supply, part of the withdrawal will evaporate, another part will return to the watershed from where it was withdrawn, and yet another part may return to another watershed or the sea.

196 USGS, 2005. Estimated Use of Water in the US, County-Level Data. http://water.usgs.gov/watuse/

197 NYSDOH, 2008. Drinking Water Infrastructure Needs of New York State. http://www.health.ny.gov/environmental/water/drinking/docs/infrastructure_needs.pdf

198 NYSDEC, 2008. Wastewater Infrastructure Needs of New York State. http://www.dec.ny.gov/docs/water_pdf/infrastructurerpt.pdf

199 USDA, 2013. Water and Environmental Programs. http://www.rurdev.usda.gov/UWEP_HomePage.html

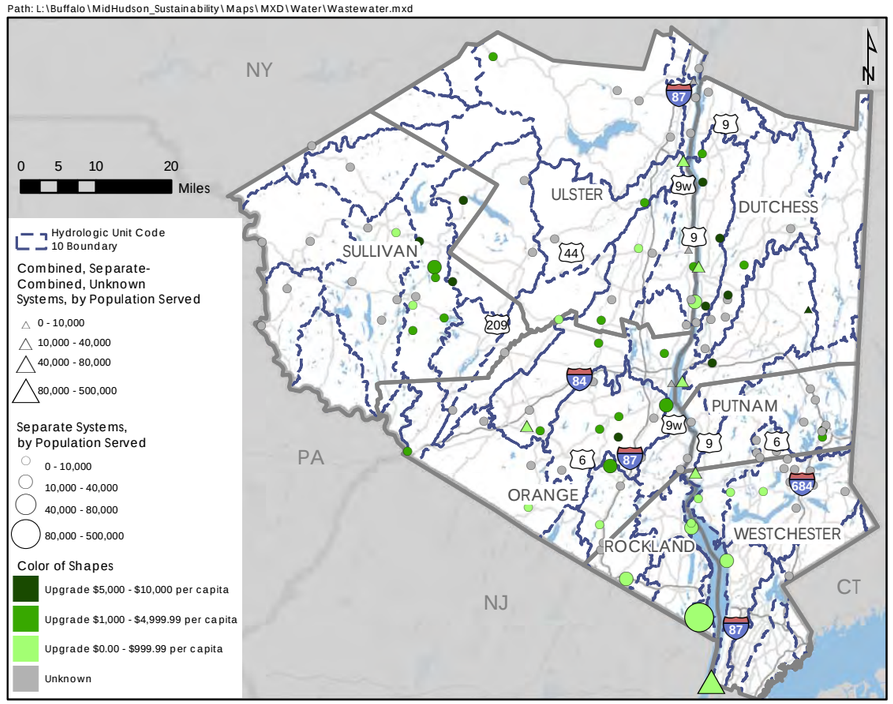


Figure 8.2 Wastewater Treatment Upgrade Needs as of 2004[203]

Water Supply

There is considerable potential to reduce water withdrawal through leak reduction and efficiency improvements at potable water treatment plants[200] and in distribution systems, because typical systems lose 10 percent or more of their water to leakage. A recent study of 21 water supply systems reported average losses of over 20%, with losses greater in smaller systems (those serving fewer than 50,000 people).[201] Upgrades that would reduce leaks and improve overall efficiency often require large capital expenses. [202]

Wastewater Treatment

Figure 8.2 shows where wastewater infrastructure improvements are needed. Capital improvement needs are weighted based on the population served by the individual facility, the condition of existing facilities, available financing, and the ability of the applicant to complete the project.

There is no precise data available on what portion of the Region is serviced by sewers. According to county GIS data, approximately 12.5 percent of the Region's area is serviced by sewers. Assuming sewer areas correlate with the population on public water supply, then approximately 78 percent of the Region's population lives within an area served by sewer, and approximately 22 percent of the population uses septic wastewater treatment. This estimate should be viewed with caution in the absence of truly comprehensive data.

Energy Consumption for Water and Wastewater Treatment

In the US, water pumping, distribution, treatment accounts for 13 percent of total electricity use, or 520 million MWh (equivalent) annually.[204] Electrical consumption for wastewater treatment alone represents

200 US EPA, 2010. Control and mitigation of drinking water losses in distribution systems. Office of Water. http://water.epa.gov/type/drink/pws/smallsystems/upload/Water_Loss_Control_508_FINALDEc.pdf

201 American Waterworks Association, 2011. Validated water audit data for reliable utility benchmarking. http://www.awwa.org/Portals/0/files/resources/water%20knowledge/water%20loss%20control/VALIDATED%20WATER%20AUDIT%20DATA%20FOR%20RELIABLE%20UTILITY%20BENCHMARKING.pdf

202 NYSERDA, 2010. Water & Wastewater Energy Management. http://www.nyserda.ny.gov/Page-Sections/Commercial-and-Industrial/Sectors/Municipal-Water-and-Wastewater-Facilities/~/media/Files/EERP/Commercial/Sector/Municipalities/best-practice-handbook.ashx

203 NYSDEC, 2008. Wastewater infrastructure needs of NYS. http://www.dec.ny.gov/docs/water_pdf/infrastructurerpt.pdf

204 American Council for an Energy-Efficient Economy, Alliance for Water Efficiency, 2011. Addressing the Energy-Water Nexus, A Blueprint for Action and Policy Agenda.

Table 8.2 Water Quality Impairments

Location	Number of Impaired Streams or Water Bodies	Total Assessed	Percent Impaired of Total Assessed	Assessed/ Total
Dutchess	3	15	20.0	15/108
Orange	3	22	13.6	22/155
Putnam	10	24	41.7	24/103
Rockland	5	15	33.3	15/48
Sullivan	6	78	7.7	78/234
Ulster	7	20	35.0	20/139
Westchester	16	29	55.2	29/110
Region	**50**	**203**	**24.63**	**203/897**

Source: NYSDEC, 2007. Waterbody inventory and priority waterbodies list.

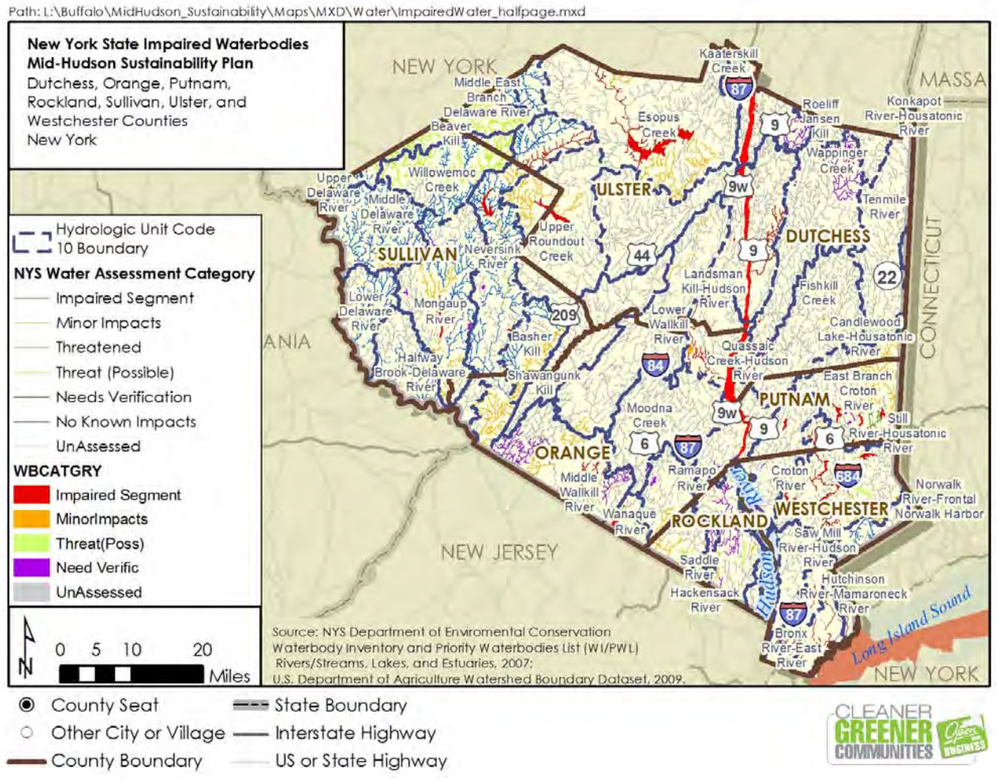


Figure 8.3 Impaired Water Bodies in the Mid-Hudson Region

about 3 percent of the US' entire electric demand, or 100 million MWh.[205] Electricity consumption alone could likely be reduced by at least 10 percent through equipment upgrades and leak repairs, and case studies show much greater savings potential for wastewater treatment plants.[206] Large scale studies show energy use reduction potential of 5-25% in many systems.[207] This would save millions of dollars and represent a proportional reduction in GHG emissions.[208]

> Wastewater treatment represents 21% of the electricity costs for the City of Kingston, or $335,992 per year.

8.1.3 Water Quality

NYSDEC monitors surface water quality in compliance with the Clean Water Act Section 303(d). When a water body is determined to be severely impaired, a Total Maximum Daily Load (TMDL) plan must be created to reduce impairment.[209] The TMDL process requires identification of the source of impairment and enactment of a remediation plan to improve water quality.

Impaired waters in the Region are shown in Figure 8.3 and distribution of impaired waters across the Region is presented in Table 8.2. Note that not all water bodies have been assessed.

To assess water quality in streams, NYSDEC also conducts biological monitoring of the ecological community that live in the streams. Biomonitoring provides a holistic evaluation of water quality based on cumulative impacts over time, and is therefore relevant to the health of wildlife, fisheries, drinking water, recreation and other human uses. Table 8.3 summarizes the results of biomonitoring.

Table 8.3 Water Quality Biomonitoring

Location	Number of Stream Reaches (moderate to severe)	Number of Stream Reaches Assessed/Total
Dutchess	27	27/118
Orange	54	54/164
Putnam	22	22/53
Rockland	15	15/41
Sullivan	4	4/122
Ulster	56	56/409
Westchester	90	90/195
Region	**268**	**258/1102**

Source: NYSDEC, 2012.

Some reservoirs and aquifers that provide drinking water have been impacted by human activities. Contaminants include siltation and other stormwater runoff impacts, industrial discharges, agricultural chemicals, and residential waste. Reservoir watersheds, wellheads and groundwater recharge areas need to be protected to maintain water quality and ensure safe drinking water. One study shows that pesticides that are commonly used on turf were detected in the Croton River, one of the watersheds that replenishes groundwater and provides drinking water to Westchester County communities and to NYC. [210]

In addition to surface water quality, groundwater is a very important resource, and quality is carefully monitored. While public groundwater wells are frequently tested for a range of potential contaminants, private wells are seldom sampled. Sampling is only required rarely—when new subdivisions are platted or, in some

Case Study: Watershed Management Saves Billions

The Catskill-Delaware system in Ulster, Greene, Sullivan, and Delaware Counties supplies 90% of NYC's water and requires only disinfection to safely supply over a billion gallons a day to eight million customers. Conversely, the Croton system, in Westchester and Putnam Counties, now requires filtration per the US EPA and NYSDOH. The new Croton Water Treatment Plant occupies 28 acres in the Bronx, and will cost $3 billion in capital costs and ongoing operational costs to supply only 10% of NYC's needs. Preserving the Catskill Delaware watersheds is a very high priority for NYC so that similar costly efforts will not be needed to filter water from these areas. Treating water from the Catskill-Delaware system would require the largest water filtration plant in the US and is estimated to cost between $8 and $12 billion to construct. NYC recognizes that the best way to continue to avoid filtration of the Catskill-Delaware system is to manage and protect land use in the watersheds and has invested $1 billion in watershed protection efforts in the Catskill-Delaware system.

SOURCE: http://blogs.ei.columbia.edu/2011/07/29/maintaining-the-superiority-of-nyc%E2%80%99s-

[205] US EPA, 2010. Energy Conservation Measures for Wastewater Treatment Facilities. http://water.epa.gov/scitech/wastetech/upload/Evaluation-of-Energy-Conservation-Measures-for-Wastewater-Treatment-Facilities.pdf

[206] US EPA, 2010. Evaluation of Energy Conservation Measures for Wastewater Treatment Facilities. http://water.epa.gov/scitech/wastetech/upload/Evaluation-of-Energy-Conservation-Measures-for-Wastewater-Treatment-Facilities.pdf

[207] Energy Sector Management Assistance Program, 2012. A Primer on Energy Efficiency for Municipal Water and Wastewater Facilities. http://water.worldbank.org/sites/water.worldbank.org/files/publication/ESMAP-EECI-WWU.pdf

[208] Precise numbers are difficult to estimate—as operating entities are diverse (private companies, municipalities, counties, etc.), there is no consistent system for tracking and reporting of energy use of water infrastructure.

[209] NYS listings are explained and can be downloaded at: http://www.dec.ny.gov/chemical/31290.html

[210] USGS, 2002. Concentrations of Pesticides and Pesticide Degradates in the Croton River Watershed in Southeastern New York.

Wetlands in the Region

Wetlands (swamps, marshes, bogs, and similar areas) are areas saturated by surface or ground water sufficient to support distinctive vegetation adapted for life in saturated soil conditions. In the Region there are two main types of wetlands: tidal wetlands, and freshwater wetlands. These wetlands provide the following benefits:

- Serve as natural habitat for many species of plants and animals
- Provide areas of recreation for the public (hunting, fishing, etc.)
- Provide surface and groundwater protection from pollution through filtration
- Absorb the forces of flood and tidal erosion to prevent loss of upland soil[1]

Wetlands are protected explicitly by the federal Clean Water Act of 1972. The Army Corps of Engineers protects all wetlands that are connected to regulated Waters of the US. NYS regulates tidal wetlands via the Tidal Wetland Act of 1973. The State preserves fresh water wetlands in accordance with the Freshwater Wetlands Act of 1975. This Act aims to preserve, protect and conserve freshwater wetlands and their benefits, consistent with the general welfare and beneficial economic, social and agricultural development of the state.[2] The national government also protects wetlands through its Wetlands Conservation provision that prohibits USDA program participants from converting wetlands on their agricultural operations to cropland, pasture, or hay land unless the wetland acres, functions, and values are compensated for through wetland mitigation.[3]

1. http://www.dec.ny.gov/lands/305.html
2. http://www.dec.ny.gov/lands/4937.html
3. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/wetlands/

cases, during transfer of property. Additionally, NYSDEC operates the Water Well program, to sample private wells periodically as part of a state-wide groundwater quality initiative.[211]

Westchester County and Dutchess County have made commitments to managing the quality of groundwater resources. Dutchess County, for example, maintains a regional groundwater level monitoring network, has issued guidance for minimum sustainable densities for individual septic systems, and has developed a model aquifer management zoning ordinance for towns to adopt. Dutchess County recently sampled 250 widely distributed domestic wells to help inform policy on domestic well management, road salt use, and septic system management.

> "Westchester County now requires that any real estate transaction involving a private well include well test results. Results of the tests are archived by the County Health Department and represent an important database. If other counties in the Region adopt similar legislation the regional groundwater supplies will be measured and monitored."

Westchester County now requires that any real estate transaction involving a private well include well test results. Results of the tests are archived by the County Health Department and represent an important database. If other counties in the Region adopt similar legislation the regional groundwater supplies will be measured and monitored. Water consumption for cooling in thermal electric power plants also affects water quality in the Region. The Indian Point nuclear reactor, the largest energy source in the Region producing over 2,000 MWh per day, withdraws 2.5 billion gallons per day from the Hudson River. Indian Point may have to recycle its cooling water to receive a new operating permit.[212] These withdrawals impact waterways by warming receiving waters, and also result in mortality to fish that become impinged on intake screens.

New York City regulates portions of the Region and NYC is under a mandate to protect surface water quality. A Memorandum of Agreement between many agencies and organizations underlies the watershed protection program in the NYC drinking water supply watersheds. Smaller municipalities also implement certain measures to preserve water quality in some drinking water supply watersheds.

In addition, the NYS Department of State along with the NYSDEC's Hudson River Estuary Program are both in support of the development of 37 inter-municipal watershed management plans.[213]

[211] USGS, 2013. Ambient Groundwater Quality Monitoring. http://ny.water.usgs.gov/projects/305b/

[212] NYCDEC, 2010. A Summary of the Adjudicatory Proceedings. http://www.dec.ny.gov/docs/legal_protection_pdf/indianir.pdf

[213] NYSDOS 2010. Inter-municipal Watershed Management Program. http://www.dos.ny.gov/communitieswaterfronts/pdfs/accomplishmentRpts/3WatershedAccomplishments.pdf

8.1.4 Stormwater

Regional infrastructure for stormwater management includes systems for drainage and, increasingly, systems that treat and infiltrate stormwater.

Urban areas contain large areas of impervious surfaces, such as paving or roofs. Whereas in natural environments water infiltrates into the soil, impervious surfaces convey stormwater, along with its acquired pollutant load, to storm drains which often discharge directly to surface waters. Additionally, development often significantly compromises or destroys wetlands which act as natural buffers during flood events. The destruction of wetlands significantly limits the water storage capacity of an area and increases susceptibility to flood. The EPA estimates that a 1 percent loss in wetlands lowers the storage capacity of that watershed by 7 percent.[214]

Combined Sewage Overflow

A significant portion of the runoff generated in cities, villages and other areas with sewers, flows into sanitary sewer lines (also referred to as combined sewer systems). During rainstorms, wastewater plants connected to these systems are overwhelmed by the resulting volume of water and the overflows are discharged directly to a receiving water body as diluted raw sewage. When sewers overflow with stormwater, the release of effluent is called a Combined Sewage Overflow (CSO). Overflows can also occur as a result of infiltration and inflow that results when groundwater infiltrates or is directly discharged into sanitary sewer lines due to intentional pumping (pumping a basement) or unintentional cracks and leaks in pipes.

> "The destruction of wetlands significantly limits the water storage capacity of an area and increases susceptibility to flood. The EPA estimates that a 1 percent loss in wetlands lowers the storage capacity of that watershed by 7 percent."

The Wet Weather Water Quality Act of 2000 requires combined sewer systems to conform to the requirements in the EPA's National CSO Control Policy. The requirements of the Control Policy include implementing Nine Minimum Controls[215] and developing a Long-Term Control Plan.

Wastewater overflows from CSOs are a large source of water pollution in the Region, and the projected costs to fix these problems are a daunting challenge. In the Mid-Hudson Region, systems in the cities of Kingston, Newburgh, Poughkeepsie and Yonkers are designated CSOs and they are required to develop and implement Long Term Control Plans to remediate these problems.

Impervious Surface Cover

One key factor for assessing the health of local watersheds and streams is impervious surface cover. Impervious cover virtually eliminates groundwater recharge, which causes changes to streams, including a reduction in the base flow that is critical for supplying streams in dry weather. Where impervious surfaces are interconnected and rapidly drained, they can create heat stress

[214] Transition to Green, 2008. Obama Administration Recommendations by Environmental Groups. http://gristmill.grist.org/images/user/6337/transition_to_green_full_report.pdf

[215] US EPA, 1995. Combined Sewer Overflows: Nine Minimum Controls. http://nepis.epa.gov/Exe/ZyNET.exe/200041XPTXT?ZyActionD=ZyDocument&Client=EPA&Index=1995+Thru+1999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A\zyfiles\Index%20Data\95thru99\Txt\00000002\200041XP.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h|-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p|f&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL

Path: L:\Buffalo\MidHudson_Sustainability\Maps\MXD\Archive\Water\General_Impervious_NYCDEP_watersheds.mxd

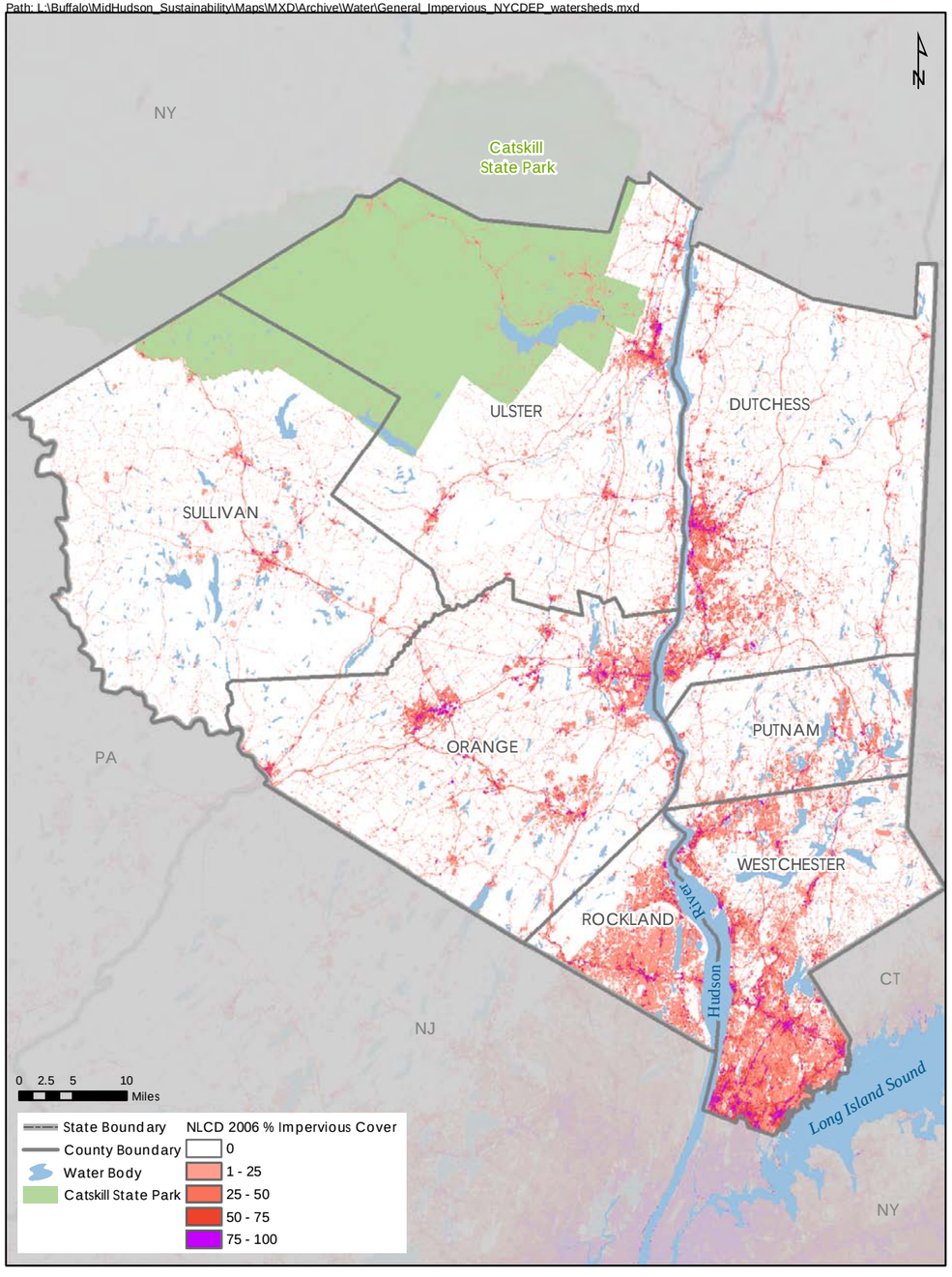


Figure 8.4 Impervious Surface Cover in the Mid-Hudson Region

Path: L:\Buffalo\MidHudson_Sustainability\Maps\MXD\Water\HUC_ImperviousGreaterThan10_NYCDEP_watersheds.mxd

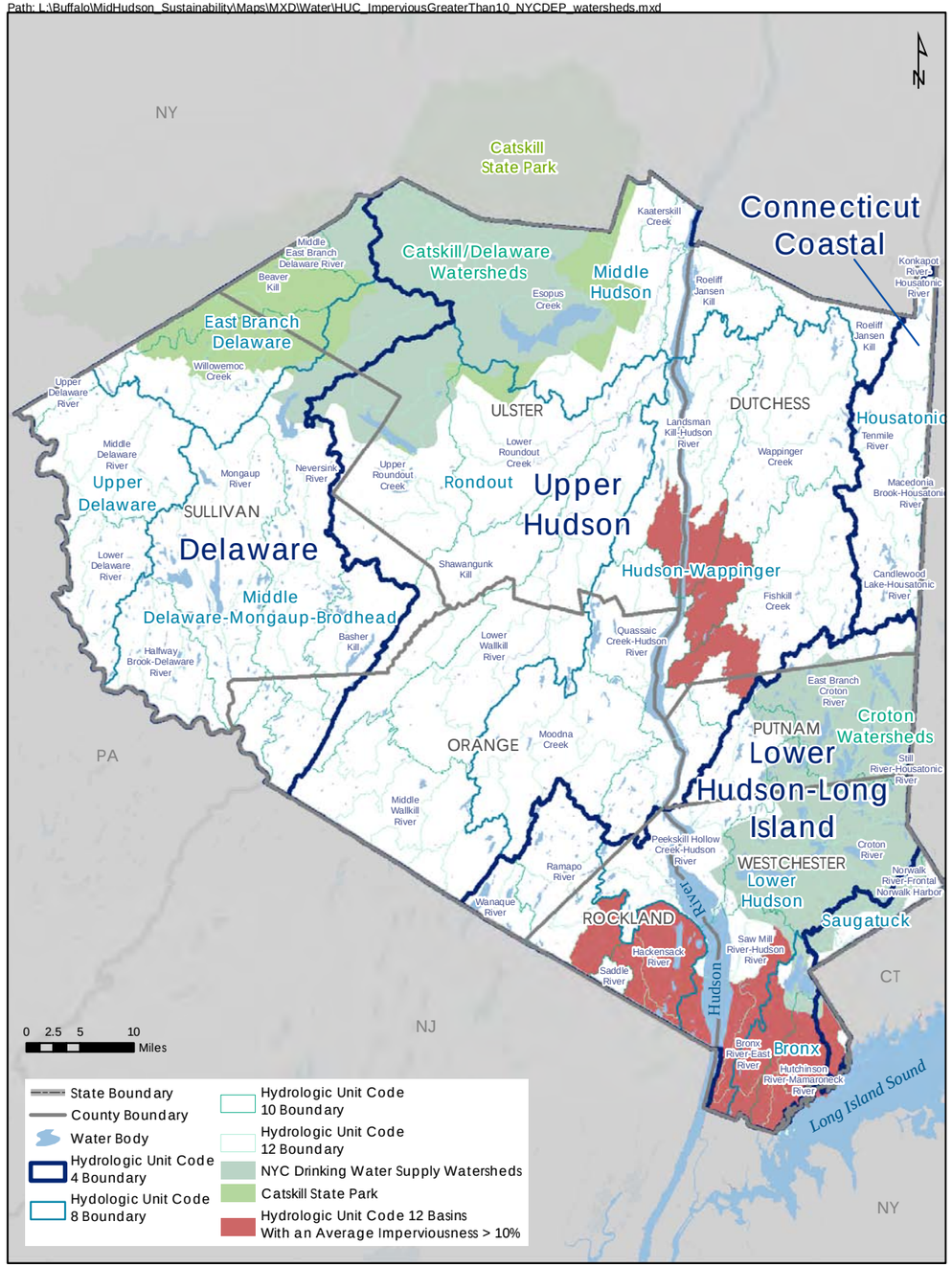


Figure 8.5 HUC 12 Watersheds with > 10% Impervious Cover

and waste transfer into rivers and lakes, which impact biological communities and water quality. These impacts occur wherever there are impervious surfaces; however, when watersheds for smaller streams exceed about 10 percent impervious cover, the water quality and stream health impacts become more significant.[216] Figure 8.4 shows impervious surface cover in the Region.

Figure 8.4 indicates that throughout the Region, significant portions of certain watersheds have exceeded the 10 percent imperviousness threshold, sometimes by a substantial margin. Figure 8.5 shows HUC 12 watersheds with average impervious surface cover greater than 10%, corresponding largely to the more highly-urbanized parts of the Region. By first focusing watershed improvement efforts on headwaters and in localized areas with imperviousness from 10-25%, and then moving on to more developed areas, substantial water quality improvements can be realized.

Soil Loss and Chemical Transport

In addition to impacts from urban areas, agricultural soil exposure and management can have negative impacts on water quality. Open fields, and particularly newly plowed fields, can result in runoff over bare soil directly to surface waters during storm events. Additionally, animal waste can be conveyed to surface waters and fertilizer over use can result in the discharge of nutrients that lead to blooms of algae. Release of toxic insecticides can also disrupt aquatic food chains. Sustainable agriculture methods, discussed in Chapter 7, can help reduce these impacts.

Dams, Bridges and Culverts

New York State's dam infrastructure is aging and in need of repair. The design lives of many dams have been exceeded. Many dams were not built, nor are being maintained according to today's engineering standards. There are 1,372 NYSDEC inventoried dams in the Mid-Hudson Region.[217] Of those dams, 128 are classified as high hazard (class C), 250 as intermediate (class B), and 921 as low (class A). Hazard rating refers to the probability of loss of human life should a dam failure take place. At a minimum, assurance is needed that the 378 class B and C dams in the Mid-Hudson Region are either scheduled for controlled decommissioning or are functionally secure.

There are also thousands of bridges and culverts in the Mid-Hudson Region. Most of these were constructed many years ago. Some are in poor condition, and many are not sized adequately to pass future predictions of floodwater flows. Undersized culverts are often the source of floodwater or ice dam restrictions which can cause flooding, culvert or road washouts, and downstream flood release surge damage, all of which can threaten life and property during major storm events, while hampering emergency flood response.

Figure 8.6 Damage to Winona Lake Spillway in Orange County on Quassaick Creek

[216] The Stormwater Center, 2013. The Impervious Cover Model. http://www.stormwatercenter.net/monitoring%20and%20assessment/imp%20cover/impercovr%20model.htm
[217] NYSDEC, 2013. NYS Dams Inventory. http://www.dec.ny.gov/pubs/42978.html

8.1.5 Environmental Justice Considerations

The siting of wastewater treatment facilities is a major EJ issue. Wastewater treatment facilities have been known to cause health impacts and can also be a public nuisance due to the smells they emit.[218]

Additionally, parts of the Region are vulnerable to flooding and other water stresses. The frequency and severity of severe storms, flooding, and drought is expected to increase due to climate change, as noted in Chapter 2. The impacts these trends may have on the Region—and specifically on vulnerable groups such as EJ communities—must be anticipated and mitigated.

The Plan addresses EJ in the water sector in multiple ways. The first is through the recommendation to improve existing infrastructure to conserve water, which can improve performance and avoid the need to site new facilities. When siting new facilities, decentralizing infrastructure can reduce the overall impact of individual facilities, and make communities more directly responsible for the waste they generate. Additionally, watershed management plans and smart growth strategies can help to protect watersheds and mitigate impacts such as flooding.

8.2 Climate Change, Water

8.2.1 GHG Emissions

Greenhouse gas emissions data from energy used in treating and distributing water are included as part of overall energy-related GHG emissions, and are presented in Chapter 5.

Additional water-related GHG emissions occur when organic waste material in wastewater degrades during the treatment process, emitting both methane and nitrous oxide. The amount of methane and nitrous oxide emitted from wastewater depends on the wastewater treatment processes used.

Wastewater treatment emissions are approximately 222,873 MTCO2e (see Table 8.4). These data should be reviewed with caution, as they are estimated on a per capita basis and thus do not directly reflect the actual practices in place in the Mid-Hudson Region's wastewater treatment plants.

8.2.2 Climate Change Vulnerability—Water

Water resources in the Mid-Hudson Region may be subject to a variety of impacts from climate change. This section examines the effects climate change may have on the Region's water quality, supply, and infrastructure. Water quality may be affected by:

- Changes in water temperatures (which correlate with changes in dissolved oxygen levels and habitat value)
- More frequent sewage overflows from CSOs and inflow/infiltration during intense precipitation events

Table 8.4 Wastewater Treatment Emissions (MTCO2e) By County, 2010

Location	CO_2	CH_4	N_2O	Total
Dutchess	-	20,009	8,933	28,942
Orange	-	25,076	11,195	36,270
Putnam	-	6,707	2,994	9,701
Rockland	-	20,964	9,359	30,323
Sullivan	-	5,216	2,329	7,544
Ulster	-	12,275	5,480	17,754
Westchester	-	63,838	28,500	92,338
Region	**-**	**154,083**	**68,789**	**222,873**

Source: Attachment 1 Regional GHG Inventory

[218] Steutz and Frechen 2001. Odours in Wastewater Treatment. http://www.iwapublishing.com/pdf/contents/isbn1900222469_contents.pdf

Table 8.5 Summary of Water Related Climate Effects

Asset	Climate Impact	Climate Effect	Description
Water Quality	Extreme heat; Drought; Warmer winters	Lower Stream Flows	Lower stream flows could occur from periods of drought, higher evaporation rates, and warmer winters with less snow and an earlier peak flow. Lower stream flows can increase the concentration of water pollutants and lead to warmer water temperatures.
	Sea level rise and flooding	Loss of Wetlands and Riparian Buffers	Wetlands and riparian buffers could be lost and/or damaged by sea level rise and flooding.
	Extreme heat; Drought	Reduced Water Supply	Water supplies most vulnerable to climate change include run-of-the-river systems and communities dependent on small aquifers without a backup water supply. Higher evaporation rates due to higher temperatures could stress the Region's water supplies.
	Drought, Sea lever rise	Saltwater Contamination of Water Supplies	Historical periods of low flow indicate the salt front location on the Hudson is susceptible to shifting up the Hudson River, threatening contamination of water withdrawals from the Hudson River at Poughkeepsie.
Water Supply	Periods of drought and accompanying decline of water tables may result in near-shore wells that currently extend into fresh water to withdraw the intruding salt water.	Damage to wastewater and sewage treatment plants, and pump stations	Wastewater and stormwater treatment plants and pump stations are especially vulnerable to sea level rise and flooding since they are typically located along rivers.
	Increased precipitation; Storm events	Increased flooding resulting from undersized stormwater management infrastructure	Stormwater management systems, such as culverts, inlets, and drains, may be undersized for larger storm events. Areas with large amounts of impervious surfaces may be particularly vulnerable.
	Sea level rise; Flooding; Storm events	Increased risk of damage to dams	Increased flooding, sea level rise, and storm events may contribute to the risk of dam failures.

- More frequent and intense late summer droughts that cause lower stream flows
- Salt water intrusion
- Rise in sea level causing erosion of protective natural buffers such as wetlands and destruction of wastewater infrastructure in floodplains
- Direct impacts from flooding[219]

For the full list of effects see Table 8.5.

As shown above, climate change could impact numerous elements of natural and human water systems. Particularly relevant to the Mid-Hudson Region, a shifting salt front could threaten some communities' water supply along the Hudson Estuary. Approximately 75,000 people rely on drinking water from the Hudson River withdrawal at Poughkeepsie, as do another 10,000 from the Town of Esopus. During a severe drought in the 1960s, the salt front moved up to the intake point for the Town of Poughkeepsie. A combination of lower flows and sea level rise makes these water intakes for the City of Poughkeepsie and the Town of Esopus potentially vulnerable in the future to salt contamination, compromising the quality of the water.[220] New York City's backup supply in New Hamburgh is also vulnerable.

Currently, there are only four permitted combined sewer systems in the Region: Kingston, Poughkeepsie, Newburgh, and Yonkers. Without any major upgrades to sewer and stormwater infrastructure, CSOs will occur more often, releasing even more contaminants into the Hudson and its tributaries.

Wastewater treatment plants (WWTPs), also referred to as sewage treatment plants (STPs) are typically located at the lowest point in a landscape so the wastewater can be conveyed via gravity. This makes them highly vulnerable to flooding. Such facilities often have flood protection systems in place; however, these systems may not be able to withstand flooding combined with sea level rise. Table 8.6 lists WWTPs that are vulnerable to flooding because:

- They are located in an existing FEMA 100-year floodplain
- With 18 inches of sea level rise, they will be located in a 100-year floodplain
- They are vulnerable due to storm surge from a category III hurricane at present-day sea levels
- They are vulnerable due to storm surge from a category III hurricane with 18 inches of sea level rise

These scenarios are intended to highlight potential vulnerabilities, and should be viewed in light of facility-specific vulnerability assessments.

Table 8.6 Wastewater Facilities within Climate Hazard Zones

	FEMA Floodplain Existing (2011)	2080 Floodplain	Cat. 3— Existing (2012)	Cat. 3 2080
New Rochelle STP	✖	✖	✖	✖
Yonkers Joint WWTP	✖	✖	✖	✖
Mamaroneck WWTP	✖	✖	✖	✖
Ossining Wastewater Treatment PLANT	✖	✖	✖	✖
Joint Regional Sewerage Board WWTP			✖	✖
Haverstraw Joint Regional Sewage Treatment Plant			✖	✖
Stony Point (T) STP		✖	✖	✖
City of Poughkeepsie Water Pollution Control Plant		✖	✖	✖
Ulster (T) SD STP	✖	✖		
Kingston (C) Sewers & WWTP	✖	✖		✖
New Paltz WWTP	✖	✖		
City of Newburgh Water Pollution Control		✖		✖
New Windsor STP		✖		✖
Wallkill (T) STP	✖	✖		
Goshen WWTP	✖	✖		
City of Rye DPW/Blind Brook WWTP	✖	✖		✖

Source: Attachment II: Climate Change Vulnerability Assessment

[219] Although no single weather event can be attributed to climate change, the frequency and impact of catastrophic weather events is expected to increase. The preliminary estimates of Hurricane Sandy's cost to the Region suggests the value in preparing for severe weather events.

[220] NYSERDA, 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State.

8.3 Objectives

The Mid-Hudson Region is blessed with a relative abundance of both surface and groundwater. With effective water management the Region can maintain and improve water quality while also competitively differentiating itself from other parts of the country, helping attract investment and grow the economy. As such, the Plan's objectives for the water focus area are:

WA1: Increase Available Water Supply by Reducing Water Consumption

- Improve water efficiency and conservation by upgrading and maintaining infrastructure. In addition to saving water, these efforts reduce energy use, GHGs, and lower operating costs for water supply and treatment systems.
- Include increased focus on water efficiency in building codes and existing building retrofit programs.

WA2: Reduce Energy Use and GHG Emissions at Water and Wastewater Treatment Facilities

- Improve energy efficiency of treatment processes, equipment, and distribution systems to reduce the overall energy footprint and operating costs of the Region's water and wastewater infrastructure.

WA3: Improve the Reliability of Water Treatment and Distribution Systems and Wastewater Treatment and Collection Systems

- Strengthen asset management and planning for water and wastewater infrastructure to secure more reliable systems and head off unexpected and costly investments.
- Repair existing infrastructure and enforce sump pump removal to reduce the load on wastewater treatment plants.
- Incentivize local funding for preventative maintenance and capital improvements by removing impediments to local tax revenue generation.

WA4: Reduce Impervious Surface Cover and Connect Permeable Surfaces to Infiltrate and Treat Stormwater

- Invest in and promote green infrastructure and low-impact development strategies to increase stormwater infiltration and detention, increase groundwater recharge, and reduce loads on treatment plants.

WA5: Protect Habitat and Water Quality

- Improve regional waters to provide a healthy habitat for wildlife, a clean drinking water supply, opportunities for recreation, and sufficient supply for economic sectors.
- Implement source protection and maintain aquatic baseflow needs and watershed carrying capacity.

WA6: Encourage Watershed Management Planning

- Implement coordinated and enforceable watershed management programs within the Region to maintain or improve watershed quality including groundwater resources and ensure long-term availability of water. Watershed management will help preserve the integrity and quality of groundwater resources, which are difficult or impossible to remediate once they are contaminated.

8.4 Indicators

Table 8.7 presents a series of sustainability indicators for the water focus area. These indicators should be used by planning units, municipalities, and private operators to track performance in achieving the Region's materials management objectives. The data sources and calculations methodologies for each metric can be found in Appendix B.

8.4.1 Metrics and Targets

Table 8.7 Indicator Inventory: Tier 1 Indicators

Objective	Metric	Current Value	Target 2020	Target 2035	Target 2050
WA1: Increase available water supply by reducing water consumption					
1a.	Per capita water withdrawals for domestic self-supply	75 gpcd	Reduce by 25%	Reduce by 45%	To Be Determined (TBD)
1b.	Per capita water withdrawals for public supply	95 gpcd	Reduce by 25%	Reduce by 45%	Reduce by 60%
WA2: Reduce the energy usage and GHG emissions at water and wastewater treatment facilities					
2a. Reduce energy use at WWTPs	Energy use per gallon of wastewater	2,800 kWh/ MGD	Reduce by 10%	Reduce by 25%	Reduce by 40%
WA3: Reduce impervious surface area and increase connectivity of permeable surfaces					
3a. Reduce overall watershed impervious cover	HUC 12 watersheds with >10% impervious cover	18 (in 2006)			
10.1% (in 2006)	Hold at Current	Reduce by 20%	TBD		
WA4: Improve the reliability of water and wastewater infrastructure					
4a. Reduce potable water supply costs	Annual expenditure per volume of potable water treated	$0.27 per gpd	Hold at Current	Reduce by 20%	TBD
4b. Reduce wastewater treatment costs	Annual expenditure per volume of wastewater treated	$1.33 per gpd	Hold at Current	Reduce by 20%	TBD
WA5: Protect habitat and water quality					
5a. Stream/water body impairment	Percent of assessed 303(d) streams/water bodies that are impaired	24.6% (50 of 203)	20%	10%	5%
5b. Assess 303(d) streams/ water bodies	Percent assessed	22.6% (203 of 897)	35%	70%	100%
5c. Continue biomonitoring	Percent of streams assessed under biomonitoring program	23.4%	35%	70%	100%
WA6: Encourage watershed management planning					
	See Tier 2 indicators				

Table 8.8 Tier 2 Indicators

Objective	Metric (units)
WA1	Water loss rate for potable water supply systems throughout the Region (as a percent of annual supply)
WA2	Energy use per gallon of potable water produced (kWh per MGD)
WA2	Energy use per gallon of water treated for each individual wastewater treatment plant in the Mid-Hudson Region
WA4	Annual operating cost per unit of supply/treatment for each public and private water system
WA6	Percent of regional watershed area covered by a watershed management plan
WA6	7Q10 flow at point of consumption

8.4.2 Limitations and Tier 2 Indicators

The metrics and indicators recommended in Table 8.8 have certain inherent weaknesses, due largely to the availability and quality of data. Known limitations of metrics are summarized below:

WA1: Increase available water supply by minimizing water consumption

- Per capita water withdrawal data includes some commercial and light industry use.

WA2: Reduce the energy usage and GHG emissions at water and wastewater treatment facilities

- An average value of energy per unit water was calculated on the basis of a single NYSERDA study. The average was calculated by multiplying actual plant capacity by an average kWh/MGD figure for a range of plant capacities—therefore, the estimate is preliminary at best.
- No data were provided for potable water treatment energy use.

WA3: Reduce impervious surface area and increase connectivity of permeable surfaces

- Impervious surface data is of limited value at the HUC 12 scale, and should be used for local (sub-watershed) planning purposes only.

WA4: Improve the reliability of water and wastewater treatment

- Little information is known about the data collected from the Comptroller's office; it is unknown whether operating budget, debt repayment and other costs are included.

WA5: Protect habitat and water quality

- Impaired water body and biomonitoring data are high-quality. However, not all water bodies in the Region have been assessed.

WA6: Encourage watershed management planning

- Mapping analysis and a comprehensive inventory of watershed management plans are needed to calculate the percent of the Region currently under watershed management.
- The widespread use of the USGS StreamStats program to calculate 7Q10 discharge for each stream in the Region could provide an invaluable baseline for watershed management planning (see Table 8.8). Measuring discharge would also provide valuable baseline information for adapting to changing flood regimes and climate change.

8.5 Initiatives for Implementation

To achieve the Plan's objectives for water—reduce consumption, improve the efficiency and reliability of supply and treatment, improve watersheds and water quality—a comprehensive series of initiatives has been proposed (see Table 8.9) and is described in detail in Section 8.5. A preliminary ranking was completed to establish priority. High priority initiatives are those that impact multiple Plan focus areas while also scoring well against other prioritization criteria described in Chapter 3. Medium priority initiatives are those that do not have as broad an impact or score as highly.

Wherever possible, example projects or case studies have been given that typify the efforts needed to achieve the Plan's objectives. Note that examples provided are not intended to be comprehensive, but are simply ideas submitted during the planning process with sufficient information to illustrate the concepts being proposed. A List of Project Ideas containing all ideas submitted during the planning process can be found in Appendix C. Additional Resources to help individuals, local governments, or organizations with implementation can be found in Appendix D.

In Chapter 9, a series of strategic priorities for the Region are described, drawing from recommendations that arose in discussion among multiple Working Groups. These strategic priorities necessarily include initiatives that impact the water focus area.

8.5.1 Upgrade Infrastructure to Achieve Water and Energy Efficiency and Mitigate the Impacts of Climate Change

Water Efficiency and Energy Efficiency Upgrades

If less water is used, less water needs to be withdrawn, treated, and distributed. If less sewage is generated, less collection and treatment is needed. All of these processes require significant amounts of energy, in turn generating GHG emissions—so efficiency increases will reduce energy consumption, costs, and GHG emissions. Through equipment retrofits, leak detection, and other efforts, water infrastructure can be made more efficient, resulting in benefits to operators, consumers, and the environment.

One challenge is that reducing water use in municipal water systems causes a drop in revenues, providing a specific disincentive for water managers to move in this direction. This loss of revenue can be recovered by assuring water losses—including un-metered uses—are minimized, and that everyone pays a fair share. Additionally, lost revenues are offset partially by lower operating costs. Implementing a comprehensive annual water audit can help identify these losses and prioritize investments.[221]

Table 8.9 Initiatives for Implementation

	WA1: Reduce Consumption	WA2: Reduce GHGs	WA3: Reduce Impervious	WA4: Improve Reliability	WA5: Protect Quality	WA6: Watershed Plans
High-Priority Initiatives						
Upgrade infrastructure to achieve water and energy efficiency and mitigate the impacts of climate change	✖	✖	✖	✖	✖	
Implement LID and green infrastructure		✖	✖		✖	✖
Medium-Priority Initiatives						
Continue to create and support watershed management plans and programs			✖		✖	✖
Strengthen water conservation and reuse using education, audits, and codes	✖	✖	✖			
Benchmark energy use of water infrastructure	✖	✖		✖		

[221] American Waterworks Association, 2013. Water loss control. http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx

Critically, limitations on municipal revenue generation have impacted infrastructure preventative maintenance and the financing of capital improvements. Alternative financing methods or removal of the impediments need to be investigated to facilitate re-investment and ongoing preventative maintenance programs.

Renewable Energy Production

Wastewater treatment processes generate considerable volumes of sludge (biosolids), which can be used to create energy through a process called anaerobic digestion. Anaerobic digestion creates methane which is a fuel that can be used to generate electricity and power parts of the wastewater treatment plant or nearby facilities. Anaerobic digestion is also beneficial in that it stabilizes biosolids for disposal in a landfill, for beneficial reuse, or for incineration.

Additionally, some water infrastructure presents opportunities for other renewable energy technologies, such as solar. Solar PV panels can be integrated into buildings, mounted over parking lots or closed reservoirs, or installed in vacant properties. It is important to note that shifting to solar and wind resources (as well as other renewable sources) reduce the need for once-through cooling, protecting fish and reducing thermal pollution.

Climate Hardening

Water infrastructure in the Mid-Hudson Region is often located in areas highly vulnerable to flooding. Projects are needed to identify and reduce risks faced by water infrastructure so as to better prepare the Region for the effects of climate change. This can include protecting low-lying treatment infrastructure from storm surges, flood-proofing pumps and other critical systems, integrating pumping infrastructure into stormwater and effluent outfalls, resizing and replacing culverts, and more. These projects would work well as part of an overall climate resilience strategy for the Region. In some cases, it may be necessary to retreat from particularly vulnerable locations. Climate vulnerability needs to be integrated into long-term planning and capital programs for water and sewer districts.

Example Projects

Culvert Analysis and Resizing

Proposed by the NYSDEC Hudson River Estuary Program, the Culvert Analysis and Resizing project would examine the Region's culverts and ditches to determine which systems are capable of handling the increased flow expected to occur with climate change. The Region is expected to see an increase in rainfall and major storm events as climate change progresses, and the current system of ditches and culverts is likely unable to handle such an increase in volume.

As a result of this project, local leaders and NYS will be better able to target funds to specific vulnerable locations to protect roadways and other facilities from flooding. This will help ensure cost-effective investment.

Mandatory Energy and Water Audits for Water Infrastructure

Local governments could implement policies requiring municipal and county-owned and/or managed water supply and wastewater treatment systems to undertake periodic water and energy audits. Ideally, policies will be coupled with a requirement for implementing conservation measures with a payback period under a defined threshold. Financing would need to be made available to mandate implementation.

8.5.2 Implement LID and Green Infrastructure

Low Impact Development is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features and minimizing imperviousness to create drainage that treats stormwater as a resource rather than a waste product.[222] Green infrastructure refers to natural or constructed stormwater management systems that emulate the function of an undisturbed catchment, by working to infiltrate stormwater, and work as part of an overall LID strategy. LID and green infrastructure provide an alternative to conventional storm sewers or combined sewers.

The benefits of LID and green infrastructure go far beyond stormwater management, and include groundwater recharge, the creation or conservation of habitats, water quality improvements, and contribution to healthier, more beautiful neighborhoods.

NYSDEC maintains a list and map of green infrastructure projects in the Mid-Hudson Region on its website (http://www.dec.ny.gov/lands/58930.html). Project summaries can be submitted to NYSDEC via email for inclusion in this list.

The NYSDEC's Hudson River Estuary Program recently conducted a survey on barriers to green infrastructure implementation in the Mid-Hudson Region. Over 120 completed responses from a wide range of green infrastructure practitioners were received. Respondents cited cost, lack of knowledge, and resistance from local, municipal officials as the top barriers to implementation of green infrastructure projects.

[222] US, EPA. Low Impact Development. http://water.epa.gov/polwaste/green/index.cfm

According to NYSDEC, green infrastructure projects include the following types:

- Rain Gardens
- Bio-retention Areas
- Vegetated Swales
- Green Roofs
- Porous Pavement
- Tree Plantings / Tree Pits
- Stormwater Planters
- Rain Barrels or Cisterns

Based on a preliminary review of the impaired water bodies map (Figure 8.3), priority areas for stream corridor and broader watershed improvements include:

- Esopus Creek
- Upper Neversink River
- Upper Rondout Creek
- Monagup River
- East Branch Croton River
- Croton River
- Quassaic Creek/Hudson River
- Middle Wallkill River
- Saw Mill River
- Hutchinson River
- Bronx River

This list should be validated as part of broader watershed management planning efforts.

Example Projects

Poughkeepsie Underwear Factory Demonstration Project

In 2013, Clearwater, Inc., Design Dynamics, LLC, Hudson River Housing, and other partners will construct a green infrastructure system at the historic Underwear Factory, adjacent to the Fall Kill Creek in the heart of the City of Poughkeepsie. The system will incorporate permeable pavement, modified tree pits, and a bio-retention area to capture and treat stormwater from the .75 acre site. The project will create new public green space along the creek with educational signage, which will complement the mixed-income housing and community space slated for the building, creating a sustainability hub in a distressed neighborhood.

Green Infrastructure and Watershed Resilience Project

Proposed in part by SUNY New Paltz, the Watershed Resilience Improvement project in the Saw Mill Brook Watershed is an example of a project in the Region that would promote green infrastructure. This project would implement and monitor the use of green infrastructure and stormwater management practices which are intended to improve watershed resiliency to climate change and flooding while improving water quality and restoring watersheds.

Through this project, the Saw Mill Brook Watershed would serve as an example of how the Region as a whole may adopt to adapt to climate change. The project will also help the university teach students in the Region about green infrastructure.

8.5.3 Continue to Create and Support Inter-municipal Watershed Management Plans and Programs

Comprehensive watershed management planning is needed to ensure that waters in the Region provide a healthy habitat for wildlife, a clean drinking water supply, opportunities for recreation, and sufficient supply for economic sectors. This must include protection of existing water resources and maintenance of aquatic baseflow needs and watershed carrying capacity. Critically, if water is managed properly, it can serve as an economic development asset.

The implementation of coordinated and enforceable watershed management programs would improve the long-term availability of water and maintain or improve watershed quality. Watershed management plans must identify specific and targeted measures to correct or avoid degradation of the resource. Priority watershed improvements will be targeted at:

- Reducing impervious surfaces
- Reducing pollution sources
- Improving wetland and stream habitat
- Managing stormwater through groundwater infiltration

Implementing targeted watershed improvements should be planned together with potable supply and wastewater capacity investments. Watershed planning needs to consider climate change-related risks.

Watershed management planning should continue to be supported and incorporated into local policy. Counties and municipalities should also take steps to encourage the alignment of jurisdictional planning with watershed management goals. For example, inter-municipal agreements and coordinated joint adoption of land use, zoning and other codes or policies can be used to integrate watershed management strategies across municipal boundaries. When determining priority areas for growth, the surrounding water resources and existing infrastructure should be considered.

There is also potential for sharing services for certain programs, such as stormwater management oversight and maintenance, stream corridor planning and management, water resources monitoring, etc. Regional management of infrastructure can be implemented without necessarily centralizing the physical infrastructure systems themselves. In other words, smaller systems should be managed together under a single entity to achieve a higher level of quality control, accountability, and economies of scale in operations. This should be done even if the systems in question are not linked together in a single collection or distribution system.

Example Project

Municipal Septic Density Analysis

As promoted by the Cornell Cooperative Extension (CCE) this initiative would involve a GIS analysis of septic densities in the Region, identify hotspots for septic system use, and hold meetings and seminars to help educate residents and municipalities in those areas on proper septic maintenance and sustainability requirements. Educational outreach will help the Region reduce the amount of non-point source pollution from septic tanks and limit the money spent on septic system maintenance.

Programs like this may also lead to an increase in interconnectivity between communities such that governance on a watershed level may be easier to implement.

This program could be expanded to include repair and rehabilitation of failing septic systems, and possibly the introduction of new alternative technologies to replace failing septic systems.

8.5.4 Strengthen Water Conservation and Reuse Efforts using Education, Audits, and Codes

Water and energy efficiency efforts are required at the infrastructure and end user level. End users—residents, commercial tenants, industrial operators, and more—have the ability to change fixtures, controls, irrigation systems, and behavior in ways that can realize significant savings. As well, building and neighborhood-scale rainwater capture and wastewater reuse systems have tremendous potential to reduce pressure on water and sewer infrastructure, further savings water, energy, and money.

Water Efficiency and Conservation

Water efficiency and conservation measures are critical as part of an overall strategy for sustainability in the water sector. By reducing water demand, the need for withdrawal, infrastructure, maintenance, and more is reduced. Education and outreach, coupled with smart incentive programs and/or ordinances, can encourage changes on the user side. Large commercial, residential, and institutional users—universities, hospitals, etc.—should be encouraged or required to benchmark their water use using tools such as US EPA's Portfolio Manager. Additionally, education of students, contractors, and more should be used to promote water efficiency behavior and investment. Local ordinances can be passed requiring the use of high-efficiency fixtures, such as those labeled under the US EPA's WaterSense program. WaterSense works with manufacturers and distributors to bring high efficiency goods to market and educate consumers.

Water Efficient Fixtures: Huge Potential to Reduce Water and Energy Use in Buildings

The 2010 Plumbing Code of NYS aligns with the 1992 Energy Policy Act requirements for plumbing fixtures. Recent advances in the performance of water-efficient fixtures present huge opportunities for consumers to save water, energy, and money when comparing fixture efficiency with the 2010 Plumbing Code requirements. For example, fixtures meeting US EPA's WaterSense requirements must exceed NYS requirements by at least 20%. Aerators and others devices can reduce water use in showers and lavatories by much more, saving energy at the same time. Dual-flush and low-flow toilets reduce water consumption by 25% or more. Waterless urinals can reduce water use by 100%. Most importantly, efficiency fixtures can be found for little to no premium compared to traditional fixtures.

There is also an opportunity to include more focus on water efficiency in existing building upgrade programs. Many municipalities are encouraging or mandating energy audits for municipal facilities—water should be added to these programs.

Finally, irrigation of lawns and turf, including golf courses, is a major element of water demand and this will likely grow given warmer temperatures in future. Public education is needed to promote alternatives to conventional lawns and to encourage water-efficient landscape choices.

Water Reuse and Rainwater Capture

Due to their potential health risk, water reuse projects—which seek to reuse treated water at the building or neighborhood scale, for example to flush toilets or irrigate landscaping—face strict standards and restrictions under the NYS Plumbing Code and the NYSDOH. These regulations are important to the health of the public and are not meant to act as a deterrent to water reuse. However, they can create a false impression of the danger and/or difficulty in implementing water reuse.

There is a need to remove or minimize real or perceived barriers to the widespread adoption of water reuse. Additionally, programs are needed to raise awareness about the benefits of building-scale rainwater capture and use.

Initiatives in this category should work to increase local understanding of alternative water use systems including rainwater capture, greywater treatment and reuse, and other techniques for residential, commercial, or industrial application.

Example Project

Model Ordinances and Implementation Resources for Water Conservation and Reuse

This project would create a compendium of model ordinances, case studies, specifications, and design details to facilitate homeowners, contractors, building owners and managers, designers, and municipal officials in designing, specifying, constructing, and inspecting water conservation, rainwater capture, water reuse, and green infrastructure systems. By compiling existing resources as well as local case studies and best practices into a single package, barriers to implementation would be reduced. The package of material would be made available on a public website, possibly that of the regional planning consortium (see Chapter 10) or another partner. As a second phase, a training program could be established in partnership with a local education provider.

8.5.5 Benchmark Energy Use of Water Infrastructure

At present, there is relatively little information about energy use in water and wastewater treatment facilities, pump houses, and other infrastructure. A centralized program to benchmark facilities' energy use will provide much needed data that can be used to prioritize investments in energy efficiency. Tools such as the US EPA's Energy Star Portfolio Manager can be readily used for facility benchmarking purposes.[223] It is strongly recommended that municipalities, counties, and private sector firms managing water and wastewater infrastructure use this free tool to begin benchmarking their facilities. In addition to energy benchmarking, water auditing and benchmarking could be implemented in potable water systems to better identify and manage leaks and other water losses.

[223]US EPA, 2013. Energy Star for Wastewater Plants and Drinking Water Systems. http://www.energystar.gov/index.cfm?c=water.wastewater_drinking_water

9 Strategic Priorities for the Mid-Hudson Region

In Chapters 4 through 8, high- and medium-priority initiatives are proposed for each focus area. These initiatives form the backbone of the Plan's implementation strategy. Many of these initiatives impact multiple objectives and even multiple focus areas. In addition to these initiatives, some common themes emerged upon review of the various ideas submitted by the participants in the planning process. These common themes suggest potential opportunities where we can positively impact multiple focus areas at the same time. These common strategic priorities include efforts to:

- Foster economic development
- Make all growth smart growth
- Invest in infrastructure to create jobs and prepare for the future
- Benefit from and preserve the Region's unique assets through tourism
- Develop a Mid-Hudson Region sustainability brand
- Foster innovation in green technologies and services
- Grow natural resource sector industries
- Enhance education and outreach for sustainability

9.1 Foster Economic Development

Virtually every dimension of the Plan can be connected to economic development. The strategies outlined in this Plan seek to increase the efficiency of resource use, spark growth in new industries, preserve working landscapes, guide development so that it reduces sprawl and the associated infrastructure investment and maintenance, and much more. The result will be a Region that is prepared for the changes of the coming decades, is an attractive and desirable place to live and work, and is at the forefront of the nation's (and the globe's) economy.

The result will be a Region that is prepared for the changes of the coming decades, is an attractive and desirable place to live and work, and is at the forefront of the nation's (and the globe's) economy.

For this reason, there is tremendous synergy between this Plan's recommendations and those of the Mid-Hudson Regional Economic Development Council's Economic Development Strategy. Broadly, the Plan's recommendations align with the REDC's four focal strategies:

- **ED1 - INVEST in Technology:** The Plan seeks to foster investment in renewable energy, smart grid technologies, transportation management tools, decentralized water and wastewater treatment systems, high performance buildings, new solid waste management systems, and much more. Many of these industries are already present within the Region—investment locally will not only spur production, but it will also create opportunities for the services industries that design, specify, install, operate, and maintain these advanced and emerging technologies. The Region should be viewed as a test-bed for new ideas that can be taken globally.
- **ED2 - ATTRACT & RETAIN Mature Industries:** As noted by the REDC, one of the principal advantages of the Region in attracting and retaining mature industries is the Region's renowned quality of life. The Plan's recommendations—if implemented—will improve air and water quality, increase access to parks and open space, retain the truly rural and urban character of different parts of the Region, revitalize historic centers, and much more. Furthermore, efforts to make the Region's infrastructure more resilient to disruption from storms, extreme temperatures, and other hazards will competitively differentiate the Region from other areas that are less proactive in planning for the future.
- **ED3 - GROW Natural Resource-Related Sectors:** A central objective of this Plan is to promote and expand the Region's agricultural economy, through increasing access to markets, investing in value-added processing infrastructure, and preserving land for agriculture. Other strategies will protect open space, free up water resources for other economic uses, and expand recreational opportunities. Promoting redevelopment of existing centers—many of which are along the Hudson River and Long Island Sound—will create new opportunities for tourism and the growth of small businesses. Encouraging local reuse and recycling of construction debris can create new industries while reducing expenditures on importing materials.
- **ED4 - REVITALIZE:** The smart growth strategies elaborated in this Plan—which seek to target growth toward existing centers and promote Transit Oriented Development (TOD) and Land Efficient Development (LED)—will help revitalize communities while also protecting rural land from development pressure. While all development creates jobs, at least temporarily, smart growth helps ensure that the Region's infrastructure is designed in a way that decreases infrastructure costs per capita (through increasing density and redevelopment of vacant property) and makes long-term operation and maintenance more affordable. By ensuring that new construction adheres to strict codes for energy and water efficiency—and that existing buildings are retrofitted for improved performance—the Region's housing and commercial stock will become more attractive and efficient, saving money on operations while increasing value.

Table 9.1 captures specific synergies between the Plan's objectives and the REDC's four focal strategies. These synergies are discussed in greater depth throughout Chapter 9. Critically, just as this Plan cannot ignore the need for economic development, economic development efforts cannot and should not be viewed

Table 9-1 REDC Focal Strategies and Plan Objectives

MHRP Objectives — REDC Synergies with REDC Focal Strategies

● Consistency Between Plans
● Strong Synergy

	INVEST in Tech	ATTRACT and RETAIN Mature Industries	GROW Natural Resource Related Services	REVITALIZE
TL1: Strengthen Centers Supported by Transit		●		●
TL2: Create Complete Communities		●		●
TL3: Reduce Transportation Fuel Consumption and GHG Emissions	●			
TL4: Improve the Safety, Integrity, and Resilience of Regional Infrastructure for All Users	●	●	●	●
EN1: Become Radically Less Energy and Fossil Fuel Intensive While Strengthening the Regional Economy	●	●	●	●
EN2: Expand Renewable Generation Exponentially as an Energy Source across the Region	●	●	●	●
EN3: Improve the Resilience of the Energy Delivery System throughout the Region	●	●	●	●
MM1: Reduce the Volume of Solid Waste Generated	●			
MM2: Increase the Proportion of Material Diverted from Landfills and Incinerators via Reuse, Recycling, Composting, and Other Organic Recycling Methods	●		●	●
MM3: Reduce T & D Cost	●	●	●	
AO1: Increase Agriculture/Silviculture Activities in the Region		●	●	
AO2: Improve Access to Sustainable Agriculture/Silviculture Training and Technologies	●	●	●	
AO3: Increase Intra-Regional Consumption of Food/Fiber			●	
AO4: Reduce GHG Emissions from Farm and Farm-Related Activities	●		●	
AO5: Strengthen the Economic Viability of Agriculture/Silviculture in the Region	●	●	●	
AO6: Increase Open Space		●		●
AO7: Protect Wildlife and Maintain Biodiversity			●	●
WA1: Increase Available Water Supply by Reducing Water Consumption	●	●	●	●
WA2: Reduce Energy Use and GHG Emissions at Water and Wastewater Treatment Facilities	●		●	●
WA3: Improve the Reliability of Water Treatment and Distribution Systems and Wastewater Treatment and Collection Systems	●	●	●	●
WA4: Reduce Impervious Surface Cover and Connect Permeable Surfaces to Infiltrate and Treat Stormwater			●	●
WA5: Protect Habitat and Water Quality				●
WA6: Encourage Watershed Management Planning			●	●

as separate from achieving this Plan's objectives. All proposed economic development activities should be reviewed for alignment with this Plan's objectives.

9.2 Make All Growth Smart Growth

The Region's land use and development patterns are at the heart of achieving the Plan's objectives. Achieving sustainable development in the Mid-Hudson Region will require the implementation of comprehensive smart growth strategies. Smart growth aims to create and maintain great neighborhoods and communities by:

1. Mixing land uses
2. Taking advantage of compact building design
3. Creating a range of housing opportunities and choices
4. Creating walkable neighborhoods
5. Fostering distinctive, attractive communities with a strong sense of place
6. Preserving open space, farmland, natural beauty, and critical environmental areas
7. Strengthening and directing development towards existing communities
8. Providing a variety of transportation choices
9. Making development decisions predictable, fair, and cost effective
10. Encouraging community and stakeholder collaboration in development decisions[224]

Tremendous work is already underway in the Region to revise codes, promote TOD and LED, and invest to achieve smart growth. The REDC's September 2012 Progress Report lists revitalization of the Region's infrastructure, including urban centers, as its one of four core strategies for economic development. In its report on implementation it recognizes that the Mid-Hudson Region is the fastest growing Region in NYS and that, to stimulate economic development and mitigate climate change, there is a need to build on the "momentum to make its urban centers more attractive as places to live, work, and shop, and to direct new development into priority growth centers supported by transit." It notes the importance of this strategy in creating construction jobs and strengthening the long term economic vitality of the Region and lists it as a key initiative for the 2012-13 year. Recent funding awards demonstrate this commitment by the REDC to smart growth.[225]

> …the Mid-Hudson Region is the fastest growing Region in NYS and that, to stimulate economic development and mitigate climate change, there is a need to build on the "momentum to make its urban centers more attractive as places to live, work, and shop, and to direct new development into priority growth centers supported by transit."

Effective leadership by each municipality in the Region will allow smart growth efforts to continue, generating private investment to help preserve the Region's unique character, while also:

- Reducing GHG emissions from transportation and land use change
- Saving money on the construction and maintenance of infrastructure
- Protecting open space from development pressure
- Improving access to parks, services, and community facilities such as schools
- Revitalizing urban centers and Main Streets in communities throughout the Region
- Protecting biodiversity and sensitive habitat
- Improving air quality and the safety of the streetscape
- Reducing auto-dependency
- Preserving cultural and architectural heritage through the reuse or preservation of historic buildings and sites
- Reducing energy use and, in turn, costs
- Creating jobs and spurring the growth of new businesses
- Improving transportation access and connectivity for local businesses
- Improving public health by encouraging walking, bicycling, and other active forms of mobility
- Increasing disaster resilience and enhancing public safety

[224] US EPA. Smart Growth. http://www.epa.gov/dced/about_sg.htm
[225] New York Regional Councils 2012. Economic Council Awards. http://regionalcouncils.ny.gov/assets/documents/2012REDCbooklet.pdf

Mayors' Redevelopment Roundtable

Per the REDC's 2012 Progress Report, "Ten cities in the region have acted to form the Mayors' Redevelopment Roundtable, with each of the mayors signing identical memoranda of understanding pledging to improve their cities as engines of economic development for the region. This recognizes the well-documented notion that regions cannot prosper without strong urban centers providing educational, housing, transit, cultural, medical, and other essential services that support economic development outside their borders. The REDC's Progress Report explains that during the past year, the mayors of the Roundtable cities have provided leadership to take specific actions that are appropriate to leverage their respective assets and solve their common problems."

Additional resources to aid in implementing smart growth—including model ordinances, zoning best practices, and more—can be found in Appendix D.

9.3 Invest in Infrastructure to Create Jobs and Prepare for the Future

As noted throughout the Plan, the Region's infrastructure—roads, bridges, wastewater treatment plants, electrical grid, and more—is in need of maintenance, repair, or upgrade to continue functioning at desired levels of performance. Proper maintenance of infrastructure extends its service life and can help avoid costly replacement. Replacement or redesign of infrastructure presents opportunities to incorporate new design features and best practices.

When upgrading existing infrastructure or building new infrastructure, it is critical that the Region's sustainability needs be taken into consideration. For example:

1. Transportation infrastructure should be designed to be flexible and allow for multiple modes (e.g. bridges and highways that allow for eventual BRT or rail; roads with shoulder space for separate/protected bike lanes, etc.)
2. All infrastructure should be designed to be resilient to natural and manmade disasters and the potential effects of climate change. Planning for today's 100-year flood is no longer adequate. In some high risk areas, burying utilities may be required to limit damage from debris and falling limbs. Transportation must be protected to limit disruption to economic activities, waste hauling, food distribution, and more.
3. Zoning of new development should seek to take advantage of existing infrastructure. This will help reduce long-term maintenance costs per capita.
4. Where relevant, distributed utility systems should be evaluated, especially in areas of lower density.

> All infrastructure should be designed to be resilient to natural and manmade disasters and the potential effects of climate change. Planning for today's 100-year flood is no longer adequate.

Local governments should require consideration of climate change in planning and environmental review documents. This could also be achieved through establishment of overlay zoning districts for areas vulnerable to climate change, in order to discourage development and/or encourage incorporation of mitigation strategies.

9.4 Benefit from and Preserve the Region's Unique Assets through Tourism

The Region has a strong foundation for tourism that supports many industries, from agriculture to historic downtowns. As part of this strategy, the Region can invest in natural and cultural infrastructure enhancements that improve the environment and quality of life not only for visitors but also for residents and employees. This helps generate economic growth in alignment with the Plan's objectives.

By capitalizing on existing trends toward eco- and green tourism, the Mid-Hudson Region can further differentiate itself as a tourism destination. In fact, in the Governor's 2013 State of the State address, regional tourism marketing was mentioned as an important area that should be focused on throughout the state. Tourism can support the service sector (including the

hospitality industry) as well as traditional natural resource industries such as agriculture by providing a high-value end market for local products, as well as secondary revenue streams.

9.4.1 Potential for Tourism that Promotes Sustainable Development

The Mid-Hudson Region has many assets that already work together to create a destination attractive for its historic, cultural, and natural character. Among them, the Hudson River stands out as "one of the most scenic rivers in America, with spectacular mountain views, historic estates, wine trails, shopping, outdoor adventures and much more."[226] The Region's tourism assets range from small farms and immense forests to historic buildings and battlegrounds; opportunities include ecotourism, agro-tourism, historic sites and buildings ready for adaptive reuse, transit accessible attractions and a whole host of sporting, viewing, touring, tasting, and experiential activities. As noted in Chapter 2, the Region benefits from extensive parks and open space, including numerous hiking and biking trails and pathways. Destination tourism is well-developed, but there are opportunities to expand.

There is strong potential for growing the Region's agri-tourism industry. There are 67 agri-tourism sites in the Region, including pick-your-own, specialty, and wholesale.

There is strong potential for growing the Region's agri-tourism industry. There are 67 agri-tourism sites in the Region, including pick-your-own, specialty, and wholesale. The Region's vineyards are often frequented by tourists, as well as by local residents; 19 are members of the Hudson Valley Wine & Grape Association.[227]

With a diverse agricultural economy and assets such as the Culinary Institute of America estate on the shores of the Hudson, the Region makes sense as a food destination.[228]

Restaurants and lodging facilities count highly among the small businesses that support the local tourism industry. Lodging accounts for 28 percent of traveler spending in the Hudson Valley, according to a NYS study, and restaurants are another high-earning piece of the tourism and hospitality industry.[229] Westchester County alone accounts for almost half of restaurants in the Mid-Hudson Region (see Table 9.2).[230]

There are numerous historic buildings and sites in the Mid-Hudson Region, and their revitalization not only supports the local historic preservation and restoration industry, but enables advances in green retrofits. On a larger scale, these projects contribute to the revitalization of urban centers, as is discussed in depth in Chapter 4. Adaptive reuse of historic sites creates new tourism opportunities while often generating fewer GHG emissions than new construction. There are already more than 1,000 registered historic sites in the Region (see Table 9.3), including historic districts, buildings, houses, cemeteries, farmhouses, churches, inns, libraries, public and private school buildings, mills and more.

Table 9.2 Restaurant and Lodging Facilities

Location	Restaurants[1]	Lodging Facilities[2]
Dutchess	223	97
Orange	225	87
Putnam	25	3
Rockland	283	18
Sullivan	98	112
Ulster	207	186
Westchester	910	47
Region	**1,971**	**550**

[1] Excludes chain restaurants, diners and delis.
[2] Includes all types of lodging, including hotel chains, bed and breakfasts, etc.
Source: County Tourism Offices of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester Counties, 2012.

[226] Hudson River Valley Tourist Bureau. http://www.travelhudsonvalley.org/
[227] Hudson Valley Wine and Grape Association: http://hvwga.com/
[228] Hudson River Valley Tourist Bureau. Hudson Valley Bounty: Delicious farm-to-table fare. http://www.travelhudsonvalley.com/itineraries/86-hudson-valley-bounty-delicious-farm-to-table-fare.html
[229] Tourism Impacts 2010. The Economic Impacts of Tourism in New York. http://catskillcitizens.org/learnmore/NYSTourismImpactHudsonValley.pdf
[230] County Tourism Offices of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester Counties, 2012

Example Projects

Deep Energy Retrofits of Historic Buildings

As recommended by Sustainable Hudson Valley, historic buildings should be targeted for deep energy retrofits. This project would seek to renovate many of the Region's historic buildings, as part of a wider Community Energy District program (see Chapter 5), turning them into shining beacons of energy efficiency. These renovations would work to combine the old and the new by maintaining the historic look and feel of these buildings while still increasing their energy efficiency. Prime targets for renovation could include the Hudson River Psychiatric Facility and the Newburgh Armory, depending on the level of interest and location of the proposed districts.

This project would show the potential for the Region to maintain its historical identity while remaining on the cutting edge of energy efficiency.

The Historic Rivertowns Trailway

The proposed Historic Rivertowns Trailway project leverages the unique network of walking and biking trails centered on the Old Croton Aqueduct State Historic Park and the South County Trailway to spur sustainable tourism and to encourage increased use of the trails by local residents. The Rivertowns Tourism Board, representing the Villages of Irvington, Dobbs Ferry, Hastings-on-Hudson and Ardsley, with sponsorship from local businesses and support from MetroNorth, has developed a successful destination marketing initiative that promotes the Rivertowns and their trailways as an 'escape' from NYC, easily accessible by public transit. The RTB intends to create a signage and trail marker system as well as to enhance bike and pedestrian safety where the trails intersect with roadways.

9.4.2 Strengthening Tourism and Increasing its Sustainability

One challenge the Region needs to overcome is the fragmented nature of tourism and marketing efforts. The Mid-Hudson Region has a strong tourism identity, with a dedicated tourism website[231], a magazine, and numerous other resources. These resources do not utilize a standard geography or terminology for defining the Region. For example, the Hudson Valley tourism site divides the Mid-Hudson Region into the Mid- and Lower Hudson Valley. This fractured identity is compounded by the NYS Tourism website[232], which divides the Region into the Catskills and the Hudson Valley.

Table 9.3 Historic Sites

Location	Historic Attractions[1]	Registerd Historic Sites[2]
Dutchess	37	248
Orange	44	175
Putnam	15	50
Rockland	33	71
Sullivan	15	70
Ulster	30	169
Westchester	45	219
Region	**219**	**1,002**

[1] Discrete sites that can be visited by the public.
[2] Sites that may or may not be available to the public.
Sources: (1) County Tourism Offices of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester Counties, 2012. (2) National Register of Historic Places, 2012.

Expanding and promoting mass transit is critical to growing tourism in the Region while also meeting sustainability objectives. The Region benefits from an enormous market in the NYC metro area, and has already taken efforts to market itself to day-trippers and weekenders from NYC. To expand the options for tourists relying on mass transit, efforts are needed to incentivize train and bus travel, expand vanpool options, and build capacity near transit centers for carshare programs like Zipcar, bicycle, and equipment (ski/camp/hike) rentals. These opportunities need to be linked with expanded complete streets, destination-oriented bike trails, an aggressive cycle safety awareness campaign, and bike safe route mapping and signage throughout the Region. This can be coupled with ongoing efforts

Expanding and promoting mass transit is critical to growing tourism in the Region while also meeting sustainability objectives. The Region benefits from an enormous market in the NYC metro area, and has already taken efforts to market itself to day-trippers and weekenders from NYC.

[231] Hudson River Valley Tourism Bureau.
[232] NYS Tourism Bureau. http://www.iloveny.com/Fall.aspx

to offer integrated tourism packages that include mass transit, lodging, meals, guides, and recreation, including farm packages, winery packages and nature study packages, hunting, fishing and cross country skiing packages.

Example Project

Creating a Central Web-Mapping Portal and App for Mid-Hudson Region Tourism Assets

There are numerous activity-specific or county-specific maps of tourism destinations in the Region.[233] However, there is no central portal that unites the different strands of tourism activities in a web-based map format linked to an app for smartphones. This mapping effort could link historic sites and arts destinations to more bio-regional or agricultural-focused topics (akin to Dreaming New Mexico's agricultural map[234]), educating and informing residents and visitors alike. It could also integrate bicycle and hiking trails and mass transit options. Historic Hudson Rivertowns has developed a mockup of this specific application whereby a web visitor can navigate their site and pull from a number of entries to create a personal itinerary, plot it on a Google map base and then transfer the document to a smartphone. The project is currently seeking funding to develop the application.

9.5 Develop a Mid-Hudson Region Sustainability Brand

The planning process has demonstrated that there is considerable interest in developing a sustainability brand for the Region. This brand would not supersede existing efforts, but rather provide an overarching umbrella that is recognizable and credible and generates grassroots momentum among a broad array of actors. A branding initiative could benefit tourism efforts, local agriculture, 'greening' of businesses, and more.

Already, robust, focused brands are established in the agricultural sector, such as the Hudson Valley Bounty program[235] and the Buy Pure Catskill[236] program. These brands help establish regional products as 'premium goods', benefiting farmers and the Region. For most sectors of the economy, similar regional brands do not exist.

9.5.1 The Mid-Hudson Region Sustainability Label

Establishing a branded 'sustainability label' and pledge that can be used by local businesses will help concretize the Plan's larger sustainability initiative in the minds of the private sector. Any sustainability label developed for the Mid-Hudson Region needs to be upheld by a series of clear, measurable criteria, aligned with the objectives and indicators that have emerged through this planning process. As residents and tourists become increasingly educated about environmental concerns, health and welfare, worker safety, and more, they ask questions about the products and services they consume, underscoring the need for a sustainability label to have credibility.

Some of the steps that could ensure the success of the sustainability label are:

- A minimum voluntary 'pledge' that requires local businesses to commit to a series of basic actions, and allows them to post some sort of sticker or label in their shop window showing that they have taken the pledge
- A meaningful ranking for sustainable businesses, in which, for example, a five-leaf business meets all cross-cutting priorities established in this plan; while a one-leaf business is starting on becoming more sustainable, a project at a time.
- Clear guidance, criteria and performance measures that support the ranking and demonstrate success 'putting the pledge into action'
- An annual report on activities in the Region, highlighting leading examples and possibly giving out awards or hosting a gala event

This labeling initiative would help small businesses in the Region demonstrate a credible commitment to sustainable development and better leverage a common purpose, common criteria, and common measures of success. It also helps unite the Region in pursuing the Plan's core objectives for sustainable development.

Example Project

Expanding the Mid-Hudson Regional Green Business Challenge

The Westchester Green Business Challenge (WGBC) is an existing, successful program that works to spur business to adopt sustainable practices.[237] First launched in 2009, the WGBC is an innovative public-private partnership that has grown to include over 200 companies, including such well-known names as Heineken, Pernod Ricard, C.W. Brown, Regeneron and Reckson.

The primary strategy of the WGBC—both in its current format and as an expanded regional initiative—is to mainstream green business practices through a highly interactive website, social media tools, educational events and customized training. This includes an online scorecard that members use to track and measure their environmental performance in six key areas: Outreach, Energy, Transportation, Land Use, Water Recourses and Waste Management/Green Products. The scorecard was customized for four business types (Tenant, Property Manager, Owner-Occupied, Home-Based) and tracks the implementation of up to 82 recommended green business strategies, both at an individual company level and aggregated for statistical analysis.

As part of the proposed expansion of the WGBC, the website (including the web-based scorecard), would be expanded and customized as necessary to meet the needs of an industry-focused regional program. In addition, the scorecard would be enhanced to require the submission of additional quantitative data to strengthen the program's ability to measure outcomes, specifically GHG, water, waste, and energy reductions and cost savings resulting from participation in the program. The WGBC has already laid the foundation for capturing such data through the promotion of US EPA's Portfolio Manager Tool.

Critical to the regional program's success will be its renewed focus on the role that industry clusters and associations play in advancing sustainability, promoting the exchange of best practices through a combination of live educational events, webinars, video and web-based case studies, direct outreach and social media engagement.

By broadening the scope of the WGBC, the program will greatly enhance the entire Region's brand as an attractive place to do business, invest, and grow a sustainable business.

9.6 Foster Innovation in Green Technologies and Services

The REDC Strategic Plan[238] and 2012 Progress Report recommends investing in technology, particularly bio-medical technology. While this makes considerable sense from an economic development perspective and is a regional strength, there are additional opportunities to invest in technology that will directly facilitate Plan implementation.

> ...there are opportunities to develop and apply new technologies to create renewable energy, manage utilities and information, improve building efficiency, monitor nutrient and water needs in agriculture, optimize transportation networks, and much more. Critically, these technologies have a direct application within the Region, allowing pilot phase deployment to address local need.

A regional priority emerging from the planning process is the need to find and nurture talented innovators who develop technologies and services that can be used and tested within the Region, contributing to sustainability while fostering market development. As mentioned throughout the Plan, there are opportunities to develop and apply new technologies to create renewable energy, manage utilities and information, improve building efficiency, monitor nutrient and water needs in agriculture, optimize transportation networks, and

[233] Hudson River Valley Tourism Bureau. Hudson Valley Tourism Maps and Transportation. http://www.travelhudsonvalley.com/mapstransportation.html
[234] Dreaming New Mexico. Current Farming and Ranching. http://www.dreamingnewmexico.org/files/DNM-FF-Map
[235] Hudson Valley Bounty: www.hudsonvalleybounty.com
[236] Buy Pure Catskills: http://www.buypurecatskills.com/
[237] Westchester County Planning 2013. Westchester Green Business Challenge. http://climatechange.westchestergov.com/wgbc-main
[238] Mid-Hudson Regional Economic Development Council 2011. Strategic Plan. http://regionalcouncils.ny.gov/themes/nyopenrc/rc-files/midhudson/MHREDCSPFINAL11_12_11.pdf

much more. Critically, these technologies have a direct application within the Region, allowing pilot phase deployment to address local need. With focused effort, the Region can become a test-bed for new 'clean' or 'sustainable' technologies.

No comprehensive data set currently captures the state of high technology in the Region, particularly with regard to sustainable applications. However, general economic data suggest that innovation is thriving. In 2011, 1,773 patents were filed in 19 of the Region's key economic centers.[239] Over 1,000 of the patents filed in the study area originated in four communities—Poughkeepsie, Ossining, Fishkill and White Plains. Innovators in these communities have doubled the annual number of patent filings since 2000. In fact, even between 2005 and 2010, ten of these communities doubled their annual number of patents filed. For example, residents and employees of the smaller economic centers (Beacon, Peekskill, New City, Somers, Carmel and Newburgh) filed 480 patents in 2010, compared with 230 patents in 2000.

> Investing in new technology—and sustainability in general—also creates a market for services related to design/application, construction, and ongoing operations and maintenance.

Furthermore, anecdotal data suggest that communities in the Mid-Hudson Region are receptive to testing innovative technologies and concepts and promoting local entrepreneurs. For example, the Solar Energy Consortium, founded in 2007, is working to establish a new solar energy industry in NYS. By focusing these efforts, the Region can build upon its strong foundation of innovation to attract sustainability-oriented entrepreneurs and innovators, as well as create new markets for green products and services.

Investing in new technology—and sustainability in general—also creates a market for services related to design/application, construction, and ongoing operations and maintenance. Numerous service sectors stand to benefit from Plan implementation, be it trade union electricians or insulators employed in energy efficiency upgrades, architectural/engineering firms designing new high performance buildings, IT consultants working on systems integration for smart grid applications, engineers and landscapers designing and constructing green infrastructure, and more.

Often, green technology and services jobs are medium or high wage positions where locally-accrued experience can be marketed in other parts of NYS or the US.[240] The Mid-Hudson Region has the potential to be not only a technology leader in sustainability, but also a resource pool for expertise in applying new tools, applications, and skillsets to achieving more sustainable outcomes.

9.7 Grow Natural Resources Sector Industries

Technological innovation is not the only path toward meeting the Plan's objectives. The Mid-Hudson Region has a strong economy based in the natural resources sector, and this economy should be further developed to maximize its potential. Natural resources sector industries, for the purposes of this Plan, include:

- Agriculture and horticulture
- Forestry
- Natural resource management including materials recovery and reuse
- Tourism and outdoor recreation (discussed in Section 9.4)

As noted in Chapter 7, agriculture and the food industries are an important source of jobs with high multiplier effect, yet wages have declined steadily. Fostering the development and profitability of this sector will help conserve the Region's rural character while also maintaining and creating jobs. Critically, the development of food hubs and other aggregation/processing facilities can help facilities market access, I proving the viability of farming.

Forestry, while not a large industry in the Region, can provide a source of biofuel as well as building materials. Innovative businesses—such as NY Heartwoods[241]—harvest dying or downed trees to create high-end lumber products. These niche or artisanal markets

> ...there are tremendous opportunities to create economic value through materials reuse and recycling. Recovering and reusing C & D debris, recycling and reusing MSW, composting, and more create value from material that would otherwise be discarded at great cost to the community and the environment.

[239] US Patent Office, 2012. http://patft.uspto.gov
[240] Brookings 2011. Sizing the Clean Economy: A National and Regional Green Jobs Assessment. http://www.brookings.edu/research/reports/2011/07/13-clean-economy
[241] NY Heartwoods: http://www.newyorkheartwoods.com/

have great potential, given the tremendous demand locally as well as in NYC. They also benefit from the Region's forest resources in a way that sustains forest cover and biodiversity.

As discussed in Chapter 5, there are tremendous opportunities to create economic value through materials reuse and recycling. Recovering and reusing C & D debris, recycling and reusing MSW, composting, and more create value from material that would otherwise be discarded at great cost to the community and the environment. Critical to growing this sector will be the development of value-added processing facilities, so that higher-value end products such as building materials, furniture, flooring, and more can be manufactured locally.

Making change at the scale required to achieve this Plan's objectives will require a broad base of public support as well as citizen action.

Finally, at the heart of this Plan's objectives is connecting businesses so that they can work together to evaluate opportunities for eco-efficiency. This is especially true in the natural resources sector, where there is potential for waste material to be reused as feedstock for another business' processes. This is already being proposed, in part, in the Community Energy District concept, which seeks to connect and aggregate local businesses and residents to make cost-effective investments in infrastructure to reduce energy costs and improve resiliency.

9.8 Enhance Education and Outreach for Sustainability

Many of the initiatives described in this Plan make tremendous business sense or are in complete alignment with planning and management best practices. Many could be highly profitable without subsidy, provided they acquire needed financing. The question then remains—why are opportunities to be more efficient, reduce environmental impacts, and improve quality of life not moving ahead? The answer lies in education and outreach.

Many of the Plan's key objectives—implementing smart growth, shifting transportation modes, achieving greater energy efficiency, increasing composting and recycling—require a combination of education and targeted outreach to succeed. Making change at the scale required to achieve this Plan's objectives will require a broad base of public support as well as citizen action.

Initiatives are needed that provide both general and specialized education in the central areas of importance to this Plan. This can include formal programs at local schools, community colleges, or universities, as well as more targeted endeavors hosted by local communities and non-profits. As new job opportunities arise in energy efficiency, renewable energy, materials management, and more, trained workers are needed to staff them. Service learning can help provided the practical experience to transition from school to employment, while also providing valuable labor for local businesses. Educational institutions should consider expanding or requiring both service learning and sustainability literacy in higher education. As the Region's many institutions of education and training expand their horizons into the community through service learning, internships, and applied research—and as continuing education in the full spectrum of sustainable development skills expands—the Region has exciting potential as a center of excellence for education and training in sustainable development.

As well, broad outreach is needed to raise awareness of the Plan, its objectives, and the actions needed to achieve them. Much is already ongoing, and a short-term action plan is described in Section 10.2.6. Additionally, targeted outreach will be needed to raise awareness of programs, funding, and other opportunities to implement recommended initiatives in the Plan.

Education and Outreach in Materials Management

Behavioral and organizational change is critical to meeting the Plan's materials management objectives. Education and outreach initiatives should seek to:

- Inform individuals and organizations about opportunities to recycle, reuse materials, prevent waste, etc.
- Educate individuals and organizations about how to recycle, what can be recycled, how to compost, etc.
- Promote the benefits of sustainable materials management, including the potential to create jobs, lower costs, and reduce environmental impacts
- Encourage individuals and organizations to rethink their purchasing practices and to seek materials with lower life-cycle impacts, less packaging, or that meet other environmental criteria

In addition to general education and outreach programs, specialized training programs can be useful in creating knowledgeable experts who can implement sustainable materials management practices at a larger scale. An example is the Master Composter/Recyclers program in Westchester County, run by the Sheldrake Environmental Center in Larchmont.

Case Study: Rockland County Solid Waste Management Authority (RCSWMA) Environmental Education Center and Outreach Programs

RCSWMA operates a conference center, a 'back-yard' composting demonstration area, a native plants garden (which provides a waste reduction, natural resource protection and pollution avoidance demonstration by requiring less water, no fungicides, herbicides or fertilizers), and an interactive Environmental Education Center that is visited by thousands of school children and adults annually. Visitors are accompanied by a trained tour guide. RCSWMA also hosts an annual 'Environmental Day' which is attended by over a thousand residents, featuring table top display areas for over 30 environmental organizations and vendors, showcasing the native plants garden, vermi-culture, solar-powered entertainment, and providing tours of the facility. At the Environmental Day, RCSWMA recognizes winners of the annual Rockland Recycles! award for community groups, schools, businesses or individuals who have 'made a difference'.

RCSWMA also produces and distributes thousands of educational brochures annually, focusing on recycling, HHW, the Education Center, native plants, composting, grass-cycling and other topics. Staff make scores of presentations to the public via radio shows, seniors groups, social organizations, school districts, etc. and the Recycling Coordinator makes hundreds of visits to businesses to promote commercial recycling.

Example Projects

Mid-Hudson Center for Sustainable Learning

The proposed Mid-Hudson Center for Sustainable Learning would provide a venue for offering training to citizens, planners, and elected officials who would like to learn how to implement smart growth. The Center could also provide other education programs that teach the public to live in more sustainable ways. For example, the Center could provide classes that teach urban, suburban, and rural youth and adults how to grow healthy foods for good nutrition, how to start and sustain natural resource-based businesses, how to access open space such as nearby parks, or how to ride and maintain a bicycle. The Center could also administer or operate as a clearinghouse for other programs that encourage sustainable transportation or land use patterns, such as carpooling programs that help commuters link up with one another to share rides, etc.

Circuit Rider Planner Initiative

Many municipal planners or volunteer-led planning boards lack the knowledge, awareness, resources, and/or training to implement smart growth best practices. They may also lack the information needed to be able to defend these best practices in terms of economic, social, and environmental impact. Creation of a technical assistance program—as has been recently started to a limited extent through the Climate Smart Communities program—could provide municipalities and counties with access to a team of smart growth professionals who have ready access to successful models and case studies from the Region (and beyond). The intent is not to duplicate or replace existing programs, but rather to create a regional framework that ensures that access to such expertise is available Region-wide, and that knowledge is transferred throughout.

Numerous training and outreach programs already exist, such as the Land Use Leadership Alliance Training Program at Pace Law School, which has trained over 2,500 local leaders in sustainable land use strategies in the past 15 years. This program has followed training programs by creating inter-municipal land use compacts and local demonstration programs.

10 Implementation Framework

Government staff, elected officials, representatives of non-profits, business leaders, students, engaged citizens, and more contributed ideas, comments, case studies, and substantial amounts of time to help develop the Plan. In engaging stakeholders from throughout the seven county Region, this planning process represents an unprecedented collaborative effort to create a long-term vision for sustainable development for the Mid-Hudson.

If our Region's objectives for sustainable development are to be achieved, collaboration must continue. New organizations, alliances, and partnerships must be formed and action taken.

Our Plan to sustain this collaboration is to:

- Track progress against indicators
- Oversee Plan implementation and updates
- Facilitate knowledge sharing
- Attract funding to the Region
- Advance the view that the Mid-Hudson Region is a national leader in sustainable development

To achieve these objectives, we will:

- Commit to tracking sustainability indicators at the county level
- Create a Sustainability Analytics Center
- Support local government implementation
- Create a Mid-Hudson regional governance coordinating body
- Participate in the REDC
- Implement regional forums to share knowledge, tools, and resources

10.1 Sustaining Regional Collaboration

The Mid-Hudson Region sustainability planning process, and its result, represents a major step forward for collaborative regional planning at a scale encompassing seven counties. Government, private sector, and non-profit representatives have worked together to identify regional priorities, share data and information, identify best practices, highlight regional success stories, and pool resources to advance the Region's sustainable development.

A premise of the Plan is that a regional approach is essential for effectively addressing the societal challenges of this century. Social, economic and environmental problems are not limited in their character or consequences by conventional governmental boundaries. They demand regional approaches, scaled commensurate with their character. Geographic features that once marked boundaries to collective actions – rivers, mountains – are now unifying features. It is compelling that this underlying premise informed, even inspired, the initiation of this planning effort.

It is critical to understand that 'regional' does not mean 'centralized.' Communities in the Mid-Hudson Region rightly value their often unique characteristics, and the Region is deeply committed to self-governance. But community and Region are not necessarily opposites. Consultative, collaborative planning leads to recognizing the value of thinking beyond boundaries, understanding tradeoffs and generating collective benefits within the Region. In this way local and regional values may be powerfully complimentary and synergistic. In fact, regional solutions to problems that transcend local boundaries are a key element in assuring the context for vital community life.

The actual and potential benefits of this regional collaboration are significant and reach far beyond the production of this Plan. Already, networking and knowledge sharing have resulted in new partnerships and proposed projects which will have a lasting impact on the Region. Now is the time to concretize these gains and overcome challenges that have previously beset regional governance for sustainable development in the Mid-Hudson.

10.1.1 Governance Challenges

As discussed in Chapter 2, government, businesses and non-profit organizations in the Region have a well-established history of collaboration for planning. Yet the geographic, demographic and economic diversity, and inclusion of its sub-regions in a number of metropolitan statistical areas, have long made it a challenge to come to a consensual definition of the Region. As a result, the geographic boundaries of the varied institutions and governance structures created in the course of collaboration often do not correspond to the Mid-Hudson Region's borders as defined for this Plan.

Hudson River-oriented organizations often exclude Sullivan County but do include counties to the north. NYC Metro-oriented entities often exclude the northern and western counties (Ulster, Sullivan) for planning or service delivery purposes. Other partnerships are defined by the parameters of a given watershed, or are limited to groups of municipalities linked via intermunicipal agreements for particular purposes.

The resulting governance landscape makes it harder for planning bodies that are genuinely committed to a cohesive regional approach to credibly present a convincing regional agenda to local municipalities and entities. This is compounded by the tradition of home rule, where individual municipalities exert final decision-making authority on land use decisions. This generally discourages regional thinking and action. Moreover, it may impact competitiveness for federal, state, and private sector funding, as regions with a more consistent geographic definition and set of aligned institutions may appear to have greater capacity for effective implementation.

The multiplicity of regional definitions also makes consistency – in data collection, terminology, project prioritization, etc. – difficult. Rather than pursuing a regional set of priorities, the different bodies within the Region may find themselves competing or working at cross-purposes. At minimum, by reaching beyond municipal boundaries, it may be possible to combine services and resources to achieve economies of scale.

10.1.2 Governance Objectives

A Mid-Hudson Region governance framework for sustainable development must sustain collaboration, facilitate Plan implementation, and track progress, accomplishing the following objectives:

RG1: Track Progress against Indicators.

- ➤ This includes developing and implementing a robust metrics management system/data repository.

RG2: Ensure and Oversee Plan Implementation and Updates.

- ➤ This includes developing mechanisms to foster local government efforts to implement the Plan, monitor local government progress, and coordinate periodic updates to the Plan

RG3: Facilitate Knowledge Sharing.

- ➤ This includes organizing events, activities and other platforms (discussion groups, web forums, etc.) that provide regional stakeholders the opportunity to share best practices with regard to Plan implementation.

RG4: Attract Funding to the Region.

- ➤ This includes coordinating efforts to apply for funding for regional-scale initiatives. Additionally, it includes facilitating local entities' acquisition of funds commensurate with their demonstrating a regional commitment to sustainable development.
  - Depending on the approach pursued, a regional governance body may also directly fund projects and programs that implement the Plan's objectives

RG5: Advance the View that the Mid-Hudson Region is a National Leader in Sustainable Development.

- ➤ This includes branding, education and outreach efforts within the Region.

Table 10.1 Governance Initiatives for Implementation

Initiative	GR1 Tracking	GR2 Local Implementation	GR3 Information Sharing	GR4 Attract Funding	GR5 Image and Branding
Commit to Tracking Sustainability Indicators at the County Level	✖				
Create a Sustainability Analytics Center	✖	✖	✖	✖	
Support Local Government Implementation	✖	✖	✖	✖	
Create a Mid-Hudson Regional Governance Coordinating Body	✖	✖	✖	✖	✖
Participate in the REDC		✖		✖	
Implement Regional Forums to Share Knowledge, Tools, and Resources	✖	✖	✖		✖

10.2 Governance Initiatives

It is possible to envisage a single entity taking responsibility for achieving the five regional governance objectives outlined above. However, because there is no existing body with a mandate that exactly overlaps with both the geography and objectives outlined above, consideration must be given to creating a new body or expanding the capacity of an existing body to achieve a model of regional governance. Indeed, it may be the case that a single centralized body is not the best model for governance in the Mid-Hudson Region.

Given these realities, an interim suite of initiatives is proposed to help achieve regional governance for sustainable development. Table 10.1 below shows the individual initiatives cross-referenced with the governance objectives they will impact.

10.2.1 Commit to Track Sustainability Indicators at the County Level

One approach to tracking progress in Plan implementation is to require each county in the Region to track and report on a minimum set of metrics. The Consortium members have agreed in principle to track performance. The minimum metrics to track should include:

- TL – 1a-b, 2c-d, 3c-d, 4a-d
- EN – 1a-b
- MM – 1a, 2a
- AO – 1a-b, 3a-b, 6a
- WA – 1a-b, 3a, 5a-c

These metrics are defined in detail in Chapters 4 through 8 and in Appendix B. These metrics should be calculated annually and compared with the baseline values in the Plan, as well as the established targets, to serve as performance indicators. If a county or set of counties wishes to change the method or data source for a given metric, this should be communicated to the other counties. A consultative process should be used in the Region to help maintain consistent reporting and to adjust the baseline for performance accordingly.

Each county should complete a simple report, to be published on a relevant county website. For comparative purposes, links should be established with reporting locations for other counties in the region. A sample reporting template is included in Appendix F. The report could be sent to NYSERDA for aggregation.

In addition to the minimum set of annual metrics, counties should seek to track performance relative to other aspects of the Plan, with a short-term goal of tracking at least one metric per Plan objective. If annual reporting is impossible, an alternate time horizon should be consultatively set; to assure capacity for comparison, it must be consistent for counties in the Region. As resources and data permit, additional indicators should be added to the tracking report, including Tier 2 indicators proposed in each focus area chapter.

10.2.2 Create a Sustainability Analytics Center

An alternative, or complement, to the approach outlined in Section 10.2.1 is to establish a regional sustainability analytics center (SAC), which would serve as an accessible clearinghouse for sustainability metrics and data.

SAC Framework

The Mid-Hudson Region sustainability planning process has resulted in the assembly of a large volume of valuable data that had not previously been gathered, organized, and presented on a regional basis. Working groups active in all six focus areas, with consultant support, identified and compiled relevant data from across many public and private sector sources.

The experience of this planning process made clear that, though there is a tremendous amount of data available in and about the Mid-Hudson Region, these data are often fragmented, inconsistent, and difficult to access and utilize. This makes it very challenging to plan and prioritize at the regional scale. It also makes it difficult to ensure that implementation efforts are accountable and to track regional progress.

An accessible, regional SAC would provide an information technology infrastructure to serve all constituents of the Mid-Hudson Region interested in sustainable development. The purpose of the SAC is to enable constituents with a variety of roles, perspectives and responsibilities to access, analyze and use data and information gathered and generated during the planning process, and to maintain and expand this resource during implementation.

The SAC will house existing and future datasets in a structured architecture to facilitate maintenance, access, and querying. Protocols – where absent - need to be established for data collection and aggregation that encourage accuracy, consistency and completeness. Building on the work undertaken during the planning process, the SAC would define and document sustainability metrics and datasets, calculation methodologies, data sources and other metadata, responsible parties for future collection, updating and aggregation, timeframe for updates, and limitations.

The SAC is intended to function as a non-profit entity that services the entire Region. Municipalities, counties, and non-governmental organizations (including universities) within the Mid-Hudson Region will be primary sources of data and information for the SAC. Additionally, state and federal agencies will be solicited to provide relevant data. Links to existing clearinghouses (such as the NYS GIS Clearinghouse) will be established. Necessary release agreements would be executed with data providers to protect privacy and ensure security of the data. An outreach program will need to be developed to create these relationships.

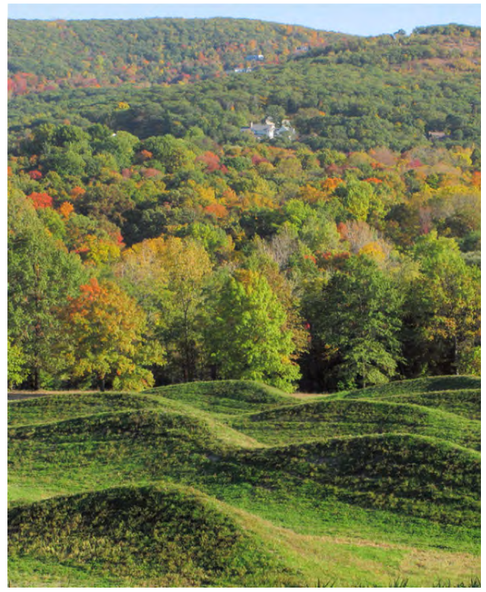
This plan has identified and gathered numerous regional, county, and municipal level metrics. The SAC will be the new repository of this data, and as future projects are funded, this proposal contemplates that projects implemented in alignment with this Plan will report to the SAC on their progress and impact on key metrics.

In time, the SAC could design 'Dashboard' and 'Scorecard' applications and a web-based interface so that municipal and county planners, as well as other actors in the Region, could easily access information and monitor performance at the regional, county, municipal, and project levels. A model developed by the Mid-Hudson REDC takes this approach and is available for consideration.

Table 10.2 Climate Smart Communities

Location	Number of Climate Smart Communities	Percentage of Cities and Towns[1]
Dutchess	3	7
Orange	2	3
Putnam	0	0
Rockland	4	7
Sullivan	3	12
Ulster	6	13
Westchester	26	30
Region	**44**	**12**

Source: NYSDEC, 2012: http://www.dec.ny.gov/energy/56876.html
[1] Based on 2010 Census designated places, cities and towns.



The long-term vision is that the SAC will collect and analyze the data required for robust regional sustainability reporting. This will eventually ultimately relieve counties of the responsibility for reporting.

10.2.3 Support Local Government Implementation

The Mid-Hudson Region has a long history of local government leadership for sustainability. A total of 44 Mid-Hudson municipalities and counties have signed on to the Climate Smart Communities (CSC) program (see Table 10.2). More than a dozen communities in Westchester County have come together to form the Northern and Southern Westchester Energy Action Consortia.

While these efforts are commendable, they are just the beginning. Despite having by far the most CSC participants in NYS, the participants represent only 12 percent of the municipalities in the Region. In terms of budgets and staff, school districts are some of the largest government entities in the Region, and are not part of the program. Furthermore, the CSC program is a commitment to take action, not measured and verified proof of local government action. More is needed.

To facilitate local government leadership, guidance has been developed regarding how local governments can use the Plan and incorporate it into processes and planning. The Implementation Guide – found in *Attachment III* – provides a roadmap for local governments that address the following topics:

- What is the Mid-Hudson Regional Sustainability Plan?
- How does it fit with other State programs and plans?
- How can local governments sign on to the Plan?
  - Sample Resolution
    - Plan objectives
  - Designing conforming projects
  - Coordinating local strategies with the Plan's components
  - Developing inter-municipal agreements and compacts
  - Commit to tracking the plan's key metrics
- Why should local governments sign on to the plan?
  - Funding
  - Cost savings related to implementation strategies
  - Technical assistance
  - Response to community values, expectations
- What do local governments need to do to implement the Plan?
  - Checklist/audit tool
- What guidance/tools are available to implement the Plan?
- How to track and report GHG reduction in the Region?

In addition to this guidance document, efforts by counties and eventually the SAC to report on progress will help spur local government action and maintain accountability.

Critically, there is a tremendous opportunity to facilitate Plan implementation by modifying contracting and procurement language. Local governments can build the Plan's objectives as well as metrics and reporting requirements into requests for proposals. When reviewing bids or projects for selection and prioritization, governments and non-governmental actors can use the Plan as one element of an evaluation framework to determine whether projects are aligned with the Region's sustainable development needs.

10.2.4 Create a Mid-Hudson Regional Governance Coordinating Body

One of the strengths of the planning process was the establishment of a central coordinating body, the planning Consortium. This governance body helped focus the planning efforts, establish priorities, and coordinate data collection and other efforts. It also provided (and continues to provide) a platform for establishing consensus on Plan-related issues. Additionally, by virtue of its membership, and the processes it established, the Consortium easily accessed and continues to engage hundreds of stakeholders in the Region.

To facilitate Plan implementation, it is important that the Region maintain some capacity for central governance and coordination. Efforts like the SAC could help with regional coordination of information, but will not necessarily provide a platform for discussion and consensus-building around regional priorities. Critically, the governance body could eventually become a locus for funding, helping obtain and disburse resources for implementation within the Region, on its behalf.

At present, the Consortium has committed to two efforts to help sustain collaboration and coordination:

- Continue the Mid-Hudson Regional Sustainability Planning Consortium as a voluntary, *ad hoc* effort for at least one additional year
- Combine resources to hire or reassign staff to support Plan coordination and implementation

Additionally, there are two additional paths forward to strengthening regional collaboration:

- Develop a 'ground-up' framework, using formal local government commitments of support and inter-municipal agreements at the county and municipal level
- Strengthen existing governance bodies or create a new governance body that can represent the entire Region and provide a formal home for the Plan and the implementation process

These options are not mutually exclusive. At present they should be viewed as part of a continuum. The ad hoc efforts of the existing Consortium eventually may become more formally rooted in a language of contracts and obligations. Each option is discussed briefly below.

Continue the Mid-Hudson Regional Sustainability Planning Consortium

The benefit of the existing Consortium is that it comprises a group of motivated, engaged, and committed partners who want to create a sustainable Mid-Hudson Region. Through nearly a year of collaboration, the participants are well-informed, understand the Plan and its objectives, and collectively represent a wide swath of the Region's geography and communities. The group comprises governmental and non-governmental members. These attributes are tremendously valuable.

At the same time, the Consortium is not a formal entity capable of acquiring and disbursing funds. It does not have a formal governance framework, with a clear, consistent standard for membership. It is nearly an entirely volunteer-led effort. While it is inclusive, it represents neither all parts of the Region nor all key communities. These factors to a degree limit its capacity to act and may also undermine its legitimacy with certain stakeholder groups. Furthermore, strictly voluntary efforts can be subject to mission or volunteer fatigue, which may threaten its long-term viability.

Despite these challenges, the Consortium is the best existing home for the planning effort. At a minimum, the Consortium will continue to meet on a bimonthly basis through January 2014. This will allow efforts to establish a more formal governance body to mature, while continuing to provide a platform for regional discussion and coordination.

Combine Funds and Resources to Hire or Reassign Staff to Support Coordination and Implementation

The Consortium has agreed to dedicate resources to hire or reassign an individual on a half-time basis for at least two years to support continued coordination and implementation. The logistics for this assignment remain to be determined. Basic responsibilities would include:

- Coordinating Consortium meetings and documenting outcomes
- Identifying funding opportunities for Consortium members and other planning participants
- Compiling annual reports from each County
- Planning the Annual Forum (see Section 10.2.6)
- Additional responsibilities to be determined

Additionally, the Consortium will solicit funding from relevant sources to acquire additional staff support and to ensure the continuity of this position over time.

Develop a 'Ground-Up' Framework

This planning process has generated substantial energy and commitment to its implementation among participants. Mobilizing this resource may provide the basis for grassroots efforts to encourage formal commitment by local municipalities to the Plan. The toolkit in Appendix G can be used to begin this process.

Case Study: NWEAC and SWEAC – Helping Westchester Municipalities Achieve Real Change

NWEAC

The Northern Westchester Energy Action Consortium (NWEAC) is a consortium of 16 municipalities in Westchester County. Formed in 2009, its goal is to work together and reduce the Consortium members' reliance on fossil fuels, save money for residents and businesses, increase energy efficiency in member communities, enable renewable energy generation, increase economic activity, and align local efforts with county, state, and federal initiatives. In 2010, NWEAC was awarded a Department of Energy (DOE) grant of $1,267,864. With this award, in combination with a NYSERDA sub award of the same amount, NWEAC scaled up the demand for Home Performance with Energy Star Upgrades of 1-4 family residential buildings with a program called The Energize Project (see Chapter 4 for details). Other recent successes for NWEAC include sponsoring a series of Land Use Seminars at PACE Law School and creating a solar buyers group for municipal, school, and residential solar buyers.

The overriding principle of NWEAC is to use scale to reduce costs and attract investors. This allows many of the smaller communities in the area to receive program benefits and to win bids for projects that they might otherwise have been unable to do as individual communities.

SWEAC

The Southern Westchester Energy Action Consortium (SWEAC) is a consortium of 10 municipalities in Westchester County. Formed in 2010, the consortium helps municipalities identify and implement cost effective environmental measures that focus on energy, materials management, and transportation support for a range of modes.

Through its robust peer network, SWEAC leverages the value of local best practices and maximizes the benefits obtained from outside resources. This approach can offer the economic advantages of joint purchasing and pursuit of grant funding. Recently, SWEAC has been successful in creating a "Complete Street Toolkit" which has subsequently been used as a model for Long Island and Connecticut, as well as in spreading the successful "Love 'Em and Leave 'Em" on-site leaf mulching program. Additionally, SWEAC has worked to recommend the use of sophisticated and cost effective energy tracking software to provide local communities the opportunity to easily identify billing errors or anomalies, benchmark facilities, and create greenhouse gas emissions inventories.

Inter-municipal agreements have already been used in the Region to create multi-County and municipality frameworks for collaboration; the Hudson River Valley Greenway Compact (which covers all counties in the Region except Sullivan) is a leading example. When coupled with tools and incentives, these entities may effect real change and establish a strong framework for cooperation.

There are limitations with this model. Counties and communities with active and engaged populations but disinterested governments may find themselves outside the framework, with no real way to contribute or participate.

Strengthen Existing Governance Bodies or Create a New Governance Body to Represent the Entire Region

The Mid-Hudson Region has a number of existing institutions with mandates that have promising similarities to the sustainable development governance needs expressed earlier in this Chapter. One or more of these organizations may have the necessary status and definition of mission in law, and – at least formally – the existing local endorsement, that allows their efficient adaptation to newly defined purposes. Most notably, the Hudson Valley Regional Council is an existing entity that directly mirrors the Mid-Hudson Region's geography and, in some aspects, has a mandate that aligns with the Plan's objectives. It is currently responsible for, among other things, preparing the Region's Comprehensive Economic Development Strategy (CEDS).

The Consortium has developed six criteria for evaluating the viability of a suitable organizational framework:

- Public and non-public representation
- Basis for legitimacy
- Function and purpose
- Level authority and influence
- Capacity
- Prospects for continuity

In the event that an appropriate existing organization is identified, considerable work will be needed to refine the mission scope, identify sources of funding and revenue, and establish a revised governance framework that enables participation from all sectors (private, public, and non-profit) and focus areas (energy, water, materials management, etc.). Existing entities taking over new responsibilities must have added resources to perform effectively, and may not be interested in realigning their mission to support this Plan.

If no such institution presents itself or proves suitable, a new one will need to be created. The challenges facing this approach include funding the hiring of staff, avoiding undue bureaucracy while maintaining legitimacy, and ensuring effective participation from non-governmental actors.

The benefit of creating a formal governance body is that it has greater potential for continuity and growth, if only due to the presence of real staff (in addition to volunteers). It can develop institutional memory. Furthermore, a formal entity may be a legitimate locus of funding, money which can then be used for implementation either directly or via contract. If effective in acquiring funding, the organization will increase its

Case Study: Sustainable Jersey

Sustainable Jersey (SJ) – www.sustainablejersey.com – is a membership platform for municipalities which offers a voluntary sustainability ranking system to assess performance as well as a suite of resources to facilitate improvement. Founded as a nonprofit partnership between the College of New Jersey (NJ), the NJ League of Municipalities, and the State of NJ, SJ provides three major services to partner municipalities. First SJ identifies actions to take in order for a municipality to become more sustainable; second, they provide the tools and guidance needed to achieve these goals; and third, they work with communities to get them the funding needed to make the projects a reality. Additionally, SJ provides a template for reporting progress which allows for municipalities to easily share the benefits of their sustainable programs.

Because SJ is hosted by a university center and jointly funded by government, university and private resources, it has a stability and legitimacy that has supported membership growth. Additionally, the SJ process is entirely voluntary and there is no cost to join or leave, thus making the program very popular. Currently there are more than 350 member municipalities which comprise more than 60% of all NJ municipalities and 70% of NJ's population. Critically, the network helps provide a structure for participation in recommended activities ("establish a recycling system," "upgrade at least 50% of municipal buildings", etc.), which brings disparate communities into alignment around shared goals, helping achieve action at a large scale. By ranking and labeling municipalities, SJ encourages healthy competition and rewards members who work hard and take concrete steps to achieving sustainable development.

legitimacy and the likelihood that local stakeholders participate. By developing some technical expertise and competence, the governance body could provide services to organizations in the Region that have insufficient capacity for planning and implementation.

The planning Consortium has already begun efforts to identify existing institutions and to determine the level of interest, capacity, and legitimacy that these institutions have for providing a platform for regional governance for sustainable development. This work will continue throughout 2013.

10.2.5 Participate in the REDC

To help foster alignment between the work of the REDC and the Plan's objectives the planning Consortium proposes that at least two representatives be included in the REDC, in a non-voting capacity if necessary. This is currently being discussed with the REDC, pending guidance from the state.

Ideally, REDC funding criteria and priorities could be revised over time to align more closely with the objectives of the Plan.

10.2.6 Implement Regional Forums to Share Knowledge, Tools, and Resources

One of the biggest benefits of the planning process was connecting regional stakeholders who had never previously met, but shared common interests and experience. While a ground-up, grassroots approach to Plan implementation has great potential, one of the risks is that independent agents of change will work in isolation, without having an opportunity to share resources, best practices, lessons learned, etc. This may slow implementation.

As well, there are many existing organizations with mandates that mirror the Plan's objectives. These organizations can coordinate on initiatives to ensure broader geographic coverage, to target specific interest groups, or simply to mutualize resources.

Presently, the Engage MidHudson site, Basecamp, and the periodic public meetings provide forums for discussion and exchange. Maintaining these forums will require time and investment.

Continue Engage MidHudson

There is a strong online community that wants to participate and discuss topics related to sustainability in the Region. The EngageMidHudson site provides a venue for this discussion. However, hosting of the site requires payment of an annual fee (approximately $250-$500/month) as well as some investment of time in moderating and managing the site. The site is currently scheduled to go offline in May 2013. A willing host is needed to maintain this valuable public platform for discussion.

Basecamp

A series of projects were established on a Basecamp site to enable the Working Groups to collaborate. These projects memorialize the discussion and material generated during the planning process. Hundreds of files and thousands of comments are currently spread across the various sites. This material should be either moved to an alternate repository (e.g. the SAC) or be maintained for further use, which requires paying a modest fee of $50/month. The site is currently scheduled to go offline at the end of July 2013.

Annual Forum

While online collaboration is valuable, in-person collaboration helps cement the relationships needed to implement this Plan. An annual (or biannual) forum, open to the public, would provide for networking and discussion. Newly-launched projects could be presented, as well as an annual report documenting changes in key metrics for sustainability. A host and organizing committee will need to be identified to make this annual forum a reality, in addition to Consortium staff support. Modest entry fees might help offset costs for renting a venue and any equipment, security, or refreshments provided.

Capitalize on Existing Communications Networks

The Region already has a robust, loosely affiliated network of media, each with an existing audience. These include traditional press – newspapers, television channels, radio – as well as the various mailing lists, forums, and other communications launched by the numerous governmental and non-governmental entities in the Region. These eclectic platforms can serve as a voice for sustainability initiatives, and already benefit from existing constituencies. As Plan implementation progresses, the regional governance body – as well as local implementers – should capitalize on these media in a coordinated, regular fashion. Using existing communications platforms will provide targeted information serving the diverse communities of the Region, while helping mainstream Plan content and ideas.

10.3 Making Change Happen

The regional governance strategies outlined in this Chapter will help coordinate efforts and keep government and other engaged volunteers moving forward. This alone will not be enough. To make change happen – the goal of this Plan – action is required by individuals, businesses, non-profits, and government actors. No one is exempt if the Plan is to be realized. To create this groundswell, there needs to be a major campaign of outreach and education to mobilize support for making the Mid-Hudson Region the nation's sustainability leader. The benefits of Plan implementation – jobs, a cleaner environment, more livable cities and villages – need to be highlighted. Critically, people need to be rewarded or recognized for their efforts and participation.

As developed in Section 9.5, a regional branding initiative will help mobilize this support and engagement. If businesses and organization can be formally recognized for their efforts to achieve the Plan's objectives, it will encourage participation while helping make the Plan more visible and tangible to individuals. As more entities take the Pledge and begin changing their practices and thinking, the impacts will slowly become visible at the regional scale. This will help perpetuate the view – shared by many engaged residents today – that the Mid-Hudson Region is truly a national leader in sustainable development.

Case Study: Green Guru Network

There are multiple existing web-based clearinghouses for information on sustainable development activities, best practices and more. One highly-successful example – which could be expanded to serve the entire Region – is the Green Guru Network. The Green Guru Network provides a place for municipal leaders, businesses, schools, and interested citizens to find regional-specific online resources, helping spur market transformation by showcasing regional sustainability assets. Of Green Guru Network's over four million hits in 2012, over 73% of the page views were local, with an average length of visit of less than two minutes. This means that local viewers are using the site as a pointer to regional resources. The lean strategy is to guide viewers to regional resources and to leave ownership, development and maintenance of content to benefiting regional entities. This ensures entities autonomy over their content and supports their brand recognition. It also helps viewers search for regional sustainability resources on a competitive basis with national and international content.

Tables, Figures, Acronyms, and Acknowledgements

List of Tables

1 Introduction

2 Central Themes

3 The Approach and Structure of the Plan

4 Land Use, Livable Communities, and Transportation

5 Energy

6 Materials Management

7 Agriculture and Open Space

8 Water

9 Priorities for a Greener Mid-Hudson

10 Implementation Framework

List of Figures

1 Introduction

2 Central Themes

3 The Approach and Structure of the Plan

4 Land Use, Livable Communities, and Transportation

5 Energy

6 Materials Management

7 Agriculture and Open Space

8 Water

9 Priorities for a Greener Mid-Hudson

10 Implementation Framework

Acronyms

ACS	*American Community Survey*
ASHRAE	*American Society for Heating, Refrigeration, and Air Conditioning Engineers*
B-MRF	*Building Material Reuse Facility*
Btu	*British Thermal Units*
BRT	*Bus Rapid Transit*
C *& D*	*Construction and Demolition*
CAFE	*Corporate Average Fuel Economy*
CCA	*Community Choice Aggregation*
CCE	*Cornell Cooperative Extension*
CDD	*Cooling Degree Days*
CED	*Community Energy District*
CNG	*Compressed Natural Gas*
CRREO	*Center for Research, Regional Education & Outreach*
CSA	*Community Supported Agriculture*
CSO	*Combined Sewer Overflow*
CTPP	*Census Transportation Planning Products*
DCRRA	*Dutchess County Resource Recovery Agency*
DEF	*(Westchester County) Department of Environmental Facilities*
DOE	*Department of Energy*
DR	*Demand Response*
E *& E*	*Ecology & Environment, Inc.*
ED	*Economic Development*
EEC	*Energy Efficiency Certificates*
EFP	*Existing Facilities Program*
EJ	*Environmental Justice*
EPA	*Environmental Protection Agency*
EPP	*Environmentally Preferable Purchasing*
FEMA	*Federal Emergency Management Agency*
GHG	*Greenhouse Gas*
GIS	*Geographic Information Systems*
GW	*Gigawatt*
HDD	*Heating Degree Days*
HHW	*Household Hazardous Waste*
H-MRF	*Household Materials Recovery Facility*
HVRC	*Hudson Valley Regional Council*
IPE	*Industrial & Process Efficiency Program*
IWS	*Interstate Waste Services*
kW	*Kilowatt*
LED	*Land Efficient Development*
LELE	*Love 'Em and Leave 'Em*
LID	*Low Impact Development*
MMBtu	*Million Btu*
MMWG	*Materials Management Working Group*
MPO	*Metropolitan Planning Organization*
MRF	*Materials Recovery Facility*
MSW	*Municipal Solid Waste*
MTA	*Metropolitan Transportation Authority*
MTCO2e	*Metric Tons of Carbon Dioxide Equivalent*
MW	*Megawatt*
NCP	*New Construction Program*
NEPA	*National Environmental Policy Act*
NERC	*North American Electrical Reliability Corporation*
NIMBY	*Not In My Back Yard*
NJ	*New Jersey*
NMTC	*New Markets Tax Credit*
NWEAC	*Northern Westchester Energy Action Consortium*
NYC	*New York City*
NYCON	*New York Council of Nonprofits*
NYISO	*New York Independent System Operator*
NYMTC	*New York Metropolitan Transportation Council*
NYS	*New York State*
NYSDEC	*New York State Department of Environmental Conservation*
NYSDOH	*New York State Department of Health*
NYSDOL	*New York State Department of Labor*
NYSDOT	*New York State Department of Transportation*
NYSERDA	*New York State Energy Research and Development Authority*
PACE	*Property Assessed Clean Energy*
PAYT	*Pay As You Throw*
PV	*Photovoltaic*
rbST	*Somatotropin*
RCSWMA	*Rockland County Solid Waste Management Authority*
REDC	*(Mid-Hudson) Regional Economic Development Council*
RHRF	*Recyclables Handling and Recovery Facilities*
ROI	*Return on Investments*
RPA	*Regional Plan Association*
RRF	*Resource Recovery Facility (Waste-to-Energy)*
SAC	*Sustainability Analytics Center*
SF6	*Sulfur Hexaflouride*
SLOSH	*Sea, Lake, and Overland Surge from Hurricanes*
SLR	*Sea Level Rise*
SNAP	*Supplemental Nutrition Assistance Program*
SSL	*Source Separation Law*
STP	*Sewage Treatment Plant*
SUNY	*State University of New York*
SWEAC	*Southern Westchester Energy Action Consortium*
SWMP	*Solid Waste Management Plan*
T *& D*	*Transport and Disposal*
TBD	*To Be Determined*
TDM	*Transportation Demand Management*
TIF	*Tax Increment Financing*
TSM	*Transportation Systems Management*
UCRRA	*Ulster County Resource Recovery Agency*
US	*United States (of America)*
USDA	*United States Department of Agriculture*
US *EPA*	*United States Environmental Protection Agency*
US *DOT*	*United States Department of Transportation*
VHB	*Vanasse, Hangen, and Brustlin Inc.*
VMT	*Vehicle Miles Traveled*
WWTP	*Wastewater Treatment Plant*
YIMBY	*Yes In My Back Yard*

Acknowledgements

MID-HUDSON REGIONAL CONSORTIUM

Orange County, Co-Chair
David Church, AICP, Planning Commissioner

Kelly Dobbins, Senior Planner

Kate Schmidt, Planner

Martha Boulanger, Account Clerk

Town of Greenburgh, Co-Chair
Thomas Madden, AICP, Commissioner of Dept. of Community Development and Conservation

Keith Eversley, Project Coordinator

Robert Joseph, Planning Intern

Dutchess County
Kealy Salomon, Planning Commissioner

Mark Debald, Transportation Council

Putnam County
John Tully, Deputy County Executive

Anthony Ruggiero, Commissioner of Planning, Development, and Transportation

Patricia Simone

Rockland County
Thomas B. Vanderbeek, Commissioner of Planning and Public Transportation

Sullivan County
Luiz Aragon, Planning/ Environmental Commissioner

Dick Riseling, Sullivan Alliance for Sustainable Development

Ulster County
Dennis Doyle, Planning Director

Amanda Lavalle, Coordinator, Dept. of Environment

Westchester County
Edward Buroughs, Planning Commissioner

Center for Research, Regional Education & Outreach (CRREO) - State University of New York (SUNY) New Paltz

Gerald Benjamin, Director
K.T. Tobin, Assistant Director

Pace University - Land Use Law Center

Mayors' Redevelopment Roundtable
Mary Foster, Mayor, City of Peekskill

Judy Kennedy, Mayor, City of Newburgh

Jessica Bacher, Land Use Law Center
John Nolon, Land Use Law Center

New York Council of Nonprofits
Audrey Grifel, Capacity Building Advisor

Susan Weinrich, Vice President

Northern Westchester Energy Action Consortium (NWEAC)
Herb Oringel

Michael Gordon

Southern Westchester Energy Action Consortium (SWEAC)
Nina Orville

Nicola Coddington

MID-HUDSON REGIONAL ECONOMIC DEVELOPMENT COUNCIL (REDC)

Aimee Vargas, Director

March Gallagher, Ulster County Deputy Director for Economic Development – Project Liaison

Luiz Aragon, Sullivan County – Project Liaison

WORKING GROUP CO-CHAIRS

Agriculture and Open Space
Deborah DeWan, Rondout Valley Growers

MaryAnn Johnson, Hudson Valley Agribusiness Development Corp

Economic Development
Herb Oringel, NWEAC

Jeff Rumpf, Clearwater

Energy
Michael Gordon, NWEAC

Richard Thomas, NY Affordable Reliable Electricity Alliance

Dick Riseling, Sullivan Alliance for Sustainable Development

Land Use, Livable Communities and Transportation
Nadine Lemmon, Tri-State Transportation Campaign

Daniel Richmond, Zarin & Steinmetz

Dennis Doyle & Amanda Lavalle, Ulster County

Materials Management
Gerald Benjamin, CRREO – SUNY New Paltz

Anna Roppolo, Rockland County Solid Waste Management Authority

Water
Scott Cuppett, NYSDEC, Hudson River Estuary Program

Russell Urban-Mead, The Chazen Companies

PROJECT CONSULTANTS

Ecology & Environment, Inc. (E & E)
Michael Wironen, Lead Project Manager

Daniel Herrera

Julie Chang

Bob Singer

James Dumpert

Nermin Ahmad

Nicole Parganos

Thomas Heins

David Weeks

Jennifer Bogle

Regional Plan Association (RPA)
Daniel Schned, Project Manager

Petra Todorovich Messick

Corey Piasecki

Robert Lane

Jeffrey Zupan

Fiona Zhu

Jackson Whitmore

Osman Dadi

Vanasse Hangen and Brustlin, Inc. (VHB)
Owen Wells, Project Manager

John Saccardi

Emmanuelle Humblet

Lauren Wang

Eric Zamft

Croton Energy Group
Leo Wiegman, Project Manager

Ed Robin

Robert James

Clearwater, Inc.

PHOTO CREDITS

We would like to acknowledge the Working Group and Consortium members, EngageMidHudson users, and other groups and individuals who graciously provided photos for use in the Plan. Additionally, we would like to acknowledge Orange County Tourism, the Westchester County Office of Tourism, Ulster County Tourism, and Sullivan County Visitors Association for providing photos for use in the Plan.

WORKING GROUP MEMBERS

Agriculture/Open Space
Michael Baden
Gail Beverly
Jan Blaire
Sarah Brannen
Ava Bynum
Betsy Calhoun
Craig Cashman
Tara Collins
Jose Colon
Carrie Davis
Jim Delaune
Samantha Diliberti
Mimi Edelman
Phil Ehrensaft
Olivia Farr
Stefan Gieger
Steve Gold
John Grazinski
Dan Guenther
Liz Higgins
Eileen Hochberg
Liana Hoodes
Noela Hooper
Jan Howard
Virginia Kasinki
Sharon Kroeger
Jennifer Mall
Mary Marster
George Michaud
Ken Migarelli
Allison Morrill Chatrchyan
Althea Mullarkey
Brian Obach
Cheryl Rogowski
Penny Steyer
Lauri Taylor
Ryan Trapani
Daniel Young

Economic Development
Kevin Bailey
Ron Bartley
Lea Cullen Boyer
Mark Castiglione
Anthony Davidowitz
Jim Delaune
Melissa Everett
Gennaro Faiella
March Gallagher
Dani Glaser
Susan Habel
Rick Herbeck
Ralph Huddleston
Shawn Joyce
Judy Kennedy
Erin Loosen
Ryan Meres
Bernard Molloy
Michael Oates
Laurence O'Connell
Jim Pinto
Linda Puoplo
John Saccardi
Kathy Schibanoff
Jeremy Schulman
Allan Scott
Christopher Steers
Gregg Swanzey
Mary Kay Vrba

Energy
Neil Alexander
Rick Alfandre
Bob Alpern
Robert Backus
Tino Baguio
Chris Bernabo
Edward Blundell
Kippy Boyle
John Burke
Betsy Calhoun
George Calvi
Anthony Campagiorn
John Carton
Allison Chatrchyan
Andy Chintz
Nicola Coddington
Hartley S. Connett
Mark Courtner
Pat Courtney-Strong
Bill Cox
Vince Cozzlino
Sue T. Crane
Michael D'Arcy
Joe Del Sindico
David Dell
Charles P. Duffy
Colleen Emery
Melissa Everett
Charles Feit
Stephen Filler
Drew Fixell
Ginny Forni
Ross Gould
Manna Jo Greene
Alexander Gromack
John Hall
William Hanauer
Paul Heuston
Daniel Higgins
Laurie Husted
Eric Ilowsky
Craig Jacobs
Jeff Jones
Tom Kacandes
Ron Kamen
Kerry-Jane King
Peggy Kurtz
Vincent Lander
Daniel Leary
Ron Leonard
Rick Lewandowski
John J. Lynch
William Makofske
Frank Maricic
John Maserjian
Kelly Meyers
Paul Moskowitz
Carol Murphy
Libby Murphy
Mary Beth Murphy
Phillip Musegaas
Deborah Newborn
Meridith Nierenberg
Brian Nieves
Todd Olinsky-Paul
Nina Orville
Allan Page
James M. Palmer
Patricia Pomeroy
Linda Puglisi
Pete Robbins
Alexander Roberts
Lee V.A. Roberts
Dan Rosenblum
Baiyina Salahuddin
William Schlesinger
Rudy Scott
Charles B. Strome, III
Peter Swiderski
Harry Terbush
Mark Thielking
Pamela Timmins
Brad Tito
Cindi Vasta
Bruce Walker
Gary Warshauer
William Weaver
Dan Welsh
Samantha Wilt
Zywia Wojnar
Abraham J.Zambrano

Transportation & Land-Use
Jessica Bacher
Eileen Banra
Keith Betensky
Jennie Nolon Blanchard
Catherine Borgia
Ethan Cohen
Neil Curri
Justin Datino
Mark Debald
Joseph D'Onofrio
Fred Frank
David Gilmour
Bill Gorton
Laura Heady
CJ Hoss
Gerald Jacobowitz
Jolanda Jansen
Guy Kempe
Robert LaColla
Milagros Lecuona
William Long
Ian MacDougall
Jamie Martinez
Peter McCartt
Robert McKeon
Althea Mullarkey
John Nolon
Larry O'Connell
Mark Porterfield
Linda Puoplo
Steve Rieger
Laura Rossi
Anthony Ruggiero
Candace Schafer
William Schuster
Eleanor Sharpe
Peter Smith
Nortrud Spero
Padraic Steinschneider
Andy Stewart
KT Tobin
Meg Walker
Nicholas Ward-Willis
Dan Welsh
Laura Woznitski

Materials Management
Michelle Bergkamp
James Best
Janet Burnet
Lindsay Carille
Christopher Crane
Neil Cutler
William Cutler
Matt De la Houssaye
John Gebhards
Evadne Giannini
Kenneth Greehan
Emilie Hauser
Anne Jaffe-Holmes
Terry Laibach
Christian Paggi
Mary Rice
Zoie Riel
Gary M. Ritchie
Timothy Rose
Mary-Jane Shimsky
MJ Wilson

Water
Aliesa Adelman
Matt Alexander
Bob Alpern
Bridget Barclay
Henry Bartosik
Jay Beaumont
Alison Boak
Tracy Brown
Brian Brustman
Michael Budzinski
Janet Burnet
Jordan Christensen
Fran Dunwell
Phil Ehrensaft
Stuart Findlay
Mark Gilliland
Simon Gruber
Steven Gruber
Peter Harckham
Emilie Hauser
Paul Heisig
Manna Jo Greene
Lorraine Keckeisen
Barbara Kendall
Carolyn Klocker
Peggy Kurtz
Diane Lewis
Cesare Manfredi
Mary McNamara
Arlene Miller
Dan Miller
Joseph Nicoletti
Steve Noble
Steve Osborn
Christian Paggi
Ryan Palmer
Fran Perchick
Brian Rahm
Jessica Ridgeway
Bill Schlesinger
William Shaw
Sacha Spector
Don Steinmetz
Ira Stern
Emily Vail

A Public Engagement Summary

As arguably the birthplace of the US environmental movement, the Mid-Hudson Region is home to an engaged, enthusiastic, and highly knowledgeable public around issues of sustainable development. To capture the latent knowledge and expertise – as well as the views and opinions – of the Mid-Hudson Region's residents, the sustainability planning process included an extensive public engagement effort. This effort was designed to maximize the opportunity for input, taking into consideration the considerable constraints imposed by the aggressive project schedule.

This Appendix describes the approach and outcomes of the public engagement process, and includes a timeline of events and key activities.

A.1 Engagement Approach

The public engagement process sought important insights and information on the Region. As such, the people targeted as part of the engagement effort included:

- Elected officials/government employees at the local, state, and federal level
- Business owners/employees
- Representatives of non-profit organizations
- Local experts and university researchers
- Members of the general public
- Regional Economic Development Council members

To reach these different constituencies, a Consortium and six Working Groups were formed. Additionally, a series of strategies were implemented to facilitate participation, including:

- Stakeholder Interviews
- Operation of the Engage MidHudson site
- Operation of the Basecamp site
- The Use of Press Releases
- Public Meetings
- A Public Review Process
- Briefings on the Project to the REDC

Note that many of these components are described in detail in the Project Execution Plan and in associated guidance memoranda.

A.2 Key Participant Groups

A.2.1 The Consortium

The governing body of the planning effort, known as the Consortium, is made up of members from local governmental and nongovernmental organizations from around the Region. The goal in forming the Consortium was to ensure representation from all seven counties, with a balance of northern and southern and urban and rural constituencies.

The planning process sought to ensure participation from stakeholders who would likely be involved in the implementation of the Plan. In order to be a part of the Consortium, member organizations had to agree to volunteer at least the equivalent of a senior planner to take part in the monthly meetings. Many Consortium members had direct participation by Commissioner/management level staff. Consortium members are as follows:

- Dutchess County
- Orange County
- Putnam County
- Sullivan County
- Ulster County
- Town of Greenburgh
- Center for Research, Regional Education, and Outreach (CRREO)
- Pace Land Use Law Center - Mayors' Redevelopment Roundtable
- Northern Westchester Energy Action Consortium (NWEAC)
- Southern Westchester Energy Action Consortium (SWEAC)
- Also, the following governmental and non-governmental partners contributed to the work of the Consortium.
- Rockland County
- Westchester County
- Mid-Hudson Regional Economic Development Council
- New York Council of Nonprofits (NYCON)

Additionally, the Consortium hired a team of consultants to act as coordinators and technical subject matter experts. The Consultant Team worked with a subgroup of the Consortium known as the Project Coordination Team in order to manage the logistics of the project while also working with Working Groups as the subject matter experts. Together, the Consultant Team helped link the Consortium to the Working Groups and ensure that information was shared broadly yet appropriately.

The Consortium met monthly during the planning process, starting in April 2012 and continuing into 2013.

A.2.2 Working Groups

The six Working Groups convened as part of the planning process constituted one of the central participant groups intended to engage the public in creating the Plan. Working Groups were created in alignment with the main focus areas of the Plan. The goal in assembling the Working Groups was to ensure that each focus area would have input from stakeholders in the Region with intimate knowledge of the issues at hand, as well as a stake in seeing real, positive change. The intent was to target individuals or organizations that are positioned to have a real impact in implementing any recommendations to come out of the Working Groups.

Each Working Group was made up of members of local government, non-profit organizations, businesses, universities, and other organizations or Consortia. The Working Groups were intended to be inclusive, open to all willing to contribute, and seeking representation from all parts of the Region (north/south, rural/urban, private/public, etc.). Each group was led by at least one governmental and non-governmental co-chair, as well as a representative of the Consortium. Consulting and Project Coordination Team liaisons were also assigned to each Working Group.

The Working Groups were populated through a widely-advertised volunteer process where people could either nominate someone for membership or self-nominate. Multiple calls were made for members; new members were allowed to join even partway into the planning process. Co-chairs for each Working Group were selected in much the same way, although they were required to agree to a larger commitment and demonstrate knowledge of the subject matter, as they were placed into a leadership position.

The Working Groups convened in person a minimum of four times during the planning process. Additionally, many Working Groups chose to meet on other occasions, or as distinct sub-groups. Multiple strategies were devised to facilitate participation and Working Group engagement outside of the formal meetings.

A.3 Engagement Strategies

A.3.1 Stakeholder Interviews

Goal

The Consulting Team conducted at least three stakeholder interviews per Working Group in order to rapidly identify the most pressing issues within each focus area. Specifically, the interviews sought to determine the following:

- Trends and priority issues as they relate to sustainable development in the Region
- Existing plans and data to inform the Baseline Assessment
- Current initiatives contributing to the Region's sustainable development
- Potential concepts or projects that could further the Region's sustainable development objectives
- A secondary goal of the interviews – conducted in the first months of the planning process – was to raise awareness of the Plan and process.

Process

Interviewees were chosen via discussion between the Working Group Co-Chairs and Consultant Team with the goal of speaking to individuals with deep local knowledge within each focus area. Interview questions were developed by the Co-Chairs and the Consultant Team. An example of the interview questions asked can be found in Attachment 4. Each interview was roughly 30 minutes in length.

Outcomes

The interviews informed the Baseline Assessment of current initiatives contributing to the Region's sustainable development. They also helped identify potential concepts or projects that could further the Region's sustainable development objectives. Most interviewees subsequently participated in Working Groups during the remainder of the planning process.

A.3.2 Engage MidHudson

Goal

Designed by the company MindMixer, *Engage MidHudson* is a website that was set up in order to provide the general public with the opportunity to engage in discussions about issues relevant to the Plan. Specifically, the site allowed for people who were otherwise unable to participate in the Working Groups to share their ideas and for members of the Consulting Team to solicit feedback from the general public on certain topics.

Process

An Engage MidHudson Web announcement flyer was designed and circulated to begin spreading the word about the site throughout the general public and Working Group members. This was circulated widely by the planning Consortium and other participants.

Once the site was launched, the Consultant Team and the Working Groups developed discussion topics which were then posted to Engage MidHudson. The general public was then free to comment and debate in a "town hall" atmosphere on the website. Discussion topics came in various formats that allowed for different information to be gathered, including but not limited to polls, surveys, idea submission, and open-ended discussion. The homepage and an example discussion page can be seen in Figures 1 and 2.

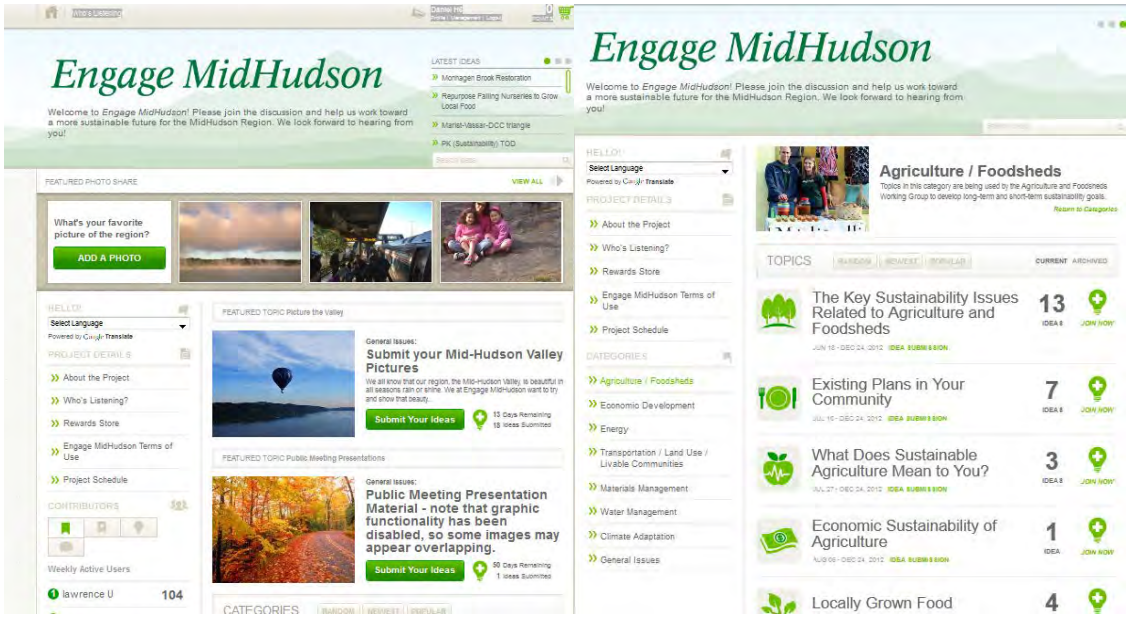


Figure 1 and Figure 2

Outcomes

Engage MidHudson now has over 400 members of varying demographic backgrounds from all over the Region – Figures 3, 4, and 5 provide some background on the user community as of Dec. 13th, 2012. Members have submitted more than 200 ideas and hundreds of comments which have helped spark discussions within the Working Groups. An example of a question and its responses can be seen in Figure 6.

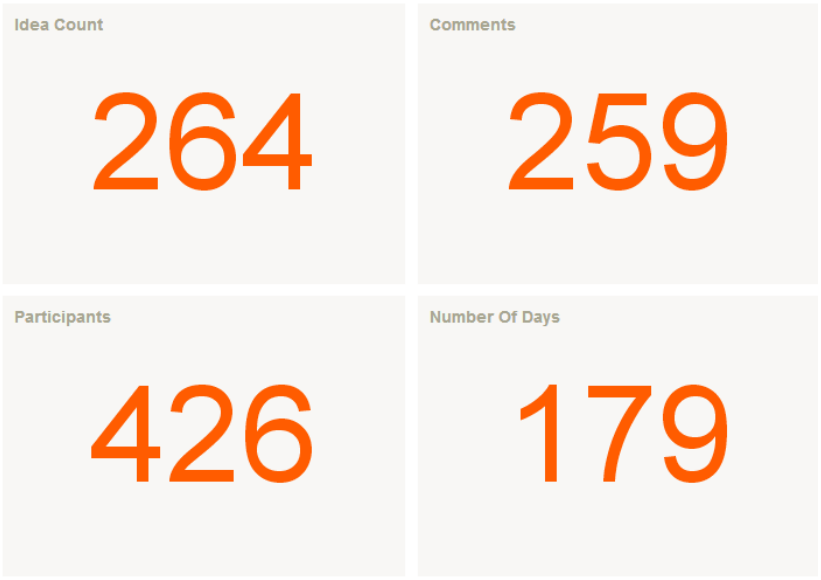


Figure 3

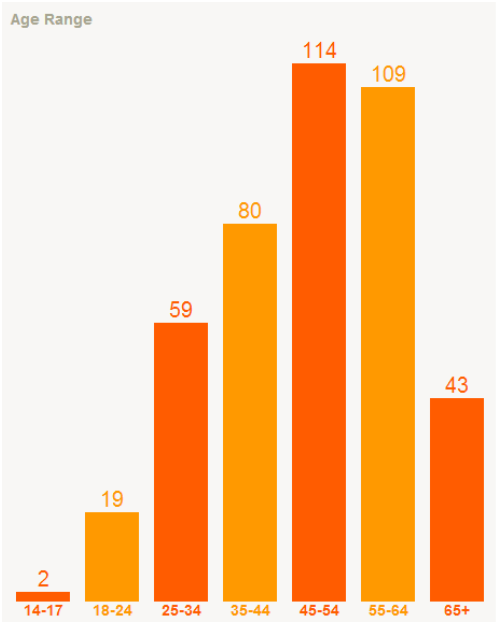


Figure 4

Figure 5

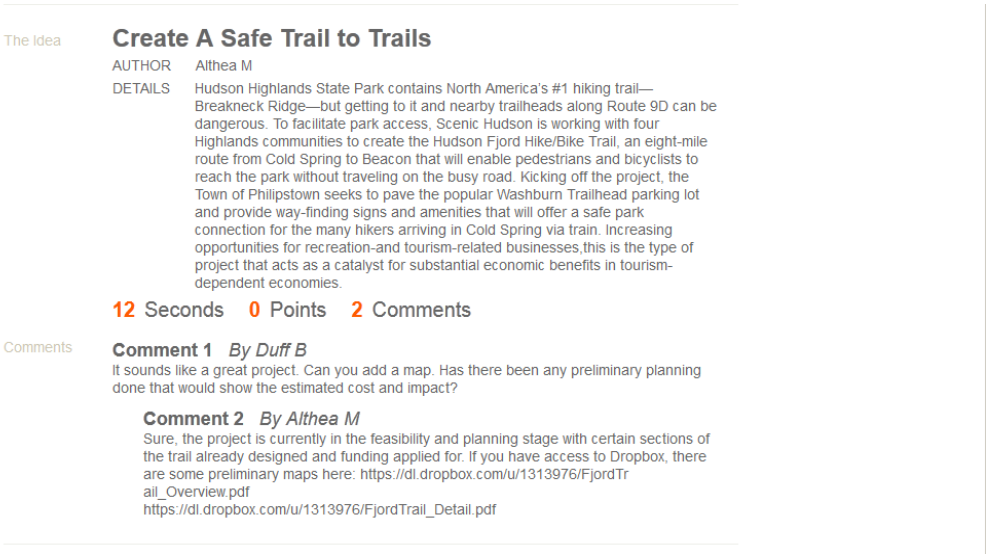


Figure 6

A.3.3 Basecamp

Goal

In order to better manage the contribution of the Working Groups and to provide a private forum for Working Group discussion, the web-based tool Basecamp was used. Basecamp allowed the Consortium, Project Coordination Team, Consultant Team, and Working Groups to communicate efficiently and effectively throughout the planning process.

Process

Basecamp acted as a platform where documents could be shared and discussions held. It provided a central area where the project managers could provide guidance and updates on overall progress. It allowed Working Group members to continue discussions between in-person meetings. Figure 7 shows a portion of the home screen for Basecamp and how information was grouped into individual discussion areas. Figure 8 shows an individual discussion area with a series of discussion threads.

Figure 7

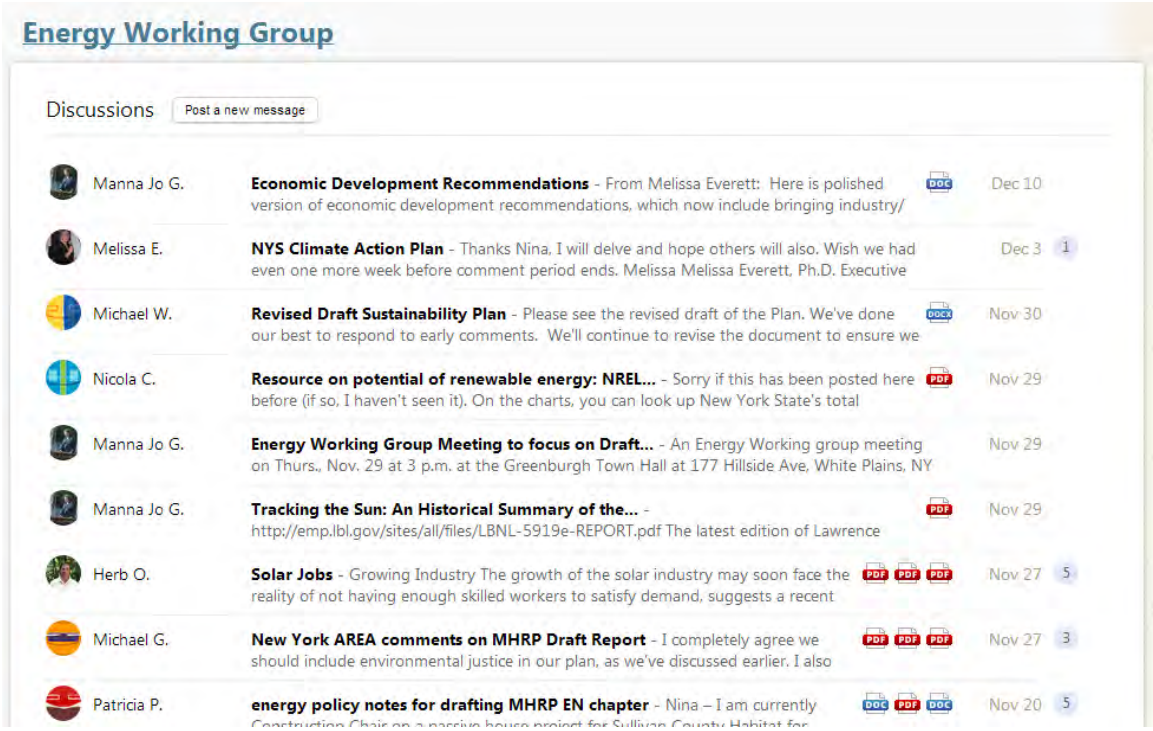


Figure 8

Outcomes

Over the duration of the planning process, more than seven gigabytes of data were stored and distributed on Basecamp. Hundreds of discussions were initiated. Best practice case studies, implementation resources, and other useful material was shared. Basecamp also provided the means for the Plan to be distributed privately for comment by members of the Consortium, Working Groups, and Consultant Team once the document became too large to email effectively. As of December 13th, 2012, 296 people have created Basecamp accounts.

A.3.4 Press Releases

Goal

Throughout the planning process multiple press releases were distributed by the Consortium regarding different events and public meetings held throughout the Region. These press releases were designed to spread the word and help raise awareness of the public meetings so as to ensure good attendance. Press Releases were circulated to a diverse list of print, social and radio media sources; a list of media sources used is included as an attachment. The press releases also helped inform the public of opportunities to contribute and review the draft Plan.

Process

Press releases were sent out to the local news media as well as posted to Engage MidHudson and distributed virally via personal email. Press Releases created throughout this planning process are included as an attachment. Major press releases include:

- Public Meeting #1 July 30th, 2012
- Public Meeting #2 November 27th, 2012
- Public Meeting #3 November 29th, 2012

Outcomes

The press releases were a vital part of generating interest and participation in the planning process. Attendance at public meetings, participation in the Working Groups, and other activities directly benefited from the increased press. Hundreds of comments were also received on the public draft of the Plan.

A.3.5 Public Meetings

Goal

Three public meetings were held over the course of the planning process. The first meeting was an introduction to the public of the project scope and process such that they could become familiar with the way the project was being run. The second and third meetings were presentations of the draft Plan that gave the public the opportunity to comment and receive direct feedback from the Consultant Team.

Process

For each public meeting, the format was similar, beginning with a presentation by the Consortium Co-Chairs and the Consultant Team Project Manager followed by a question and answer period providing members of the public with an opportunity to discuss the Plan and process. This gave the public a chance to directly question members of the Project Coordination Team and Consultant Team about the Plan.

Outcomes

More than 100 people attended each of the three public meetings held throughout the Region. Figures 9 and 10 are photos taken at two of the events. As a result of the public meetings, the Consultant Team was able to raise awareness of the existence of the planning effort, solicit ideas for inclusion in the Plan, and receive comments and feedback on the draft Plan. After all three public meetings, site traffic on *Engage MidHudson* increased and more people joined the

discussions. Additionally, each meeting was attended by local media which were able to further spread information on the Plan.

Figure 9

Figure 10

A.3.6 Public Review Process

Goal

The goal of the public review process was to ensure that the public had the opportunity to comment on a draft of the Plan prior to it being finalized and delivered to NYSERDA. While there was not enough time in the planning process to administer a formal period of public

comment and review according to governmental standards, the planning team sought to provide as much time for input as possible.

Process

Multiple rounds of review were undertaken. For the Baseline Assessment (which included the Climate Change Vulnerability Assessment and the draft Regional GHG Inventory), the Project Coordination Team completed an initial review. The Working Groups were then provided time to review and submit comments. The Baseline Assessment was then revised and submitted to NYSERDA for review and approval.

The draft Plan was first reviewed by the Project Coordination Team in late October. It was subsequently sent to the Consortium for review in early November. Because of the time pressure in the schedule, the draft was subjected to a parallel review/revision process.

In mid-November a revised draft was circulated to the Working Groups for review. On November 21st the first public draft was posted for review. This draft was updated on November 30th, and comments were accepted through December 10th. A final draft was submitted to NYSERDA on December 18th.

Comments were solicited using a spreadsheet posted as a Google Doc so that anyone with a computer and internet access could post their comments in a clearly defined rubric. By using this system, the Consultant Team was better able to keep track of comments received and ensure they were acknowledged and addressed.

Outcomes

More than 380 comments were received via the Google Doc and subsequently addressed by the Consultant Team. Several hundred additional comments were received via email or phone. A complete list of comments received in the Google Doc from both the general public and the Working Groups is included as an attachment. The public review has provided additional legitimacy to a planning document developed through a collaborative, inclusive process.

A.3.7 REDC Briefings

Goal

The REDC is a key Plan constituency as they are responsible for updating the Regional Economic Development Strategy and, in part, awarding project funds via the Consolidated Funding Application process. Aligning the Plan and its implementation efforts with the work of the REDC is critical. The REDC briefings were designed to educate the REDC on the

planning process and how it sought to address thematic issues like economic development in the Region.

Process

Members of the Consortium, including the Co-Chairs, were invited to speak at certain REDC meetings. At these meetings the Co-Chairs presented on the status of the planning effort. A presentation of the draft Plan is currently being scheduled.

Outcomes

Out of these meetings, the sustainability planning process was able to better coordinate its goals with those of the REDC. For example, as the REDC revised and updated its draft Economic Development Strategy, members of the Consortium and the Consultant Team were able to provide targeted input. Henceforth, the REDC has formally referenced the Plan in a section of the REDC's goals document. It is hopefully that this initial engagement will result in additional involvement with the REDC by members of the sustainability planning team.

A.3.8 Conclusions

The networking, discussion, and overall engagement that resulted from this planning process are unprecedented in the Region. Hundreds of people interacted on a regular basis to discuss issues of short- and long-term concern, in an effort to create a vision for a sustainable future. Relationships were built, partnerships established, and new dialogue initiated.

During the implementation stage, the cooperation and collaboration exhibited during the planning process may prove foundational to ensuring the ideals and goals of the Plan are realized. New partnerships and relationships have been formed, which provide a strong basis to begin implementing real change. This should, among other things, help ensure that Phase II of the Cleaner Greener Communities program is a success and results in lasting positive change.

Attachments

- Working Group Nomination Card
- Four Page CGC flyer
- Media Resources List
- Public Meeting Announcement for *Engage MidHudson*
- Public Meeting Press Releases
- Working Group Guidance Document
- Project Idea and Nomination Form
- Public Comment/Response

B Indicator Data Sources and Calculations

The following series of tables shows the metric, calculation and data sources used in the Indicator Inventory for each of the plan focus areas.

Table B.1 – Land Use, Livable Communities, and Transportation

Metric	Calculation	Data Source
1a. Acres of urbanized land per capita	(Total acreage of urban development) / (Total population)	Urban development data – Urban Area, U.S. Census Population – U.S. Census
1b. Percent of population and jobs in centers supported by transit	Center – An area that meets the corresponding thresholds in each of the following categories: • Road Connectivity > 20 intersections/mi^2. • Area must be < 5 miles from a train station • Area must have > 1 bus stop/mi^2 • Transit score > 1 • Walkability score > 0.3	Road Data – U.S. Census TIGER Transit Data – RPA, Ulster County, MTA Metro North Schools Data – NYS Department of Education Population Data – U.S. Census Jobs Data – U.S. Census Transportation Planning Package
2a. Ratio of the number of jobs to the number of housing units	(Total jobs) / (Average housing units / Census tract)	Most recent U.S. Census CTPP available
2b. Ratio of average annual job pay to median home values	(Average salary put to a 1-10 scale) / (Median home value normalized to a 1-10 scale per census tract)	Salary data – County business patterns Home value data – U.S. Census, ACS
2c. Share of housing permits issued for units in multi-family (5+ units) buildings	(Total permits issued for housing units in multifamily buildings) / (Total permits issued for all housing units annually)	U.S. Census, ACS
2d. Percent of people living within one half mile of a park	(Total number of people living within one half mile of a park) / (The total population)	Parkland data - Scenic Hudson. Population data - U.S. Census
3a. Gallons of gasoline sold per registered vehicle	(Total annual gallons of gasoline sold) / (Total active vehicle registrations)	NYSERDA / NYSDMV
3b. Change in carpool, transit, and non-motorized minus change in single occupant vehicle work trips	(Change in the percentage of work trips by carpool, transit, bike, and walk) – (Change in the percentage by single occupant vehicle)	Most recent U.S. Census CTPP available and ACS
3c. Annual vehicle miles traveled	Total annual vehicle miles traveled	NYSDOT

Table B.1 – Land Use, Livable Communities, and Transportation		
Metric	**Calculation**	**Data Source**
3d. Active vehicle registrations per 1,000 capita	((Total active vehicle registrations) / (The total population)) / 1,000	NYSDMV
3e. Hudson River bridge crossings per registered vehicle	(Total annual Hudson River bridge crossings) / (Total active vehicle registrations)	Bridge data – NYSBA Vehicle Registrations - NYSTA
3f. Annual commercial truck traffic at all toll barriers in the Region	Total annual commercial traffic at toll barriers	NYSBA
3g. Transportation fuel use (MMBtu) per capita	(Total transportation fuel consumption (in MMBtu)) / (The total population)	Regional Tier 1 or 2 Greenhouse Gas Inventory, DOT, DMV, CAFÉ impact, NYMTC
3h. Transportation GHG emissions per capita	(Total transportation GHG emissions) / (The total population)	Regional Tier 1 or 2 Greenhouse Gas Inventory, DOT, DMV, CAFÉ impact, NYMTC
4a. All injuries due to motor vehicle accident per 10,000 registered vehicles	((Total injuries due to vehicle accidents) / (Active vehicle registrations)) / 10,000	NYSDOH, Bureau of Injury Prevention
4b. Pedestrian and bike injuries due to vehicle accidents per 10,000 registered vehicles	(Total pedestrian and bike injuries due to vehicle accidents) / (10,000 active vehicle registrations)	NYSDOH, Bureau of Injury Prevention
4c. Percent of bridges that are classified as “structurally deficient”	(Total number of bridges classified as structurally deficient) / (The total number of bridges)	NYSDOT
4d. Average condition rating of road pavement	Average annual condition rating of road pavement by county	NYSDOT
4e. Percentage of the passenger rail network located in FEMA 100-year floodplains and SLOSH hazard areas	(Number of miles of rail lines in SLOSH zones and FEMA 100 year floodplains) / (The total rail line miles)	National Weather Service (NWS) and MTA Metro-North
4f. Roads in FEMA 100-year floodplain and SLOSH zones	(Number of miles of road in FEMA 100 year floodplain and SLOSH zones) / (The total road miles)	National Weather Service (NWS) and NYSDOT
4g. Population in FEMA 100-year floodplain or SLOSH zone	(% of land area of Census tract in SLOSH zone) x (Population of Census tract)	National Weather Service (NWS) and US Census

TABLE B.2 - ENERGY		
Metric	**Calculation**	**Data Source**
1a. Energy intensity: Regional energy consumption (MMBtu) per capita	(The sum of annual energy uses by sector) / (The total population) Where the sum of regional energy consumption = Residential Energy Consumption + Commercial Energy Consumption + Industrial Energy Consumption + Transportation Energy Consumption	Energy use data - Regional Tier 2 Greenhouse Gas Inventory, NYSERDA and US EIA; Subcomponents include annual energy use for residential, commercial, industrial, and transportation;[1]
1b. Stationary fossil fuel use (MMBtu) per capita	Regional fossil fuel combustion in stationary sources per capita = (The sum of fuel combustion for space heating and cooling) / (The total population[2])	Energy uses from Regional Tier 2 Greenhouse Gas Inventory, NYSERDA and US EIA Subcomponents include annual energy use for residential, commercial, industrial, and transportation
1c. Stationary fuel consumption GHG emissions (MTCO2e)	See Regional GHG Inventory	See Regional GHG Inventory
2a. Installed capacity (MMBtu) per capita	(The sum of renewable installed generation capacity) / (The total population) Where the sum of the capacity of all on-site renewable energy sources = On-Site Solar PV Capacity + On-Site Solar Thermal Capacity + On-Site Wind Turbine Capacity + On-Site Geothermal Capacity + Capacity of Other On-Site Renewable Sources	NYSERDA and Regional Tier 2 Greenhouse Gas Inventory Subcomponents include cumulative generation capacity from installations of PV, solar thermal, wind, biomass, geothermal, etc.

[1] Energy use intensity: A further refinement would be Energy intensity per dollar of Gross Regional Product.

[2] Stationary fossil fuel use intensity: A further refinement would be weather-normalizing this use annually: ∑ Fuel Combustion for each fuel type=[(Btu/Household/HDDfor space heating) X HDD X (# of households)]+[(Btu/Household/CDD for space cooling) X CDD X (# of households)] + [(Btu/Household for dhw) X (# of households)]+[(#of Employees in region / # of employees in state) * Statewide commercial consumption]+[(#of Employees in region / # of employees in state) * Statewide Industrial consumption] - [Industrial fuel consumption * % consumed in non-energy uses]

TABLE B.3 MATERIALS MANAGEMENT		
Metric	**Calculation**	**Data Source**
1a. Per capita MSW disposal (lbs/person/day)	Weighted population average of ((Annual lbs MSW) / (County population)) / (365 days/year)	County Planning Unit, Solid Waste Management Plans
2a. Recycling Rate (%)	Weighted population average of (Total materials recycled (MSW +C & D) per county / Total materials generated per year per county)	County Planning Unit, Solid Waste Management Plans
2b. GHG Emissions (Million MTCO2e)	See Regional GHG Inventory	See Regional GHG Inventory

TABLE B.4 AGRICULTURE AND OPEN SPACE		
Metric	**Calculation**	**Data Source**
1a. Acres of farm land	Total acres of farmland	USDA Census of Agriculture
1b. Number of farms	Total number of farms	USDA Census of Agriculture
3a. Number of farmers markets	Total number of farmers markets	County Tourism Offices of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester Counties
3b. Number of municipal markets	Total number of municipal markets	County Tourism Offices of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester Counties
4a. GHG emissions (MTCO2e)	See Regional GHG Inventory	See Regional GHG Inventory
5a. Net cash farm income in the Region	(Total cash farm receipts) / (Total cash farm costs)	USDA Census of Agriculture
5b. Net cash farm income per farmer	((Total cash farm receipts) / (Total cash farm costs)) / (Total number of farmers)	USDA Census of Agriculture
6a. Acres of land preserved from development	(Total land preserved) / (The total Population)	Scenic Hudson, US Census
7a. Average acreage of contiguous forests	(Total acreage of contiguous forest) / (The number of counties in the Region)	NYSDEC

TABLE B.5 WATER		
Metric	**Calculation**	**Data Source**
1a. Per capita water withdrawals for domestic self-supply	(Total water withdrawals for domestic self-supply) / (The total population)	United States Geological Survey (USGS) Estimated Use of Water in the United States, County-Level Data for 2005
1b. Per capita water withdrawals for public supply	(Total water withdrawals for public supply) / (The total population)	United States Geological Survey (USGS) Estimated Use of Water in the United States, County-Level Data for 2005
2a. Energy use per gallon of wastewater	(Total energy used) / (Gallons of potable water used)	Energy Estimate: Water & Sustainability (Volume 4): U.S.Electricity Consumption for Water Supply & Treatment - The Next Half Century, Electric Power Research Institute (EPRI), 2002
3a. HUC 12 watersheds with >10% impervious cover	GIS mapping	United States Geological Survey (USGS) – National Land Cover Database, Percent Developed Imperviousness, 2001 and 2006
4a. Annual expenditure per volume of water treated	(Annual expenditure) / (The total volume of water treated for water production)	United States Geological Survey (USGS) Estimated Use of Water in the United States, County-Level Data for 2005
4b. Annual expenditure per volume of wastewater treated	(Annual expenditure) / (The total volume of water treated for wastewater treatment)	2004 Descriptive Data of Municipal Wastewater Treatment Plants in New York, NYSDEC; United States Environmental Protection Agency (USEPA) Enforcement and Compliance History Online Database
5a. Percent of assessed 303(d) streams/water bodies that are impaired	Total number of impaired water bodies	NYSDEC Waterbody Inventory and Priority Waterbodies List (WI/PWL), 2007; U.S. Department of Agriculture Watershed Boundary Dataset 2009.
5b. Percent assessed	(Total number assessed) / (Total number of streams)	NYSDEC Waterbody Inventory and Priority Waterbodies List (WI/PWL), 2007; U.S. Department of Agriculture Watershed Boundary Dataset 2009.
5c. Percent of streams assessed under biomonitoring program	(Total number assessed) / (Total number of streams)	NYSDEC Stream Biomonitoring Program, 2012

C List of Project Ideas

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
1	Agriculture and Open Space	Sustainable Livestock Production in the Hudson Valley	Mid-Hudson Region	Glynwood, Inc., Urban Design Lab at Columbia University	To address the gap between supply and demand, this project will promote sustainable meat production in the region through research on land assets, the development and dissemination of on-farm best practices and GHG impact measurement for conventional versus local supply chains. Activities will include 1) analysis of the current extent of livestock production,2) assessment of potential grazing land using available statistics, 3) lifecycle analyses comparing production, processing and transportation of local, pastured meat versus conventional meat, and 4) an experimental and training program to develop production and marketing best practices for pastured livestock.
2	Agriculture and Open Space	Groundwork's Sustainable Food Programs	Yonkers	Groundwork	With a local developer, Groundwork is exploring the feasibility of building a 10,000 sq. ft. rooftop farm that would utilize Science Barge technologies on a much larger scale. The project would train and employ local residents in hydroponic/aquaponic farming techniques as well as business management and marketing skills
3	Agriculture and Open Space	Connecting Farmers and Preserving the Landscapes	Westchester and Putnam Counties		The goal of the land match initiative is to renew, restore and strengthen the farm to table connection, build local food sheds and contribute to the sustainability of the community. Land matches return land to agriculture use and nourishes the local community in the present and for future generations
4	Agriculture and Open Space	Whitecliff Winery Retrofit and expansion	Whitecliff Vineyard		The building features a state of the art geothermal heating and cooling system utilizing one mile of piping and 500 feet of trenching along with equipment upgrades to enhance their energy efficiency. The example of this winery can be expanded to other wineries around the Region so that others may increase their efficiencies as well.
5	Agriculture and Open Space	Improving access, availability and identification of healthy foods in community settings through mobile farmers markets, community gardens, and local foods access points for institutional purchasing	Mid-Hudson Region	Cornell Cooperative Extension Dutchess County	Cornell Cooperative Extension (CCE) staff will work with community planning, institutions, agricultural providers, faith-based organizations, individual residents and other stakeholders to expand on current successes and efforts to integrate mobile farmers markets to provide coverage to rural and urban counties, to incorporate school and community gardens in settings accessible to community residents and institutions serving youth, families, disabled and the aging, and to establish food hubs/microbusiness units for the facilitation of local and regional food purchasing by institutions and retail outlets. Planning and development groundwork has already been laid in Dutchess and Ulster counties, with partnerships in place for expanding best practices and new opportunities to the neighboring counties in the Hudson Valley. Some grant sources/seed money is already in use for development and operations. Project funds would be used to

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					create systems and infrastructure development, as well as stakeholder buy-in within the communities, through education and community engagement in to the project initiatives.
6	Agriculture and Open Space	Saving the land that matters most	Mid-Hudson Region	Scenic Hudson Land Trust	Scenic Hudson is working in collaboration with 16 fellow land trusts and government agencies to save ridgelines offering iconic views, forests and wetlands critical to maintaining the Hudson Valley's extraordinary biological diversity and farmland essential to creating a sustainable "foodshed" for the region and NYC. In addition to providing the cornerstone of a sustainable economy for the region, protected lands help attract new business. A recent study by the trust for public land notes that executives looking to relocate or start-up firms rank quality of life - including an abundance of parkers and open space - higher than housing, cost of living, and good schools. To date, the saving the land that matters most initiative has conserved more than 6800 acres.
7	Agriculture and Open Space	Mobile Unit Meat Processing – (MUMP)	Dutchess County and New York State	Cornell Cooperative Extension Dutchess County	Farm sustainability is critical, weather patterns are changing, pressure to raise quality meats is increasing and all farms in the mid-Hudson Valley region are struggling with profitability issues. Slaughter facilities are at capacity and the need for more regional mobile slaughtering units is growing. Mobile units, when located in appropriate locations paired with a processing facility will ensure that locally raised meats can remain competitive in the current and future markets. Feasibility studies have been done in recent years that point to a serious need for more USDA inspected slaughter facilities by producers. Mobile Slaughtering units can fit the need without the risk of permanent structures, would provide local job opportunities for food processors, butchers, inspectors and new farm workers. As the slaughter, butchering and processing can all be done within close range of each other, out lays will be reduced for the farmer and increases in overall profitability will ensure that farms continue to grow and expand in the region and thus remain sustainable. A marketing initiative will also be incorporated into the program through the producer cooperative and conducted by Cornell Cooperative Extension Dutchess County (CCEDC). Cornell Cooperative Extension Dutchess County will oversee the project, establish a producer cooperative similar to ones that have been establish in nearby states, such as Rhode Island. CCEDC is uniquely qualified for instituting a project such as this with the available resources of staff and Cornell University and our strong ties to the agricultural community.
8	Agriculture	Improving	Mid-Hudson	Cornell	Cornell Cooperative Extension (CCE) staff will work with community planning,

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
	and Open Space	community walkability and access to essential goods and services through small scale systems change and infra-structure modifications.	Region	Cooperative Extension Dutchess County	institutions, agricultural providers, faith-based organizations, individual residents and other stakeholders to expand on current successes and efforts to alter systems and environments to enhance community walkability, bike-ability and access to goods and services. Improving ease of access to and placement of goods and services within communities will enable families to remain within the community when seeking food, supplies, entertainment and support while also providing opportunities for "aging in place", increasing physical activity for reduction in chronic diseases, and reducing need for transportation systems. For example, in Dutchess County alone, four rural towns have sidewalks that stop ¼ mile from the grocery stores. This prevents anyone from walking to the store-even though many desire such-in a safe manner. Education, infrastructure modifications, and community engagement in such development as "Complete Streets" and "Safe Routes to School" will enable communities to create safe access to goods and services while reducing the need for single passenger transportation or mass transportation in many settings.
9	Agriculture and Open Space	Planning for sustainable septic system reliance in suitable areas	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County	While the proportion of urbanized land in the mid-Hudson region (22.2%) is higher than that across the entire state (9.1%), the majority of land in the mid-Hudson region is still rural. Wastewater treatment in these rural areas is provided almost entirely by individual septic systems. In order to provide sustainable water quality and improve the reliability of water and wastewater treatment in the rural areas of the region, officials responsible for land use planning must know where soil and groundwater conditions limit the landscape's ability to support septic systems. Local zoning should encourage smart growth development in rural areas where conditions are not limiting to septic system function and discourage development where conditions are very limiting to septic system function. Communities should also consider planning for future wastewater treatment infrastructure in densely developed pockets within rural areas or in rural areas zoned for dense development where septic system function is limited. Tools provided by USDA Natural Resource Conservation Service (NRCS) can be used to determine where soil conditions limit septic system function. The goal of this project is to compare the location of assumed septic systems (based on tax parcel and assessment information) and local zoning to septic system rating maps generated by the NRCS tools in order to identify areas where density of existing

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					development or the density allowed by local zoning is limited by limited septic system function. The resulting maps will help local officials responsible for land use planning identify areas where: ▪ zoning may need to be examined to allow for higher or lower densities that could potentially be supported; ▪ planning for future wastewater treatment infrastructure should be considered; ▪ development should be discouraged to maintain local water quality.
10	Agriculture and Open Space	Energy Efficiency and Renewables Training and Tools for Farmers in the Mid-Hudson Region	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County	Cornell Cooperative Extension (CCE) staff will work with farmers through existing networks to increase the rates of energy efficiency and incorporation of renewable energy on farms in the Mid-Hudson Valley region. While New York State has numerous energy efficiency and renewable energy programs that agricultural operations can apply to, a program specifically geared toward the agricultural community ended in 2011, and adoption of energy efficiency practices in the region could be significantly improved though a targeted program. Challenges include the difficulty of accessing information, lack of time to research alternatives, cost, and lack of trust in the process. Cornell Cooperative Extension is a strong community partner with trusted relationships built over the long-term with the agricultural community. CCE will first assess the level of understanding of energy efficiency and renewable energy options in the agricultural community, barriers, and specific needs. Working with the Cornell Cooperative Extension Statewide Energy and Climate Change Team, existing networks and programs, and state partners, CCE educators will then to develop targeted tools to help more farmers complete more farm energy audits, apply for existing funding or incentive programs, and put energy efficiency changes into place. CCE will also develop clear information and cost-benefit tools to help inform farmers' decisions about renewable energy options. This project will help contribute to sustainability in the region by improving farm viability and the resiliency of local agricultural operations. There is strong possibility that the project can be replicated to other regions of NYS through close collaboration with Cornell University and regional Extension networks. CCE program outcomes are tracked through development of logic models and continuous evaluation. Cornell University would be responsible for ongoing maintenance of the tools

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					that are developed, and made available via extension websites.
11	Agriculture and Open Space	Conserve the Valley's Breadbasket	Red Hook	Scenic Hudson Land Trust	In addition to supplying local residents via farmers' markets, CSAs and pick-your-owns, Hudson Valley farms are a major provider of fresh nutritious food to NYC greenmarkets and restaurants. Yet while the population in these two regions is growing, productive valley farmland continues to vanish, in part because farmers are retiring and a new crop of young farmers can't afford it. Partnered with land trusts, government and farmers Scenic Hudson is engaged in conserving a "critical mass" of highly productive farmland in Red Hook - one of the valley's prime agricultural communities. By securing conservation easements on family-owned farms, partnerships enable existing farmers to invest in their operations and put land prices within financial reach of new farmers - in the process of guaranteeing our future food security.
12	Agriculture and Open Space	Consolidating Regional Protected Lands Information into a GIS Database to Promote Land Conservation and Climate Change Adaptation Efforts	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County (CCEDC)	Comprehensive land use planning is required to create a sustainable future for the Mid-Hudson Region. The goals of sustainable planning efforts should include increasing preserved land, increasing access to parkland, and maintaining unfragmented forest. This project would result in a comprehensive, standardized, annually updated GIS database of protected lands in the six-county region to aid local and regional sustainable land use planning and conservation efforts. Municipal comprehensive planning committees, county planning departments, conservation organizations, and regional planning entities need accurate, up-to-date, and easy-to-access geographic information about the type and extent of protected lands in their communities and throughout the region. However, there is no source of protected lands data that meets these criteria. Instead, planners must often piece together geographic data produced by various agencies and organizations, spending significant time reconciling the varying levels of resolution and accuracy, attribute information, and overlapping and/or duplicate records in these data in order to capture a reasonable picture of protected and conservation lands in their communities. As project lead, Cornell Cooperative Extension (CCE) would work with land trusts, county tax departments, conservation organizations, and others to gather all available information about protected lands into a single GIS database, reconciling all inconsistencies to provide an accurate and consistent resource of information about each parcel of protected land in the region. CCE would be

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					responsible for annual updates. Scenic Hudson, which annually solicits protected lands information from other land trusts throughout the region, would act as a project partner by providing its data. New York Natural Heritage Program would provide guidance on the data structure, which would be based on a statewide database of conservation lands. The resulting data for the mid-Hudson region would be incorporated into the statewide database.
13	Agriculture and Open Space	Mill Brook Preserve Plan	New Paltz	Town of New Paltz Clean Water and Open Space Protection Committee	This Plan provides policies and guidelines for the stewardship of the proposed Mill Brook Preserve. When implemented, it will help the community protect and interpret the biological, recreational, aesthetic, and conservation resources of the landscape that are located here. The long-term mission of this Plan is to preserve, restore and interpret natural plant and animal communities, to protect the landscape and character that is vital to defining the neighborhood and the entire Village and the Town of New Paltz, and to provide for management practices that maximize ecological, educational and recreational benefits while minimizing impacts of such use.
14	Agriculture and Open Space	Rapid Response Training and Tools to Help Farmers Adapt to Extreme Weather and Climate Change in the Mid-Hudson Valley Region.	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County	Cornell Cooperative Extension (CCE) staff will work with farmers in the Mid-Hudson Valley to help them adapt to climate change, including documented warmer temperatures and a longer growing season, and an increase in extreme weather, such as heavy precipitation events causing flooding of fields, warm winter spells, sudden spring frost, and prolonged summer drought conditions. Farmers indicate they need access to local information and knowledge of how the climate will continue to change. CCE staff will first assess the impacts of extreme weather on agricultural operations in the region and the specific need for information and tools. They will then work in cooperation with the Cornell University Climate Change Program Work Team to develop targeted tools to help farmers adapt their operations to extreme weather and climate change, using an adaptive management process – or the process of refining a management strategy in response to evaluating its success. This process takes into account data collected for local conditions, and evaluates success based on scientific principles and local experience. One example of a new management tool is the Cornell University Adapt-N Tool for nitrogen management, which uses a computer model and high resolution weather information to provide information on farm-level nitrogen needs. This project would develop similar tools to help

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					farmers based on local climate modeling, and will help contribute to the sustainability of the region by improving farm viability and the resiliency of local agricultural operations. There is strong possibility that the project can be replicated to other regions of NYS through close collaboration with Cornell University and regional Extension networks. CCE program outcomes are tracked through development of logic models and continuous evaluation. Cornell University would be responsible for ongoing maintenance of the climate change tools that are developed, and made available via the www.climatechange.cornell.edu website.
15	Agriculture and Open Space	Training for collecting, analyzing, and mapping agricultural operations data	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County	In order to develop solutions to maximizing the value of the regional agricultural economy, more granular information is needed about the extent and types of farms present in the region. This information can also provide planners and conservation groups with detailed information to expand land conservation efforts, and help target education and training about sustainable farming practices to specific types of operations. For example, identifying the location, type, and relative size of various farm operations can illuminate relationships between them and the economic support they provide to each other. Planners can also use this information to create a clearer picture of agricultural lands in the region, understand the extent of the ecosystem services they provide, and assess the potential impacts associated with them. Educators can identify clusters of different types of farms where educating on specific sustainable farming practices may have the most impact. The goal of this project is to train responsible agencies and organizations in the 7-county mid-Hudson region to collect, store, and analyze this data as part of the state-mandated 8-year review of agricultural districts. This project will build upon the successes and lessons learned during the 2007-2008 agricultural district review in Dutchess County, which was led by Cornell Cooperative Extension Dutchess County (CCEDC) and the Dutchess County Farmland Protection Board, as well as subsequent efforts with Dutchess County Planning and Dutchess County Soil and Water Conservation District to update and refine the data and analysis. As the lead agency in this project, CCEDC would provide the training and tools

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					needed to collect information about farming operations, store the information and a template used to present information to communities, which includes statistics, charts, and map of information gleaned from the data.
16	Agriculture and Open Space	Mentoring New Farmers and Connecting New Farmers to Existing and Traditional Farms	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County	Dutchess County is home to nearly 700 farms totaling 102,360 acres (2007 USDA Census). Cost of production has increased, farm sustainability is critical and similar trends are seen throughout the Hudson Valley. The surge in the expansion of niche, small acreage farms reflects the diversity of agriculture in the Mid-Hudson Region. Our target audience is limited acreage and traditional farmers in the Mid-Hudson region Marketing skills are found to be lacking in many of our more traditional farms. At the same time, there has been an influx of people who are new to the farming industry, have smaller properties (50 acres or less) but wish to make their properties "grow" in a productive manner. Many of these beginner farmers have the marketing skills, but not the farm knowledge. Matching the beginner farmers as a new client base to our traditional farmers will not only strengthen our agricultural base, but will encourage mentoring on both sides to develop the skills necessary to succeed in today's technologically based environment. There is an urgent need to connect new farmers with retiring farmers to continue local farm operations? CCE is in a strong position to create these connections, using well-established farm networks. This project will help contribute to sustainability in the region by improving farm viability. There is strong possibility that the project can be replicated throughout the region regions of NYS through close collaboration with Cornell University and regional Extension networks. CCE program outcomes are tracked through development of logic models and continuous evaluation.
17	Agriculture and Open Space	Workforce preparation: Greenhouse Management	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County	Greenhouse production in NYS is a 261 million dollar industry (Ag Census 2007). It is a diversified industry which includes bedding/garden plants, cut flowers, cut florist greens, foliage plants, potted, flowering plants, vegetables, herbs, fruits berries and other floriculture and bedding crops. The commercial agricultural greenhouse industry has difficulty finding and hiring qualified employees knowledgeable in greenhouse production and practices. Other than a college level curriculum there is not much available to greenhouse owners and managers in the Hudson Valley and this translates into a lot of time and money devoted to training employees which can cut into productivity and profitability. Greenhouse

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					production and management is a specialized skill. CCEDC proposes to provide training for individuals with little or no greenhouse work experience as well as skills upgrades for those already employed. All aspects of greenhouse production as well as greenhouse business management and NYSDEC Pesticide Applicator Certification training will be covered. Employees certified to apply pesticides is crucial to efficient greenhouse production practices. CCEDC is in the unique position of having a commercial greenhouse facility on our property. Participants will receive both classroom and hands-on learning experiences. Upon completion of the training participants will be more employable and knowledgeable and contribute a to the sustainability of the greenhouse industry.
18	Agriculture and Open Space	Workforce preparation: International Society of Arboriculture (ISA) Professional Arborist Certification Training	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County	With the arrival of the newest invasive species, the emerald ash borer (EAB) into the Mid-Hudson region communities will have no choice but to prepare for management of this dangerous insect which is a threat to our native ash. Communities in the mid-west have been decimated by this pest which has killed thousands and thousands of ash trees. The US EPA states trees can reduce bothersome noise by up to 50%. Using trees helps to deflect sunlight and reduces the heat island effect caused by pavement and commercial buildings. Trees provide oxygen, improve air quality, climate amelioration, conserve water and preserve soil. Trees control climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. Trees lower the air temperature and reduce the heat intensity of the greenhouse effect by maintaining low levels of carbon dioxide. Both above and below ground, tree roots hold soil in place and fight erosion. Trees absorb and store rainwater which reduce runoff and sediment deposit after storms allowing for ground water recharge, preventing the transport of chemicals into streams and prevents flooding. The demand for qualified arborists is increasing especially with the need to control invasive species. The ISA Certified Arborist Training will train and prepare arborists actively working in arboriculture, to take the ISA Certified Arborist Exam. The result will be a professional and sustainable workforce ready to address invasive species and thus energy conservation
19	Agriculture and Open Space	Agricultural Conservation Easements in the	Town of Red Hook, Dutchess County	Scenic Hudson Land Trust	The assemblage of farm parcels for which Scenic Hudson, the Columbia Land Conservancy (CLC), the Dutchess Land Conservancy (DLC), the Town of Red Hook and the County of Dutchess seeks preservation funding supports some of the

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		Hudson Valley's Breadbasket			region's most productive fields, orchards, and dairy operations. In addition to contributing to the local $810 million agricultural economy, these farms contain important scenic and historic resources that help drive the region's $4.7 billion tourism industry. Conserving a "critical mass" of highly productive farmland in projects like these enable existing farmers to invest in their operations and puts land prices within financial reach of new farmers—in the process guaranteeing our future food security. The farm properties include prime soils, statewide important soils, forest land and wetlands designated for special protections by the state Department of Environmental Conservation and U.S. Fish and Wildlife Service. The soils that will be protected from a critical component of the New York City foodshed, and approval of this project will help bolster regional food security and ensure access to high-quality, locally produced fruits, vegetables, and dairy products. As exemplified by Scenic Hudson's recent utilization of federal funds to successfully preserve nearly 680 acres of Hudson Valley farmland, the organization has an outstanding track record of working with federal, state, and local government agencies, partner NGOs, and private funding sources to permanently protect and steward critical agricultural lands and each stakeholder will have some responsibility in the ongoing success of the conservation easement.
20	Agriculture and Open Space	Value-Added Processing for Regionally Grown Produce	Ideally a facility in each county with a strong agricultural base (Ulster, Orange, Dutchess) central to producers and close to transit options.	New York State Department of Agriculture	Commercial food processing for end consumer use at regional facilities (preferably by attracting investment by a known food entity) with access to the commercial food distribution channel. Ideally, the processing of local food products at three consumer price points (economic for families; mid-priced Hudson Valley branded product; luxury Hudson Valley branded product which would be based on a unique Hudson Valley flavor pallet – see below). Partner with Culinary Institute of America in Hyde Park (regional expertise) to develop the flavor pallet to distinguish it from other regions. Capitalize upon local products (fruit, vegetables, meat, cheeses, fowl, herbs) and organic/biodynamic products, locavore, local wines, beers and liquors to express the unique Hudson Valley terroir. A second and natural partner is Valley Table one of the finest magazines in the Country with its focus on local foods, restaurants, taste experiences and farming. This is certainly not a new idea, but one which has been successful in California, France, Spain, South Africa, and Lancaster, PA.

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					This would add the following elements of sustainability to the Region: 1) Agriculture supporting industry with stream of revenue, tax ratable, real jobs at living wages at all levels. These can be filled at many levels by an already experienced and capable workforce. 2) Increase demand to meet local supply 3) Provide another level of revenue to farms 4) Add jobs that are not excluded from the employment figures. 5) Local facilities cut down on time and transportation – less fuels, fresher food 6) Make local food available at a more approachable price point to economically challenged families – many of whom never get to farmers' markets. Better nutrition, better health 7) Like the dairy farmers of the 1800's, processing allows local product to penetrate a broader market with a longer shelf life and brings these local products to the attention of the wholesale distribution network. This raises the importance of our Hudson Valley foods for C&S, SuperValu and ShopRite. Can potentially expand the market. 8) Adding a Hudson Valley flavor pallet with the support of the CIA and Valley Table (if possible) on the same level playing field with Napa, Sonoma, San Francisco, Provence along with an ever more sophisticated group of locally made wines, beers and spirits. Physical and memorable expression of the benefits of the Hudson Valley - branding 101. 9) Encourages a more sustainable tourism (farm tours, local arts and crafts, experience-based events, lodging, cooking schools and test kitchens) and creates a cultural base (particularly in Orange County) that contributes to the desirability of locating a business here.

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
21	Agriculture and Open Space	Hilltop Hanover Farm Incubator-Food hub Training Facility	Yorktown Heights, NY	Friends of Hilltop Hanover Farm & Environmental Center	Hilltop Hanover farm is an ideal place to establish an "incubator farm – food hub". The land is owned by the County of Westchester and operated by a non-profit friends group. There is already infrastructure and programming in place. The program proposal would help build & sustain our local food system through the expansion of our existing WCC Agricultural Certificate Program – which would include an on-the-job apprenticeship program and development of the farm into a "cooperative hub" by: · ▪ Enhancing the viability of farming by providing access to training, equipment, resources and markets. ▪ Serve as a local Foodhub for distribution. Promote the sustainable use and stewardship of land. Provide a mentor network of farm collaborators. Provide a mentor network of farm collaborators. This would be a 2-yr apprenticeship program to train 5 to 7 farmers a year. At the end of their second year the farmers would have the opportunity to work at new satellite farms within in region. Satellite farms under consideration would be Community College, local hospitals and corporate parks in the area that want to have access to fresh produce on-site for CSA programs and/or on-site cafeterias.
22	Agriculture and Open Space	Training and Implementation	GAP Training & Certification for Small Farms	Mid-Hudson – specific location TBD	HVADC is proposing a pilot project to certify ten small farms in Good Agricultural Practices (GAP). GAP provides a way for farmers to reduce microbial contamination on their farms and to improve food safety systems. GAP is a critical element of a farm's ability to sell product directly to supermarket chains, school systems and other institutions, restaurants and distributors. It is anticipated it will soon be a requirement at farmer markets in the region. By achieving GAP certification, these farms will enhance their market opportunities and manage economic risk by reducing potential for food related illness to originate at the farm thus leading to economic sustainability. HVADC is proposing to partner with Cornell Cooperative Extension, food safety/GAP experts and distributors who have expressed a direct interest in obtaining product from small farms but have been unable to overcome the lack of GAP certification. HVADC has been approached by several distributors who are willing to assist these farms. This interest is a direct result of the growing demand

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					for local food in the region. HVADC would like to provide the necessary training and assist the farmers through the certification process to ensure success. Success will be measured in terms of the number of farms which complete the certification and access to at least one new market opportunity in the growing season following the certification. HVADC is at the design stage of this project and has a work scope developed. The training program would be delivered at no cost to the participants, however we believe a 50% cost share is an appropriate responsibility for the farmer to obtain the GAP certification. This model is easily replicable to other regions with proper public and private funding as GAP certification is an industry standard.
23	Agriculture and Open Space	Hudson River foodway corridor	This project supports the economic development of NY agricultural producers statewide and delivers fresh, local NY farm and forest products from the Port of Albany to New York City via barge on the Hudson River.	Lower Hudson – Long Island Resource Conservation and Development Council (RC&D)	The Hudson River Foodway Corridor Project envisions a sustainable, regional food distribution system that empowers the farming industry of New York State, provides high quality food to the New York City residents, and revitalizes the Hudson River as the transportation corridor. The Foodway Corridor project has been designated as one of six Marine Highways Initiatives selected nationwide by the US Dept of Transportation in 2010 The project and its contribution to sustainability in the region: 1. Benefits include: Agriculture/Foodsheds – This project supports the economic viability of NY agriculture and increases access to fresh, local foods to New York City residents. Climate Change Adaptation – This project supports climate change adaptation by replacing truck traffic with waterborne transportation. Economic Development – This project supports the economic development of New York State farming communities and those involved in product aggregation and distribution. Energy – This project lessens consumption of fossil fuels by taking trucks off the road and focuses on locally sourced agricultural products rather than those sourced out of State or internationally.

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					Transportation – This project benefits highway infrastructure and reduces traffic congestion in and around New York City by reducing the number of food delivery trucks entering and exiting the NYC metropolitan area. By focusing on New York State producers, this project reduces the amount of food travelling from other states or countries. This will be especially important during and following the planned Tappan Zee Bridge replacement project.
24	Agriculture and Open Space		City of Newburgh, Ulster County/Village of Warwick, Village of New Paltz, Orange County	Groundwork Hudson Valley (Yonkers)	Feasibility study + planning grant for multi-use trail from Yonkers->Bronx
25	Economic Development	New Rochelle Armory	New Rochelle	City of New Rochelle	The project consists of a proposal to rehabilitate and reuse of the former Armory located on East Main Street in New Rochelle to support mixed use occupancy, including as its primary use an indoor open, local, "farm-to-table" market as part of The City of New Rochelle's ongoing effort to improve the Echo Bay waterfront. The goals of the project are to: 1. Rehabilitate and preserve a historic structure with distinctive architectural features; 2. Activate a currently underutilized site for the public's enjoyment and benefit; and 3. Complement and enhance the surrounding revitalization of the New Rochelle shoreline.
26	Economic Development	NY Energy Savers: Modular heating plants demonstration	Mid-Hudson Region		Shovel-ready retrofit D3620 modular heating plants to existing houses and collect actual energy usage data to consistently realize an energy savings of 50%. Grew from the 2006, NYSERDA sponsored study of, "The Performance of Integrated Hydronic Heating Systems."
27	Economic Development	Advocacy for Climate Smart Communities	Mid-Hudson Region		Encourage communities to join Climate Smart Initiative
28	Economic Development	Regional Expansion of the "Green Guru"	Mid-Hudson Region		Expansion of an existing Westchester-based online social network for green leaders and the public

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		Online Social Network			
29	Economic Development	Dover Knolls - Mixed-Use Development and MNR Station	Harlem Valley Psychiatric Center	Dover Knolls Redevelopment Co. II, LLC	Shovel-ready redevelopment of Harlem Valley Psychiatric Center into MNR station and mixed use space (retail/residential/grocery) ; 2.5 million sf; 933 acres
30	Economic Development	Green Technology Training at Community Colleges	Mid-Hudson Region		Building upon existing curricula. According to research by Sustainable Hudson Valley, most MHR counties have a community college with adult/continuing education offerings in green technology training
31	Economic Development	Continuation of the Green Talent Pipeline (through NYS DOL) and similar efforts			Continuation of a NYS Dept. of Labor project from 2009
32	Economic Development	Elementary and Secondary School Sustainability Curriculum	Mid-Hudson Region		Create and market materials for incorporating sustainability into K-12 curricula
33	Economic Development	Daylighting the Saw Mill River, Phase II	Yonkers (Westchester)	City of Yonkers	Daylighting a river and encouraging building owners to reactivate vacant space on upper floors
34	Economic Development	Hudson River Valley Warriors Program	Mid-Hudson Region	Hudson Valley Tourism	Writers and photography fellowship to promote tourism
35	Economic Development	Sing Sing Prison Museum Program	Ossining (Westchester)	Village of Ossining (In cooperation with Historic Hudson River Towns)	Creating an on-site museum depicting the construction and evolution of this historic prison facility
36	Economic Development	Hudson Rising/Floating Green Expo	Hudson River from Harlem 125th St to Albany/Rensselaer	OurHudson, Clearwater	Working ship expo and traveling festival/exhibition
37	Economic Development	Kingston Homeport/Sloop Restoration	Kingston Rondout Waterfront	Hudson River Sloop Clearwater	Repurpose an existing building as a maritime hub including community hall and performance stage

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
			(Ulster)		
38	Economic Development	Hudson Valley Food Hub Phase II	Kingston (Ulster)	Hudson Valley Agribusiness Development Corporation	Capital expansion of two food processing and distribution firms currently serving 60 NYS farms
39	Economic Development	Monohk Preserve Foothills Connectivity Project	Ulster County	Mohonk Preserve	The only New Paltz trailhead connecting the Wallkill Valley to the Shawangunk Mountains
40	Economic Development	Hudson Fjord Trail	State Route 9D, Beacon, Cold Spring	Town of Philipstown	Phased implementation of a hike/bike trail with access to Hudson Highlands State Park
41	Economic Development	Catskill Interpretive Center	Shandaken/Mt. Tremper (Ulster County)	The Catskill Center for Conservation and Development	Interpretive/visitor center for Catskill Park and Forest Preserve
42	Economic Development	City of Kingston Multi-Modal Connectivity Project	City of Kingston	City of Kingston	Improve bike/ped facilities in the town by converting abandoned or underutilized railroad corridors and through complete streets strategies along Broadway and Greenkill Avenue.
43	Economic Development	Colony Farm / Catskills-Shawangunk Greenway	Wawarsing	Friends of Colony Farm	Re-purpose the former NYS prison farm in Wawarsing as Catskills-Shawangunk Greenway and hang-gliding site
44	Economic Development	Hudson River Greenway Water Trail	Hudson River from Whitehall (Washington) and Hadley (Saratoga) south to The Battery	Hudson River Valley Greenway	256 mile, 96 site water trail for kayakers and boaters extending from the Adirondack Park and Lake Champlain to Manhattan
45	Economic Development	No Child Left Inside 4-H Program	Mid-Hudson Region	Cornell Cooperative Extension Dutchess County	Providing Underserved Youth in the Mid-Hudson Valley with Environmental Leadership, Teaching, and Outdoors Training through the No Child Left Inside 4-H Program. This project proposes to replicate Cornell Cooperative Extension Dutchess County's (CCEDC) No Child Left Inside (NCLI) program throughout the Mid-Hudson region. CCEDC's current NCLI model trains inner-city high school students from Poughkeepsie to become environmental leaders and works with them to teach their peers and younger youth about the environment, all while

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					getting the youth outdoors and in their community. Students in the program also gain important job and leadership skills.
46	Economic Development	Green Teen Community Gardening	Mid-Hudson Region		Providing Mid-Hudson Valley Youth with Small Farms and Green Job Training through the Green Teen Community Gardening 4-H Program
47	Economic Development	Hudson River Valley Ramble	counties adjacent to Hudson River	Hudson River Valley Greenway and National Heritage Area	Expanding a 13 y/o event with ~200 guided sports (hikes, bikes, walks, paddles), festivals and educational events held annually in the region
48	Economic Development	Kingston Home Port & Education Center	Rondout Creek Waterfront, Kingston	Hudson River Sloop Clearwater, Inc.	a year-round hub for river education that includes winter boat building workshops and seasonal field programs
49	Economic Development	Mid-Hudson Regional Green Business Challenge	Mid-Hudson Region centralized in Westchester County	Westchester Green Business Challenge (WC County Govt & Business Council of WC)	A networking platform that mainstreams green business practices through online/social media tools, including a “scorecard” used to track each member's environmental performance
50	Economic Development	Mid-Hudson Sustainable Communities Consortium	Mid-Hudson Region	Sustainable Hudson Valley	Regionwide membership network (i.e., Southern Westchester Energy Action Consortium) to coordinate funding, establish compacts, etc.
51	Economic Development	River Cities Sustainability Education Program	Mid-Hudson Region	Hudson River Sloop Clearwater, Inc.	performing youth empowerment and environmental science education programming; working with leaders in at-risk environmental justice communities
52	Economic Development	Sparrowbush Preserve	Deerpark (Orange County)	Orange County	Provide public access on 18 acres on Delaware River for fishing and boating
54	Economic Development	Tappan Zee Bridge	Rockland County, Westchester County		Push for state funding to examine the implications (environmental, financial, economic, etc.) for implementing the proposed mass transit options being discussed (e.g. train, bus rapid transit, etc.)
55	Economic Development	Two-Row Wampum Enactment	Albany to New York City	Neighbors of the Onondaga Nation (NOON)	A series of cultural and educational events highlighting the 400th anniversary of the Two Row Wampum Treaty
56	Economic	Green Lights for	Mid-Hudson	Unknown	To identify priority redevelopment areas, proactively create a plan and perform

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
	Development	Green Sites	Region		much of the SEQR review -- to make the sites more business-ready, becoming "fast-tracked" and predictable places for businesses to build. Additionally, the various agencies that would need to provide approvals (DOT, DOH, etc.) could conduct pre-review.
57	Economic Development	Town of Hyde Park - Commercial Hub Improvement Program (CHIP)	Town of Hyde Park	Town of Hyde Park	Supporting reinvestment in our decaying commercial hubs. Public investment in this effort could create a pilot public-private redevelopment model for other communities to follow. Read more: http://teamhydepark.files.wordpress.com/2011/09/chip-fact-sheet.pdf
58	Economic Development	Preserving West Point Foundry- A Hudson Valley Historical Asset	Cold Spring, Putnam County	Scenic Hudson Land Trust	The West Point Foundry Preserve contains the largest and most important remains of a 19th-century ironworks on the East Coast. Scenic Hudson is now in partnership with local, private and state efforts to stabilize the most historically significant remains
59	Economic Development	Fort Montgomery Marina Property Revitalization	Town of Highlands, Orange County	Scenic Hudson Land Trust	To secure the former Fort Montgomery Marina property in order to create a park with several potential amenities including a boat launch and kayak rental, including 1,000 feet of open, accessible riverfront.
60	Economic Development	Monroe Village Hall	Village of Monroe, Orange County	Village of Monroe	The Village wishes to construct a LEED-certified building to house Village offices, meeting room, justice court, and potentially the Public Library.
61	Economic Development	Electric Vehicle (EV) Infrastructure Build-out Demonstration	Mid-Hudson Valley Municipal Parking Facilities, Metro North Railway Stations, NYS Thruway Rest Areas	The Solar Energy Consortium (TSEC)	The installation of approximately 40 two-bay EV charging stations at locations which will provide both charging convenience and technology exposure to a broad group of early-adopters and potential end-users
62	Economic Development	Clover grass lawns	Mid-Hudson Region	Pace University	We would encourage homeowners to substitute pristine "golf lawns" with clover lawns.
63	Economic Development	Porous pavement	Mid-Hudson Region	Pace University	Install porous pavement in municipalities
64	Economic Development	Composting	Mid-Hudson Region	Pace University	Scraps of vegetables should be available to the public for organic fertilizer. Municipalities and grocery stores can publicize the use of composters.
65	Economic Development	Design & Installation of PV Solar Arrays	Kingston, NY and Ulster County	Solartech Renewables, LLC	Two utility scale photovoltaic solar arrays to be developed, designed and constructed in the Mid-Hudson Region for Ulster County and the City of Kingston using local materials and labor

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
66	Economic Development	Bio-solid reduction and Waste Water Treatment	Mid-Hudson Region	Ceres Technologies	To apply mature waste water, bio-solid destruction and water purification technologies to alternative use for NYS projects. Example: apple production and grape processing rendering, brewery/spent grains or Dairy/Yogurt process by-product reduction.
67	Energy	GreeNR	City of New Rochelle	City of New Rochelle	New Rochelle would like to develop a TOD zone around its transit center which is a multi-modal facility serving Metro North, Amtrak, and buses.
68	Energy	Mid-Hudson Data Repository	SUNY New Paltz	SUNY New Paltz, Croton Energy Group + private sector IT partners	Tracking baselines and providing metric updates for sustainability indicators.
69	Energy	NWEAC DR Program	Mount Kisco	NWEAC	NWEAC has entered into a process with Con Edison in Mount Kisco, New York, to install meters on the low and medium voltage distribution system. These meters are cost-effective, because three high-quality meters will capture the real-time consumption of an entire 10 MW distribution loop. When installed, these meters will allow all consumers inside the loop to participate in DR programs for which they are currently ineligible because individually, they are too small. The Mount Kisco location has planned the installation of four separate multi-vehicle charging stations, each of which will be able to charge vehicles dynamically, earning money through demand response provided.
71	Energy	Energy Improvement Districts	Northern Westchester as pilot	NWEAC, SWEAC, etc	Develop demonstration energy improvement districts in each of our regions. Each district will incorporate one (or more) of the following resources/strategies, in a manner that creates synergistic values for all of these technologies/capabilities: renewable generation, energy efficiency, demand response, energy storage, electric vehicle charging, collective energy purchase.
72	Energy	Net Zero Energy District Education Center:	Sullivan County (Liberty, NY)	Sullivan Alliance for Sustainable Development	The project will lead to a replicable model for the region as many building portfolios face the same challenges and all areas have potential for renewable energy integration.
73	Energy	Resource Centers for Sustainable Community: Living and Learning Hubs:	Mid-Hudson Region	Sustainable Hudson Valley	GHG reduction by creating vibrant live/work hubs, prioritizing those near transit, and demonstrating the state of the art in green renovation and local energy.
74	Energy	SUNY New Paltz Bio-Mass Boiler Systems:	SUNY New Paltz	SUNY New Paltz	Use of a biomass boiler is estimated to potentially reduce the campus CO2 emissions by 20-34%.
75	Energy	SUNY New Paltz	SUNY New Paltz	SUNY New Paltz	An expanded system is estimated to potentially reduce total campus CO2

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		Expanded Photovoltaic Systems:			emissions by 45%.
76	Energy	Sustainable Energy Planning and Security in the Mid-Hudson Region:	Mid-Hudson Region	Clearwater and other NGO and local govs	Demonstrate the reliability of solar with storage, reduce energy costs and impacts for these pilot communities, assuring that emergency services of participating municipalities have reliable back up power
77	Energy	Green Street Lighting Upgrades for Mid-Hudson Municipalities:	Mid-Hudson Region	Pound Ridge Partnership and other Municipalities:	Lighting upgrades deliver expected 50%-90% energy savings.
78	Energy	Sustainable Operations for Safety	Mid-Hudson Region	Clearwater and Solar Advantage Solutions	As proposed by Hudson River Sloop Clearwater and Solar Advantage Solutions, the SOS project looks to install PV systems with sufficient battery storage to power emergency services in 7 to 10 pilot municipalities in the Mid-Hudson Region. These projects will address climate resilience by assuring reliability in an emergency, while providing distributed renewable energy to significantly reduce the participating municipalities' energy costs in non-emergency day-to-day operations. This project will essentially create an electricity island that can come off the larger disrupted transmission and distribution system by switching to local generation or stored energy instantly if needed.
79	Energy	Engineered Heating Systems for New and Existing Buildings:	Mid-Hudson Region	Energy Application Associate	When the proper heating plant is retrofitted to existing homes, it is possible to consistently realize an energy savings of 50% when measured against the previously installed heating system.
80	Energy	Expanding "Energize New York" to the Mid-Hudson Region	Mid-Hudson Region	NWEAC/Energize	An expanded ENY will have positive regional impacts in the areas of job creation, community development, economic growth, energy independence, GHG reductions and more.
81	Energy	Trees for EEHVRC:	Mid-Hudson Region	Hudson Valley Regional Council and Partners	Create replicable models for implementation and long term maintenance of optimal urban tree cover, addressing: appropriate tree species; placement; integrating tree decisions with solar energy siting potential to optimize energy benefits; and building municipal capacity for effective tree maintenance, including prioritizing management of existing trees that are currently saving energy and providing other ecosystem services.
82	Materials	Alternative Fuel	Rockland County	Rockland County	Feasibility study project to investigate siting a pilot co-generation facility for

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
	Management	Generation Project		Solid Waste Management Authority	anaerobic digestion to process food and yard waste into compost, while producing renewable natural gas.
83	Materials Management	Building Material Reuse Facility (B-MRF)			A Building Material Reuse Facility (B-MRF) is proposed to facilitate reuse of building materials and reduce C & D debris exported to landfills. The facility would receive materials primarily from contractors that are rehabilitating or demolishing structures, although they would be open to the public. The B-MRF facility would capitalize on the emerging trend of 'deconstruction', which is a process of dismantling buildings in a manner that conserves the function/use of the existing materials, furniture, appliances, etc., thus allowing for their reuse. The B-MRF would target higher-value materials that may be sold and reused and would not focus on materials typically processed and recycled at C & D debris facilities – an existing example is the Build It Green program in NYC.
84	Materials Management	New Technology Demonstration Program	Mid-Hudson Region		In partnership with a local university, this proposal seeks to conduct a new technology demonstration project. The demonstration project would solicit proposals from technology providers to complete a side-by-side trial of new demonstration-scale materials management solutions. This would provide a proving ground for local clean technology start-ups as well as an opportunity to public evaluate the costs and benefits of new technologies for use at a larger-scale in the Mid-Hudson Region.
85	Materials Management	Integrated Solid Waste System Feasibility	Mid-Hudson Region	Hudson Valley Regional Council	A feasibility study would examine the present status of solid waste management, private and public.
86	Materials Management	Intermodal/Rail Transfer Station	Rail Corridors in Region	NYSDOT, Private Entities	The project proposes an intermodal transfer station to facilitate the distribution of MSW, recyclables, biosolids, ash, and/or other materials by rail.
87	Materials Management	Landfill Feasibility Study	Mid-Hudson Region	Hudson River Sloop Clearwater, Inc.	This project would address the concept and feasibility of siting one or more landfills within the seven county region.
88	Materials Management	Love Em and Leave Em	Mid-Hudson Region	NA	Promote and implement management practices for collection and removal of non-woody yard materials.
89	Materials Management	Organics Recovery Facility	Mid-Hudson Region	Ulster County Resource Recovery Agency - Hudson Valley Regional Council	Reproduce or scale up Ulster County's Organic Recovery Facility

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
90	Materials Management	Region 3 materials Management Administration	Mid-Hudson Region	NYSDEC-Region 3	Development of an inclusive regional materials management planning process
91	Materials Management	New industrial composting facility	Northern Dutchess County	Cornell Cooperative Extension Dutchess County (CCEDC)	Facilitating a state-of-the-art, regional, industrial composting facility for the Northern Dutchess region, using anaerobic digestion for energy production
92	Materials Management	Increasing Household Recycling Rates	Dutchess County and Mid-Hudson Valley Region	Cornell Cooperative Extension Dutchess County (CCEDC)	The regional network of Cornell Cooperative Extension (CCE) associations is proposing to implement a household recycling assessment and outreach project for the Mid-Hudson Region. There is approximately 280,000 tons of municipal solid waste generated in Dutchess County each year, and the estimated rate of recycling in the county is approximately 23%, much lower than the national average of approximately 34%. Licensed haulers can now haul recycled materials to a brand new single-stream recycling facility in Beacon, NY owned by ReCommunity, which processes recyclable materials from throughout the region. Many residents have not been informed about the change to the single-stream process. Several recent studies have called for better education of residents, schools, institutions and companies to increase Dutchess County and the Mid-Hudson Valley's recycling rates. CCE will first assess the level of knowledge of recycling options and habits of Mid-Hudson Valley residents, and identify barriers to recycling through a social science survey. Working with the Cornell Waste Management Institute and county coordinators, CCE educators will then recommend various policy options to increase recycling rates, and develop targeted outreach to municipalities, institutions and residents. This project will contribute to sustainability in the region by improving recycling rates and reducing the use of energy to haul or incinerate trash. There is strong possibility that the project can be replicated to other regions of NYS through close collaboration with Cornell University and regional Extension networks. CCE program outcomes are tracked through development of logic models and continuous evaluation. Cornell University would be responsible for ongoing maintenance of the tools that are developed, and made available via extension websites.
93	Materials	Increasing	Dutchess County	Cornell	The regional network of Cornell Cooperative Extension (CCE) associations is

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
	Management	Household Composting Rates	and Mid-Hudson Valley Region	Cooperative Extension Dutchess County (CCEDC)	proposing to implement a household composting assessment and outreach project for the Mid-Hudson Region. There is approximately 280,000 tons of municipal solid waste generated in Dutchess County each year. It is unclear what the rate of composting is in the county, but the rate is very low. Several recent studies have called for better education and outreach to residents, schools, institutions to increase Dutchess County and the Mid-Hudson Valley's composting rates. Currently, there are 4 large composting facilities permitted by the NYS DEC in Dutchess County, with several more municipal and educational facilities in operation. There is currently no county or regional program to increase household composting rates. Cornell Cooperative Extension, in collaboration with the Cornell Waste Management Institute, provides research-based education and demonstration of household composting methods. CCE Dutchess County maintains an active compost demonstration site, and provides training through its Master Gardener Program. Other New York counties offer Master Composter Certification through CCE. CCE will first assess the level of knowledge about composting methods and habits of Mid-Hudson Valley residents, and identify barriers to composting through a social science survey. Working with the Cornell Waste Management Institute and county waste coordinators, CCE will then recommend various policy options to increase composting rates, and develop targeted training for residents. CCE will also provide training through its Master Gardener Program, and develop a new master Composter Program. This project will contribute to sustainability in the region by improving composting rates and reducing the use of energy to haul or incinerate biodegradable waste. This project can be replicated to other regions of NYS through close collaboration with Cornell University and regional Extension networks. CCE program outcomes are tracked through development of logic models and continuous evaluation. Cornell University would be responsible for ongoing maintenance of the tools that are developed, and made available via extension websites and other mechanisms
94	Materials Management	Regional Composting Opportunities and NYS Correctional Facilities	Mid-Hudson Region	Hudson Valley Pattern for Progress	Expand existing on-site prison composting operations to include community-generated food waste.

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
95	Materials Management	Shopping Center/Retail Procurement Initiative	Mid-Hudson Region	Planning Units	Feasibility study, implantation and monitoring of environmentally preferable purchasing (EPP) and packaging reduction initiatives
96	Materials Management	Demolition Debris Legislation	Mid-Hudson Region	NA	Development of a model ordinance or local law on required demolition debris reuse, for subsequent consideration by County planning units or municipalities.
97	Materials Management	Transitioning from NIMBY to YIMBY	Mid-Hudson Region	Hudson Valley Regional Council	conduct region wide online opt-in contests that discover who may actually want to proactively host MSW facilities in their communities, in exchange for a host community benefit to secure a project
98	Materials Management	Newburgh Food Waste Processing	Newburgh		The project proposal is to make use of empty lots and abandoned industrial buildings in the indicated area to create a compost production and distribution facility for the city of Newburgh. The compost production facility should take as input a) all food waste from the restaurant development on Front Street, b) all grass clippings, leaves and woody debris collected by the City of Newburgh, c) food and kitchen scraps from a (new) residential food recycling program to be instituted in Newburgh, d) food waste from schools, colleges and other institutional cafeterias in the City, e) hops waste from local breweries. The compost production facility can use water from the Hudson in its compost cooking processes. The resultant compost/soil amendment can be used in a) any city owned property as a landscaping amenity b) as a low-cost product to be sold to significant Newburgh tenants, such as SUNY for landscaping purposes and c) as a retail product for sale in the region.
99	Materials Management	Flow Control Legislation - Regional, Local	Mid-Hudson Region		Amendment(s) to the NY Environmental Conservation Law (ECL) or General Municipal Law (GML) could help clarify and delineate the authority for local governments to enact flow control statutes.
100	TLULC	Bike Lane/Path	Pleasantville, Westchester County	Pleasantville CAC	Creating a bike lane/ path connecting center of Pleasantville with Briarcliff-Peekskill Trailway, Pace University Pleasantville Campus, and Graham Hills Park.
101	TLULC	Putnam Rail-to-Trail Transit Connector	Yonkers, Westchester County	Groundwork Hudson Valley (Yonkers)	Feasibility study + planning grant for multi-use trail from Yonkers->Bronx
102	TLULC	Trail to the Train	Village of Millerton, Town of Northeast, Dutchess County	Village of Millerton/ Town of Northeast/Town	Extending Harlem Valley rail trail

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
				of Amenia	
103	TLULC	Expand Broadband	Mid-Hudson Region		Facilitate telecommuting and telelearning - converted trips
104	TLULC	Congestion Pricing	Mid-Hudson Region		Congestion pricing in NYC has the potential to generate revenue that could be used for transit projects in the Mid-Hudson Region.
105	TLULC	Encourage the use of Tax Increment Financing	Mid-Hudson Region		Pass laws that give municipalities and developers more leeway to use Tax Increment Financing (TIF)
106	TLULC	Goldens Bridge Pedestrian Improvements	Hamlet of Goldens Bridge, Town of Lewisboro, Westchester County	Town of Lewisboro	Construction of sidewalks, crosswalks, and other ped-friendly improvements at the intersection of route 35 and route 138
107	TLULC	Local Sidewalk Improvement Incentive Program	Mid-Hudson Cities, Villages, and Town Centers	Local (non-State) government agencies	Create an incentive program for municipalities to repair and improve sidewalks
108	TLULC		Eastchester, Westchester County	Eastchester Environmental Committee	Punch through cul-de-sac to create through path for walkers/riders
109	TLULC	Fishkill Mixed Use Housing Development	Former Dutchess Mall		The project proposal is to repurpose the abandoned mall to create a mixed-use, mixed-income walkable community with commercial amenities. The concept is based somewhat on the Village Homes community in Davis, CA. It would combine affordable housing units with mid-priced units with a few higher priced units on the upper and first floors. The residential units could be up to 4 stories. This must be a walkable community, integrating key amenities into the plan. Amenities would include a small grocery store/farm market, a gym, a play field/park, a child-care center, a community room, a library/Internet work hub, a CSA, bus transportation to Fishkill proper and to the local theatre just to the

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					north and, finally, a community composting operation for food waste and agricultural and yard waste.
110	TLULC	Pedestrian Improvements	Hyde Park, Dutchess County	Town of Hyde Park	Inventory and analyze sidewalk system/ improve sidewalk system
111	TLULC	Pedestrian Improvements	Rhinebeck, Dutchess County	Village of Rhinebeck	Repair sidewalks, create crosswalks, improve access to schools
112	TLULC	Somers Business District Sidewalks	Somers, Westchester County	Town of Somers	3 miles of sidewalk and bike lanes
113	TLULC	Mahopac Branch Trail	Somers, Lewisboro, Westchester County	Town of Somers	Create a bike/ped trail along the Mahopac Branch of the Harlem Division railroad to facilitate bike commuting to the Goldens Bridge station
114	TLULC	Promote and improve the infrastructure of the Old Croton Aqueduct	Old Croton Aqueduct	Rivertowns Tourism Board and municipalities in the Rivertowns	The rivertowns and their tourism board would like to improve the signage at locations where the Old Croton Aqueduct trail crosses streets. This would be done along with an advertising campaign to advertise the Aqueduct as a tourist destination and also as a way to get around between the towns.
115	TLULC	Mid-Hudson Center for Sustainable Learning			The proposed Mid-Hudson Center for Sustainable Learning would provide a venue for offering training to citizens, planners, and elected officials who would like to learn how to implement smart growth. The Center could also provide other education programs that teach the public to live in more sustainable ways. For example, the Center could provide classes that teach urban, suburban, and rural youth and adults how to grow healthy foods for good nutrition, how to start and sustain natural resource-based businesses, how to access open space such as nearby parks, or how to ride and maintain a bicycle. The Center could also administer or operate as a clearinghouse for other programs that encourage sustainable transportation or land use patterns, such as carpooling programs that help commuters link up with one another to share rides, etc
116	TLULC	Climate Planning Circuit Riders	Generic	Gilmour Planning LLC	Underwriting municipal & private planners to advance climate planning
117	TLULC	Generic Environmental Impact Studies for	Mid-Hudson Region		To attract private investment such as TOD or LED, local governments should coordinate to establish a revolving loan fund to finance Generic Environmental Impact Studies for areas targeted for TOD and LED. The loan fund would allow

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		Designated TOD and LED Areas			local governments to develop station area or sustainable neighborhood development plans as Generic Environmental Impact Studies with sufficient detail and analysis to obviate the need for project-specific environmental impact statements. Developers benefitting from such studies would then be charged a pro-rata amount for the cost of such studies and their payments used to discharge the loan. These repayments could then be used to fund other studies in other municipalities. Such a financing mechanism would streamline the development review process and favor projects consistent with the objectives of this Plan.
118	TLULC	Local Sustainable Development Demonstration Projects	Five Mid-Hudson Communities	Pace University, Land Use Law Center	Assist five communities in the region reduce their GHG emissions. These communities will serve as demonstrations for other communities to learn from.
119	TLULC	Restore a Prime Environmental Educational Resource in the Hudson Valley		Scenic Hudson Land Trust	Building environmental learning center
120	TLULC	Setting the Foundation for Sustainability: Comprehensive Plan Components	White Plains, Westchester County	Pace University, Land Use Law Center	Create a Land Use Law Center to prepare model sustainability components to assist local governments in drafting local comprehensive plans
121	TLULC	Training to Reduce GHG and Energy Use and Adapt to Climate Change Through Land Use Strategies and Consensus-Based Decision-Making	Mid-Hudson Region	Pace University, Land Use Law Center	Conduct a Land use Leadership Alliance Training Program in each of the region's seven counties to establish a leadership infrastructure to support the implementation of sustainable development projects.
122	TLULC	Amenia Hamlet Sewer Project	Amenia, Dutchess County	Dutchess County Water and Wastewater Authority/ Town	Alternative sewer treatment system

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
				of Amenia	
123	TLULC	Preserving West Point Foundry	West Point Foundry	Scenic Hudson Land Trust	Stabilizing, maintaining, preserving property
124	TLULC	Quassaick Creek Multi-Purpose Conservation Corridor	Newburgh, Orange County	Newburgh Community Land Bank (Madeline Fletcher)	Re-orienting neighborhoods around creek/ creation of riparian corridor
125	TLULC	The Roundout Valley- Building A Sense of Place	Rosendale to Mamakating, Sullivan County	Roundout Creek Watershed Council and Via Associates	Create an organization to bring together stakeholders to formulate one unified vision and strategy for the Roundout Valley watershed and create a sense of belonging
126	TLULC	Bike sharing/ solar panels/ invasive species	White Plains	Milagros Iecuona	Milagros would like us to look at these issues
127	TLULC	Market Street Conversion & Pedestrian Improvements	Poughkeepsie, Dutchess County	City of Poughkeepsie	Create a two-way street and improve pedestrian infrastructure
128	TLULC	Future Use/Re-Use of Taconic DDSO Site	Amenia, Dutchess County	Town of Amenia/ Taconic Development Disabilities Service	Re-using the vacant DDSO campus for a TOD project, educational institution etc
129	TLULC	U.S. Lace Curtain Mill Factory	Kingston, Ulster County	Rural Ulster Preservation Company	Adaptive re-use of abandoned factory to low income housing
130	TLULC	"Bus Plus"	Ulster County	Ulster County Planning Department (Dennis Doyle)	Signal preemption for transit systems on congested routes
131	TLULC	Paved shoulders with share the road signs	Mid-Hudson Region		Making bicycling safer on highways.
132	TLULC	Tappan Zee Bridge Intermodal Transfer Station/Connector	Tappan Zee Bridge eastern toll	MTA/Village of Tarrytown	Create a people mover connecting passengers from buses crossing the TZB to the MNR station. The project would include a moving walkway and pedestrian corridor to accommodate reverse peak commuters.

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
			plaza/Tarrytown, Westchester County		
133	TLULC	Transportation Management Systems Implementations	Mid-Hudson Region	Ed Robin	Implement Traffic Management Systems in heavily traveled areas and corridors in the region to reduce congestion
134	TLULC	State program to support alt-fuel trucks	Mid-Hudson Region	Ed Robin	State subsidy or incentive program to encourage companies to switch their truck fleets to alt-fuel vehicles
135	TLULC	Green Growth Corridor Revitalization & Infrastructure Retrofit	Mid-Hudson Region	Gilmour Planning LLC	Revitalizing select high-order suburban edges of urban cores
136	TLULC	Hamlet Plans & Updates	Mid-Hudson Region	Gilmour Planning LLC	Updating and reinforcing smaller-scale and rural plans
137	TLULC	Health Impact Assessment	Mid-Hudson Region	Gilmour Planning LLC	Underwriting detailed assessment of public health impacts for alternative capital investments and development programs
138	TLULC	Open Space Plans	Mid-Hudson Region	Gilmour Planning LLC	Underwriting open space planning
139	TLULC	Parking Policy Reform	Mid-Hudson Region	Gilmour Planning LLC	Reforming surface parking and design standards in zoning laws
140	TLULC	Redevelopment Analysis	Mid-Hudson Region	Gilmour Planning LLC	Underwriting municipal & private planning for district and area unit impacts for existing or proposed build out alternatives
141	TLULC	Transit District Zoning	Mid-Hudson Region	Gilmour Planning LLC	Establishing model transit zoning
142	TLULC	GreeNR- New Rochelle's sustainability plan	New Rochelle, Westchester County		GreeNR is New Rochelle's adopted sustainability plan. It appears as if they are asking for some level of funding but make no specific request.
143	TLULC	Pedestrian and bicycle safety improvements in the Village of New Paltz	New Paltz, Ulster County		The implementation of physical design features that will enhance civic life in - from environmental sustainability to economic prosperity, and, of course, most importantly: protect lives.

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
144	TLULC	LEED certification for transportation projects	Mid-Hudson Region		Awards for high scoring projects in terms of environmental production
145	TLULC	Taxes for Transit Operations	Mid-Hudson Region		Ballot initiatives to raise taxes for transit operations.
146	TLULC	Develop regional business clusters	Mid-Hudson Region		Based on synergistic materials use - reduce transport distances.
147	TLULC	Regional events to discuss the idea of redeveloping Hudson Valley cities with existing infrastructure and rail lines	Mid-Hudson Region		Discussions about integrating improved mass transit, using all modes, and more intelligent land use focused on directing growth to existing centers.
148	TLULC	Program to encourage bicycle parking at employers	Mid-Hudson Region		Program would provide incentives to employers for providing bicycle racks, showers, and lockers to encourage bicycle commuting.
149	TLULC	New Rochelle TOD Smart Growth Study	City of New Rochelle	City of New Rochelle	The project is to create a vibrant transit oriented development zone around the New Rochelle Transit Center, leveraging the city's transit assets to provide improved access to housing and jobs locally and regionally. New Rochelle's location makes the city ideally positioned for transit-oriented development providing location advantages with proximity to the employment centers of New York City, Stamford and/or White Plains, and the surrounding region.
150	TLULC	Small Town Sustainability Action Plan Handbook	Red Hook	Town of Red Hook Conservation Advisory Council	Red Hook would like to create a "Small Town Sustainability Action Plan Handbook" based off of its experiences implementing the town's Energy Climate Action Plan. The handbook would cover sustainability initiatives, their benefits, implementation challenges, etc.
151	TLULC	Expansion of Park and Ride lots	Mid-Hudson Region		Park and Ride lots are immediate short term actions that have a direct impact on reduction of emissions and can be applied in the more rural areas of the Region.
152	TLULC	Program to encourage the use of Transfer of Development Rights (TDR) to direct	Mid-Hudson Region		Program would encourage the transfer of development rights using existing laws from sensitive environmental areas to priority growth centers and transit-oriented development.

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		growth towards centers			
153	TLULC	Make better connections between jobs and homes	Generic and Tarrytown, Westchester County		Build affordable housing close to job centers and close to transit; make buses more attractive to take with more and faster service' or make sure key cross-county links are made—for example, build the "Tarrytown Connector", a bus rapid transit link between Rockland County and the Tarrytown train station.
154	TLULC	Kingston Intermodal Facility	Kingston, Ulster County		This new public transportation facility would serve regional and local transit operators including Kingston CitiBus, Ulster County Area Transit (UCAT), Adirondack-Pine Hill Trailways, Coach USA-Shortline, and Laidlaw.
155	TLULC	Install real time bus information at bus stops	Mid-Hudson Region		Adding transit rider amenities like bus arrival countdown clocks can encourage commuters.
156	TLULC	Dedicated bus lanes	Mid-Hudson Region		Counties consider more dedicated bus lanes.
157	TLULC	Flexed bus service	Mid-Hudson Region		Tied to employers and jobs - specific shuttles to major employers such as schools and hospitals large stores - modal choice.
158	TLULC	Shared services	Mid-Hudson Region		Ulster County tried this without success but between local highway, county and state DOT we are running over each other to plow roads. Providing more incentives to get to shared services would be great and would reduce deadhead miles.
159	TLULC	Traffic Management System Implementation	Mid-Hudson Region		Implement Traffic Management Systems in heavily traveled areas and corridors in the region to reduce congestion
160	TLULC	Allow crossroad development that includes necessary services	Mid-Hudson Region		Shorter trip length for essentials
161	TLULC	Create car/van pools and clubs	Mid-Hudson Region		Includes seniors and schools - increased passenger count
162	TLULC	Reduce VMT by employees	Mid-Hudson Region		Competition sponsored by the local Chamber of Commerce with annual recognition of any innovative company idea that reduced VMTs by employees.
163	TLULC	Double track west shore CSX	Along the CSX Corridor		More freight capacity less yard time
164	TLULC	Designate and create better truck	Mid-Hudson Region		Create passing zones, improve turning radii, loading docks - etc. - safer and reduced emissions, requires the use of smart way shipper info - epa -

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		routes			http://www.epa.gov/smartway/partnership/shippers.htm tracking tool for emissions
165	TLULC	Central Avenue Bus Rapid Transit	Westchester County		The Central Avenue BRT Project, sponsored by the Westchester County Department of Transportation, involves building a 14.4 mile express bus route along NYS Route 100, connecting major destinations in the Region including: Downtown White Plains, the Westchester County Center, Cross County Shopping Center, Yonkers Raceway, NYC Subway, and other Westchester Bee-Line bus routes. The project will include intelligent transportation systems, such as traffic signal priority at most intersections and queue jump lanes at selected intersections, preferential roadway treatments, and attractive bus stations with shelters, real-time arrival information, low floor boarding, and off-board fare collection. These features could reduce travel times by 16 to 37 minutes one way, or 25-35 percent, generating ridership increases of up to 35 percent. The project is estimated to cost $32.79 million over several years
166	TLULC	Cluster Development	Mid-Hudson Region		Shorter road system
167	TLULC	Replace on-street parking with bus/bike lanes	Mid-Hudson Region		There is much talk about conversion of travel lanes for bus/bike lanes but parking can more easily be mitigated. Many large dense urban areas do not allow parking on the major urban street and dedicate a lane to bus/bikes.
168	TLULC	Snow / ice removal	Mid-Hudson Region		Municipalities are responsible for the snow and ice maintenance for their sidewalks. Public resistance to walking has a lot to do with keeping snow and ice off sidewalks in front of their houses/businesses.
169	TLULC	Increasing pedestrian traffic in Tarrytown	Benedict Avenue, Tarrytown, Westchester County		This is a proposal to extend the sidewalk along the south side of Benedict Avenue from Prospect Avenue to Martling Avenue in Tarrytown. The length of the new sidewalk is approximately 0.2 of a mile. The proposed sidewalk would be maintained by the village of Tarrytown.
170	TLULC	Incentive program or ordinances to allow multiple families to live in single-family residences	Mid-Hudson Region		Program to incentivize builders to retrofit single-family houses for multiple families, and legally allow those families to live in them.
171	TLULC	Program to encourage the use	Mid-Hudson Region		Program would encourage the purchase of development rights using existing laws from agricultural properties areas and place a conservation easement on

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		of Purchase of Development Rights (PDR) to protect agricultural land			them.
172	TLULC	Incentives or ordinances to encourage universal design	Mid-Hudson Region		Would help ensure that future building stock can accommodate the needs of an aging population.
173	TLULC	Create a program to encourage location efficient metrics when siting facilities	Mid-Hudson Region		Location efficient metrics can be used when siting businesses close to freight and centers, or when siting senior centers or other public facilities.
174	TLULC	Hyde Park Wastewater Treatment Options	Hyde Park, Dutchess County		Collaboration with private landowners/developers to look at wastewater treatment options that would allow redevelopment of commercial hubs.
175	TLULC	Harriman Transit-Oriented Development	Harriman, Orange County		A mixed-use community is planned for a 130-acre site adjacent to the Harriman station, proposed by Woodbury Development.
176	TLULC	Freight Systems Planning	Mid-Hudson Region		Study of freight issues in the Region and planning to make the freight delivery system more efficient.
177	TLULC	Suite of TDM and TSM strategies in the Route 17/86 Corridor	Mid-Hudson Region		Implement a suite of travel demand management and transportation systems management strategies to reduce congestion on this corridor as it continues to be upgraded to an interstate highway.
178	TLULC	School Bus of the Future	Mid-Hudson Region		Create a program that retrofits existing school buses with clean fuel engines.
179	TLULC	Harrison Transit-Oriented Development	Harrison, Westchester County		The plan involves 3.3 acres with a parking garage, high-density residential development, and retail stores.
180	TLULC	Fuel efficient buses	Mid-Hudson Region		Invest more funds into retrofitting the existing bus fleet and acquiring more fuel efficient buses.
181	TLULC	Increase urban tree cover	Village of Warwick, City of Newburgh, Village of New		Inventory, map and assess existing street trees; identify existing trees and new planting sites where shading of buildings, cooling of surrounding air (via evapotranspiration), and winter wind buffering provide optimal energy efficiency benefits; implement planting and maintenance program to increase tree cover,

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
			Paltz, City of Kingston, Village of Nyack, others TBD, Orange, Rockland, and Ulster counties		including operations and maintenance training for municipal staff responsible for ongoing maintenance.
182	TLULC	New ranking criteria for TIP projects	Mid-Hudson Region		MPOs should adopt SB 375-type measures when ranking projects on TIP to help achieve regional GHG emissions reduction targets.
183	TLULC	Complete Streets implementation	Mid-Hudson Region		Complete streets law – statewide law, consider the context of each project – must now consider the character of surroundings (demographics, housing, etc.). When areas are not complying, planners will have some teeth. Next step is local initiatives aimed at implementation.
184	TLULC	Catskill Mountain Rail Trail	Ulster & Delaware Railroad Corridor City of Kingston to Town of Shandaken	Ulster County	The *Catskill Mountain Rail Trail* (CMRT) project in Ulster County will upgrade the former Ulster & Delaware (U&D) Railroad corridor into a non-motorized recreational trail. The project will focus initially on developing the CMRT within the City of Kingston and connecting Kingston neighborhoods to the Ashokan Reservoir, where the CMRT would run westward along the length of the Reservoir. Subsequent phases of the project could extend the CMRT a total of 38-miles from Kingston to the Delaware County border.
185	TLULC	Adopting rural road standards	Mid-Hudson Region		Current subdivision road standards are by far too wide and more controlled by fire departments than planning boards. Reduced installation and maintenance costs/ environmental benefits. Requires connectivity - shorter trip length.
186	Water	Trees for Energy Efficiency	Mid-Hudson Region		Test state-of-the-art tools and methods for increasing tree cover in urbanized areas to achieve energy efficiency, runoff reduction, air quality, carbon sequestration, livability and walkability, job creation, climate adaptation and other benefits. Create replicable models for implementation and long term maintenance of optimal urban tree cover.
187	Water	Demolition and replanting of empty buildings and parking lots	Mid-Hudson Region		Remove out of use or abandoned impervious surfaces to increase infiltration of stormwater runoff
188	Water	Increases in extent of riparian buffers	Mid-Hudson Region		Increases in extent of riparian buffers
189	Water	Water and Energy Awareness Plan: for	Mid-Hudson Region		Create programs to educate the upper management of business, industry and education sectors on water use and conservation. In Rockland County the central

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
		Management in Business, Industry and Educational Facilities			water corridor is along the Hackensack reservoir system (that provides water for both Rockland and New Jersey), and is a major business and industrial corridor. Tie in with other water quality and management issues and the sharing of water between New York and New Jersey.
190	Water	Watershed Management in the Mid-Hudson region	Mid-Hudson Region		Implement a large-scale analysis of existing conditions in the mid-Hudson watersheds, to ensure the most efficient use of federal, state, and county dollars related to water supply. Pair the Watershed Forest Information Management System results with knowledge of field conditions, managers can make an informed assessment for various landscape-scale plans and decisions.
191	Water	Private well replacement	Mid-Hudson Region		Implement a private well replacement program for residences
192	Water	Energy efficient infrastructure replacement	Mid-Hudson Region		Encourage replacement of public and private infrastructure with more energy efficient equipment
193	Water	Aerated Botanical System pilot project	Mid-Hudson Region		ABS (Aerated Botanical System) pilot project - that will demonstrate and advanced wetland treatment system for wastewater (location TBD)
194	Water	Asset Management	Mid-Hudson Region		Asset management, including longer-term capital planning
195	Water	Install potable well for Bedford Village Water District	Bedford Village Water District		Provide a groundwater source for 1500 residents in this town who's current supply has been contaminated
196	Water	Create a River/Reservoir Friendly Landscaping Program	Mid-Hudson Region		Promote sustainable landscaping and gardening in the region building off of successful programs in Chesapeake Bay and San Francisco
197	Water	Promote rain barrels	Mid-Hudson Region		Capitalize on regional programs already under way that promote rain barrels to use captured rain/stormwater for irrigation and other appropriate uses. Promote "a rain barrel for every downspout"
198	Water	Universal Metering	Mid-Hudson Region		Implement universal metering to promote water conservation
199	Water	Leak detection	Mid-Hudson Region		Implement leak detection programs to reduce water losses in infrastructure
200	Water	Water conservation programs	Mid-Hudson Region		Implement water conservation programs such as low flow toilet replacement for commercial users, low flow fixtures for homeowners

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
201	Water	Promote the building of cisterns where appropriate	Mid-Hudson Region		Capture rainwater to use for irrigation and other appropriate uses
202	Water	Culvert Analysis and Resizing	Mid-Hudson Region	NYSDEC Region 3	Proposed by NYSDEC Region 3, the Culvert Analysis and Resizing project would examine the Region's culverts and ditches to determine which systems are capable of handling the increased flow expected to occur with climate change. The Region is expected to see an increase in rainfall and major storm events as climate change progresses, and the current system of ditches and culverts is likely unable to handle such an increase in volume.
203	Water	Watershed remediation	Mid-Hudson Region		As a result of this project, local leaders and NYS will be better able to target funds to specific vulnerable locations to protect roadways and other facilities from flooding. This will help ensure cost-effective investment.
204	Water	Clean Aquifers in Consolidated Drinking Water Districts	Mid-Hudson Region		Implement advance septic, remediate contaminated groundwater, acquire open space for watershed management
205	Water	Septic maintenance programs	Mid-Hudson Region		Implement programs to encourage septic maintenance and upgrades
206	Water	Quassaick Creek Multi-Purpose Conservation Corridor, Newburgh's other Waterfront	Town of Newburgh		Concept plans for the lower estuary portion of the creek exist; feasibility of biofiltration of storm water, separation of storm & sanitary drains where possible to relieve COS condition & reduce surges at WWTP are in planning stage. Management Plan for Quassaick Creek Watershed will be completed Fall of 2012.
207	Water	Fall Kill Green Corridor	Fall Kill		The Fall Kill Plan prepared by Clearwater has identified a number of project sites and includes stream daylighting, constructed wetlands, and green infrastructure
208	Water	Stormwater wetland treatment	Mid-Hudson Region		Ecological stormwater wetland treatment to capture 80-90% of the loading into the lake at Wappinger's Falls
209	Water	Poughkeepsie Underwear Factory Demonstration Project	Fall Kill Creek Underwear Factory	Clearwater and Design Dynamics	In 2013, Clearwater, Inc., Design Dynamics, LLC, Hudson River Housing, and other partners will construct a green infrastructure system at site of the historic Underwear Factory, adjacent to the Fall Kill Creek in the heart of the City of Poughkeepsie. The system will incorporate permeable pavement, modified tree pits, and a bio-retention area to capture and treat stormwater from the .75 acre site. The project will create new public green space along the creek with educational signage, which will complement the mixed-income housing and

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					community space slated for the building, creating a sustainability hub in a distressed neighborhood
210	Water	Green Infrastructure Implementation in the Hudson Valley	Mid-Hudson Region		Reduce flows of stormwater to combined sewer overflows using green infrastructure in the following cities: Kingston, Newburgh, Poughkeepsie, Saugerties and Yonkers (cities with CSOs in the region).
211	Water	SUNY New Paltz Green Infrastructure	New Paltz		Green Infrastructure Installation (Proposed in the 2012 Campus Sustainability Plan). Will include education, collaboration with community and school, and water quality monitoring.
212	Water	Get municipalities involved in green infrastructure	Mid-Hudson Region		Enable more green infrastructure projects within municipalities by removing cost and knowledge barriers.
213	Water	Gray water projects	Mid-Hudson Region		Reduce stormwater runoff and increase stormwater reuse
214	Water	Green infrastructure in River Cities = Cleaner water and greener cities	Mid-Hudson Region		Incentivize green infrastructure by setting a goal for the region. For example 20% (of projected stormwater flow annually to be handled by green infrastructure)
215	Water	Community Based Website to Calculate Stormwater Footprint	Mid-Hudson Region		Use a stormwater footprint calculator with Google earth so homeowners can see their individual footprint and compare to community average
216	Water	Separate stormwater from sewer systems	Mid-Hudson Region		Separate stormwater from sewer systems in cities that have CSOs
217	Water	Green Infrastructure to Improve Watershed Resiliency in the Saw Mill Brook Watershed	Saw Mill Brook Watershed		Throughout this project, two tenets in the Hudson River Action Agenda, watershed management and climate change adaptation, will be pursued through an integrated approach: implementation and monitoring of green infrastructure and stormwater management practices to improve watershed resiliency to climate change and flooding while improving water quality and restoring watersheds
218	Water	Black Creek Corridor Climate Change Mitigation and Recreational Access Project	Black Creek Corridor	Scenic Hudson	The Black Creek corridor – located in the Towns of Lloyd and Esopus in Ulster County – contains seven ecologically valuable properties that are currently available for purchase by New York State, comprising over 1,300 acres that are identified in the New York Open Space Plan (the state's blueprint for land acquisition). Permanent protection of these lands also helps to ensure clean

#	Working Group	Project Title	Project Location	Sponsor Organization	Project Description
					drinking water, recreational opportunities for paddlers on the creek and hikers who contribute meaningfully to the Hudson Valley's $4.3 billion tourism economy. Conservation of these lands would complement and build upon the State's acquisition and establishment of the Black Creek State Forest in 2011.

D Additional Resources

Additional Resources

This Appendix contains a list reference material compiled with the goal of aiding in implementation of the Plan. This is not meant to be an exhaustive list of resources or bibliography, nor was all of the material used in the creation of the Plan. The resources listed in this Appendix contain additional detail and information that can help inform local decision makers, interested parties, or those tasked with implementing the Plan on behalf of their organization or municipality. For more information on local planning efforts in the Region, please refer to the county planning department's website listed below.

- Dutchess County Department of Planning and Development: http://www.co.dutchess.ny.us/countygov/departments/planning/plindex.htm
- Orange County Department of Planning: http://www.orangecountygov.com/content/124/1362/default.aspx
- Putnam County Department of Planning, Development, and Public Transportation: http://www.putnamcountyny.com/planningdept/
- Rockland County Department of Planning: http://co.rockland.ny.us/planning/
- Sullivan County Division of Planning and Environmental Management: http://co.sullivan.ny.us/Departments/DepartmentsNZ/PlanningandEnvironmentalManagement/tabid/3225/default.aspx
- Ulster County Department of Planning: http://www.co.ulster.ny.us/planning/
- Westchester County Department of Planning: http://planning.westchestergov.com/

Additional resources can be found on the websites of the non-County Consortium members:

- Center for Research, Regional Education & Outreach: http://www.newpaltz.edu/crreo/
- Pace University Land Use Law Center: http://www.law.pace.edu/landuse
- New York Council of Nonprofits: http://www.nycon.org/
- Northern Westchester Energy Action Consortium: http://www.nweac.org/
- Southern Westchester Energy Action Consortium: http://www.sweac.org/

Materials Management

- NYSDEC, 2010. Beyond Waste: A Sustainable Materials Management Strategy for New York State. http://www.dec.ny.gov/chemical/41831.html

- Dutchess County, 2012. Draft Local Solid Waste Management Plant (LSWMP). http://www.dcrra.org/reports/LSWMP_12-4-10.pdf
- Orange County, 2010. LSWMP. http://www.thrnewmedia.com/assets/OCSWMPDraft.pdf
- Rockland County, 2011. LSWMP.
- Sullivan County, 1992. LSWMP.
- Ulster County, 2009. Ulster County Annual Recycling and Municipal Solid Waste Report Data. http://www.ucrra.org/recycling/graphstats.htm
- Westchester County, 2011. Annual Report http://www.westchesterda.net/2011annualreport.pdf
- NYSDEC, 2012. Division of Solid & Hazardous Materials, Annual Planning Unit Recycling Report – All County Planning Units.
- EPA, 2009. Sustainable Materials Management: The Road Ahead. http://www.epa.gov/smm/vision.htm
- Sustainable Materials Management Coalition, 2012. Sustainable Materials Management – A New Materials Hierarchy, Solutions to Barriers, and Recommendations for a Path Forward. http://www.michaeldbaker.com/documents/smm_final_report.pdf
- EPA, 2008. Planning for Natural Disaster Debris. http://www.epa.gov/osw/conserve/imr/cdm/pubs/disaster.htm
- Brown, Milke, and Seville, 2011. Disaster Waste Management: A Review Article. http://ir.canterbury.ac.nz/bitstream/10092/6199/1/12635544_LitReview_rev3.pdf

Agriculture and Open Space

- Glynwood, 2010. The State of Agriculture in the Hudson Valley. http://www.glynwood.org/publications-multimedia/state-of-ag/
- Northeast State Foresters Association, 2007. The Economic Importance and Wood Flows from New York's Forests. http://www.dec.ny.gov/docs/lands_forests_pdf/economic.pdf
- American Farmland Trust, 2004. Agricultural Economic Development for the Hudson Valley. http://www.farmlandinfo.org/documents/29796/Hudson_Valley_AED_Complete_Technical_Report.pdf
- Rondout Valley Growers Association: www.rondoutvalleygrowers.org
- Scenic Hudson: www.scenichudson.org
- Cornell Cooperative Extension- Agriculture and Food Systems Programs http://www.cce.cornell.edu/Ag/Pages/default.aspx

- United States Department of Agriculture- Agriculture Census: http://www.agcensus.usda.gov
- Sullivan County Farm Network: http://www.sullivancountyfarmnetwork.org/
- Sullivan County Department of Agriculture: http://co.sullivan.ny.us/Departments/DepartmentsNZ/PlanningandEnvironmentalManagement/Agriculture/tabid/3257/default.aspx
- Dutchess County Agriculture and Open Space: http://www.co.dutchess.ny.us/CountyGov/Departments/Planning/16864.htm
- Orange County Department of Planning- Agriculture Division: http://www.orangecountygov.com/content/124/1362/1462/4632/default.aspx
- Putnam County Department of Agriculture and Farmland Protection Board: http://www.putnamcountyny.com/agboard/
- Rockland Farm Alliance: http://www.rocklandfarm.org/
- Ulster County Farm Bureau: http://www.ucfbny.org/
- Ulster County Department of Planning: http://www.co.ulster.ny.us/planning/

Economic Development

- NYS 2100 Commission, 2013. Recommendations to Improve the Strength and Resilience of the Empire State's Infrastructure. http://www.rockefellerfoundation.org/uploads/files/7c012997-176f-4e80-bf9c-b473ae9bbbf3.pdf
- Scenic Hudson. Securing New York City's Foodshed Plan. http://www.scenichudson.org/files/u2/scenic-hudson-farmland-case-statement.pdf
- Patterns for Progress, June 2011. Housing the Hudson Valley: A Discussion Brief on the Future of Housing Policy, Markets and Growth. http://www.upstatehouse.com/view/full_story/14430626/article-Housing-the-Hudson-Valley-Report-Examines-Future-of-Policy--Markets--and-Growth-in-Region
- Mid-Hudson Regional Economic Development Council, 2011. Strategic Plan. http://regionalcouncils.ny.gov/themes/nyopenrc/rc-files/midhudson/MHREDCSPFINAL11_12_11.pdf
- Mid-Hudson Regional Economic Development Council, September 2012. Focus on the Future: Progress Report. http://regionalcouncils.ny.gov/mid-hudson/091712/progressreport
- CRREO, SUNY-New Paltz, Spring 2010. Regional Well-Being. Finding Agreement in the Mid-Hudson Valley: How We're Doing, Where We're Going – Economy, Environment and Quality of Life. http://www.newpaltz.edu/crreo/rwb/

- The Hudson Valley Focus, 2011. The Economic Impact of Tourism in New York. http://www.rocktourism.com/images/pdf/NYS-Tourism-Impact-Hudson-Valley.pdf
- New York State Department of Labor, Division of Research and Statistics. New York State Green Jobs Survey: Report for the Hudson Valley Region. http://www.labor.ny.gov/stats/green/hudsonvalley.pdf
- Hudson Valley Agribusiness Development Corporation, October 2008. Comprehensive Economic Development Strategy.
- The Dyson Foundation/Marist Poll, 2012. Many Voices, One Valley survey http://www.manyvoicesonevalley.org
- Glynwood's Keep Farming Program: http://www.glynwood.org/programs/keep-farming/
- Our Hudson: http://www.ourhudson.org
- American Planning Association, Economic Development Division: https://www.planning.org/divisions/economic
- Green Guru Network: http://www.greengurunetwork.com
- Sustainable Hudson Valley: http://www.sustainhv.org
- CRREO: http://www.newpaltz.edu/crreo/

Energy

- IRC, 2009. State of Markets Report. www.isorto.org
- NYISO, 2012. Load and Capacity Data Gold Book. www.nyiso.com
- NYISO, 2012. Reliability Needs Assessment. www.nyiso.com/public/about_nyiso/fundamentals_of_planning/reliability_planning/index.jsp
- NERC, 2012. Summer Reliability Assessment. www.nerc.com
- US Census, 2012. American Community Survey. Fact Finder. www.census.gov
- NYSERDA, 2012. Energy Data and Prices. www.nyserda.ny.gov/Energy-Data-and-Prices-Planning-and-Policy/Energy-Prices-Supplies-and-Weather-Data.aspx
- NYSERDA, 2012. Energy Fast Facts. www.nyserda.ny.gov/Energy-Prices-Supplies-and-Weather-Data/Energy-Statistics.aspx
- NWEAC, 2011. Mid-Hudson Regional Energy Solutions Road Map. www.nweac.org/2011/10/26/the-mid-hudson-regional-energy-solutions-road-map/
- NY DEC, 2010.New York State Climate Action Council Interim Report 2010. http://www.dec.ny.gov/energy/80930.html
- New York State Energy Planning Board, 2013. New York State Energy Plan. http://www.nysenergyplan.com
- New York State Energy Planning Board: www.nysenergyplan.com

- New York State Transmission and Distribution Systems Reliability Study and Report
- NYSERDA, 2011. Patterns and Trends: New York State Energy Profiles: 1996–2010. www.nyserda.ny.gov
- NERC, 2013. Peak Demand and Energy Projection Bandwidths: 2004-2013 Projections. www.nerc.com
- NYISO, 2012. Power Trends. www.nyiso.com
- U.S. Department of Energy, 2012. U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis NREL/TP 6A20-51946. www.osti.gov/bridge/
- U.S. Energy Information Agency, 2012. State Energy Data System. www.eia.gov/state/seds/
- U.S. Department of Energy, 2012. U.S. Energy Information Agency, Annual Energy Outlook. www.eia.gov/oiaf/aeo/
- U.S. Department of Energy, 2012. Database of State Incentives for Renewables & Efficiency. www.dsireusa.org
- Energize New York: http://energizeny.org
- NYSERDA, 2012. Energy Analysis Program. www.nyserda.ny.gov/Energy-Data-and-Prices-Planning-and-Policy/Energy-Analysis.aspx
- NYSERDA, 2012. Energy Data and Prices. www.nyserda.ny.gov/Energy-Data-and-Prices-Planning-and-Policy/Energy-Prices-Supplies-and-Weather-Data.aspx
- Energy Improvement Corporation: www.energyimprovementcorp.org
- Local Energy Aggregation Network: www.leanenergyus.org
- New York Renewable Portfolio Standard: www.nyserda.ny.gov/Program-Planning/Renewable-Portfolio-Standard.aspx
- New York State Public Service Commission: www.dps.ny.gov
- Property Assessed Clean Energy: http://pacenow.org
- Regional Greenhouse Gas Initiative: www.rggi.org
- State and Local Energy Report: www.stateenergyreport.com

Land Use, Livable communities, and Transportation

- US EPA, 2009. Smart Growth Guidelines for Sustainable Design & Development. http://www.epa.gov/dced/pdf/sg_guidelines.pdf
- US EPA, 2010. Sustainable Design and Green Building Toolkit For Local Governments. http://www.epa.gov/region4/recycle/green-building-toolkit.pdf
- US EPA, 2012. Trip Generation Tool for Mixed-Use Developments. http://www.epa.gov/dced/mxd_tripgeneration.html
- US EPA, 2009. Nelson, Kevin. Essential Smart Growth Fixes for Urban and Suburban Zoning Codes. http://www.epa.gov/dced/pdf/2009_essential_fixes.pdf

- US EPA, 2012. Nelson, Kevin. Essential Smart Growth Fixes for Rural Planning, Zoning, and Development Codes. http://www.epa.gov/dced/pdf/rural_essential_fixes_508_030612.pdf
- US EPA, 2012. Examples of Codes That Support Smart Growth Development. http://www.epa.gov/smartgrowth/codeexamples.htm
- US EPA, 2012. Smart Growth. http://www.epa.gov/dced/index.htm
- Seskin, Stefanie. Smart Growth America, 2012. Complete Streets Local Policy Workbook http://smartgrowth.org/
- Schilling, Elizabeth, and Mara D'Angelo. Smart Growth America, 2012. From Vacancy to Vibrancy. http://www.smartgrowthamerica.org/.
- Bhatt, Neha, and Elisa Ortiz. Smart Growth America, 2011. Transit Campaign Planning: A strategy template for organizers smartgrowthamerica.org.
- Edrington, Suzie, Jonathan Brooks, Linda Cherrington, Meredith Highsmith, and Matt Sandidge. Texas Transportation Institute, 2012. Toolkit for Rural Transit Operations and Financial Planning. Texas Transportation Institute Transit Mobility Program. http://tti.tamu.edu/group/transit-mobility/files/2012/11/Toolkit-with-Appendix-for-Rural-Transit-Operations-and-Financial-Planning-Final.pdf
- Nolon, John R. Environmental Law Institute, 2001. Well Grounded: Using Local Land Use Authority to Achieve Smart Growth.
- Hass, Peter, Gajus Miknaitis, Harley Cooper, Linda Young, and Albert Benedict. Center for Transit-Oriented Development, 2010. Transit Oriented Development and The Potential for VMT-related Greenhouse Gas Emissions Growth Reduction. Center for Transit-Oriented Development. http://www.cnt.org/repository/TOD-Potential-GHG-Emissions-Growth.FINAL.pdf
- Bordoff, Jason, and Pascal Noel. The Brookings Institution, 2008. Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity. http://www.brookings.edu/~/media/Research/Files/Papers/2008/7/payd bordoffnoel/07_payd_bordoffnoel_pb.PDF
- New York State, 2010. New York State Climate Action Council. Climate Action Plan Interim Report. http://www.climatestrategies.us/library/library/view/108
- Transportation Research Board, 2012. Transit Cooperative Research Program. Summary of Research Findings: Assessing and Comparing Environmental Performance of Major Transit Investments. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rrd_105.pdf
- Salon, Deborah, Marlon Boarnet, Susan Handy, Steven Spears, and Gil Tal. Transportation Research Board, 2012. How do local actions affect VMT? A critical review of the empirical evidence. http://amonline.trb.org/1sc769/1sc769/1

- Transportation Research Board, 2009. Driving and the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions. http://onlinepubs.trb.org/Onlinepubs/sr/sr298.pdf
- United States Energy Information Administration, 2011. Emissions of Greenhouse Gases in the United States 2009.
- H T Affordability Index. Center for Neighborhood Technology. Center for Neighborhood Technology. http://htaindex.cnt.org/
- Transportation Research Board, 2012. Guide for Implementing Bus on Shoulder (BOS) Systems. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_151.pdf
- Transportation Research Board, 2012. Ridesharing as a Complement to Transit. http://www.trb.org/TCRP/Blurbs/166923.aspx
- Transportation Research Board, 2012. Toolkit for Estimating Demand for Rural Intercity Bus Services. http://www.trb.org/TCRP/Blurbs/165858.aspx
- Transportation Research Board, 2012. Public Participation Strategies for Transit. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_89.pdf
- Transportation Research Board, 2012. Public Participation Strategies for Transit. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_87.pdf
- Tachieva, Galina, 2010. Sprawl Repair Manual. Washington D.C.: Island Press, Print.
- Dunham-Jones, Ellen and June Williamson, 2011. Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs: Updated Edition. Hoboken, NJ: John Wiley & Sons.
- Orange County Planning Department, 2011. Regional Plan Association, and Lincoln Institute of Land Policy. Orange County Design Manual. http://www.orangecountygov.com/filestorage/124/1362/4663/Orange_County_Design_Manual.pdf
- Stiffler, Natalie, Polytechnic State University, 2011. The Effect of Transit-Oriented Development on Vehicle Miles Traveled: A Comparison of a TOD versus a non-TOD Neighborhood in Carlsbad, CA. California. http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1590&context=theses
- Sallenger Jr, Ashbury H., Kara S. Doran, and Peter A. Howd, 2012. Hotspot of accelerated sea-level rise on the Atlantic coast of North America. http://www.nature.com/nclimate/journal/v2/n12/full/nclimate1597.html
- Blanchard, Jennie and John R. Nolon, U.S. Green Building Council, 2012. Neighborhood Development Floating Zone: A Model Ordinance to Foster Green Community Development Using the LEED for Neighborhood Development Rating System. https://new.usgbc.org/sites/default/files/Neighborhood Development Floating Zone_2012_Part B_1h_ pdf

- Byerly, Meg, Jennie Nolon Blanchard, John R. Nolon, and et al. U.S. Green Building Council, 2012. Technical Guidance Manual for Sustainable Neighborhoods. https://new.usgbc.org/sites/default/files/Neighborhood Development Floating Zone_2012_Part B_1h_ pdf
- American Planning Association. Job-Housing Balance. APA publication (login required). http://www.planning.org/pas/reports/
- American Planning Association . Community Indicators. APA publication (login required). http://www.planning.org/pas/reports/

Water

- Center for Research Regional Education and Outreach, Fall, 2010. Discussion Brief #4, Hudson Valley Water: Opportunities and Challenges. http://www.newpaltz.edu/crreo/brief4_water_online_version.pdf
- United States Geological Survey, 2005. Estimated Use of Water in the United States in 2005, County-Level Data. http://water.usgs.gov/watuse/
- New York State Department of Health, 2008. Drinking Water Infrastructure Needs of New York State. http://www.health.ny.gov/environmental/water/drinking/docs/infrastructure_needs.pdf
- NYSDEC, 2008. Wastewater Infrastructure Needs of New York State. http://www.dec.ny.gov/docs/water_pdf/infrastructurerpt.pdf
- USDA Water and Environmental Programs: http://www.rurdev.usda.gov/UWEP_HomePage.html
- US EPA, 2010. Control and Mitigation of Drinking Water Losses in Distribution Systems. http://water.epa.gov/type/drink/pws/smallsystems/upload/Water_Loss_Control_508_FINALDEc.pdf
- New York State Energy Research & Development Authority, 2010. Water & Wastewater Energy Management. http://www.nyserda.ny.gov/Page-Sections/Commercial-and-Industrial/Sectors/Municipal-Water-and-Wastewater-Facilities/~/media/Files/EERP/Commercial/Sector/Municipalities/best-practice-handbook.ashx
- American Council for an Energy-Efficient Economy, Alliance for Water Efficiency, 2011. Addressing the Energy-Water Nexus, A Blueprint for Action and Policy Agenda. http://aceee.org/white-paper/addressing-the-energy-water-nexus
- US EPA, September, 2010. Energy Conservation Measures for Wastewater Treatment Facilities. http://water.epa.gov/scitech/wastetech/upload/Evaluation-of-Energy-Conservation-Measures-for-Wastewater-Treatment-Facilities.pdf

- Patrick J. Phillips and Robert W. Bode, U.S. Geological Survey, 2002. Concentrations of Pesticides and Pesticide Degradates in the Croton River Watershed in Southeastern New York. http://ny.water.usgs.gov/pubs/wri/wri024063/
- NYSDEC, 2003. Fact Sheet. New York State Pollutant Discharge Elimination System (SPDES) Draft Permit Renewal with Modification: Indian Point Electric Generating Station. http://www.dec.ny.gov/docs/permits_ej_operations_pdf/IndianPointFS.pdf
- Summary of the adjudicatory proceedings is available at: http://www.dec.ny.gov/docs/legal_protection_pdf/indianir.pdf
- US EPA, 1995. Guidance document, Combined Sewer Overflows: Nine Minimum Controls. http://nepis.epa.gov/Exe/ZyNET.exe/200041XP.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1995+Thru+1999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A\zyfiles\Index%20Data\95thru99\Txt\00000002\200041XP.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h|-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p|f&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL
- The Center for Watershed Protection, 2012. The Impervious Cover Model. http://www.stormwatercenter.net/monitoring%20and%20assessment/imp%20cover/impercovr%20model.htm
- US EPA Low Impact Development (LID) program: http://water.epa.gov/polwaste/green/index.cfm
- US EPA ENERGY STAR for Wastewater Plants and Drinking Water Systems: http://www.energystar.gov/index.cfm?c=water.wastewater_drinking_water

Attachment 1 - Greenhouse Gas Inventory

- US EPA, 2012. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2010. http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html
- IPCC, 2006. IPCC Guidelines for National Greenhouse Gas Inventories. http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html
- C40 Cities Climate Leadership Group and ICLEI 2012, 2012. Local Governments for Sustainability. Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC), Pilot Version 1.0. http://www.iclei.org/fileadmin/user_upload/documents/Global/Progams/GHG/GPC_PilotVersion_1.0_May2012_20120514_01.pdf
- US EPA, 2012. Emissions & Generation Resource Integrated Database GRID2012 Version 1.0. http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html

- U.S. Energy Information Administration, 2012. (SEDS) State Energy Data System for New York. http://205.254.135.7/state/seds/seds-states.cfm?q_state_a=NY&q_state=New%20York
- EPA Greenhouse Gas index: http://epa.gov/climatechange/emissions/ghgdata/index.html.
- NYSDOT Environmental Science Bureau, 2009. Mobile 6.2 CO Emission Factors for project-Level Microscale Analysis, Appendix A. https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/repository/coeftab0.pdf
- Air Resources Board, 2010. Local Government Operations Protocol. Version 1.1. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf
- US Forest Service, FIA Program: Forest Inventory Data Online: http://apps.fs.fed.us/fido/
- Carbon OnLine Estimator (COLE) data are based on USDA Forest Service Forest Inventory & Analysis and Resource Planning Assessment data. http://www.ncasi2.org/COLE/

Attachment II - Climate Change Vulnerability

- Colorado State University and Bridgewater State University, 2012. 2012 Tropical Cyclone Landfall Probabilities. United States Landfalling Hurricane Probability Project. http://landfalldisplay.geolabvirtualmaps.com/
- Hazards & Vulnerability Research Institute, 2011. The Spatial Hazards Events and Losses Database for the United States, Version 9.0. http://www.sheldus.org/
- NASA, 2005. What's the Difference Between Weather and Climate?. http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html
- NYS Department of Environmental Conservation, 2012. Climate Change Program for the Hudson River Estuary. http://www.dec.ny.gov/lands/39786.html
- NYSERDA, 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State. Technical Report. http://www.nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/~/media/Files/Publications/Research/Environmental/EMEP/climaid/11-18-response-to-climate-change-in-nys.ashx
- Fernald, Sarah, Christopher Mitchell, Christine Healy, and Lisa Renee Williams, 2012. The Impact of Tropical Storms Irene and lee on Submerged Aquatic Vegetation and Water Quality in the Tivoli Bays. Conference on the Impacts of Tropical Storms Irene

and Lee on the Hudson River. http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDQQFjAA&url=http%3A%2F%2Fwww.hres.org%2Fjoomla%2Fimages%2Fstories%2FConferences%2FConference.Handbook.docx&ei=vk_PUO2bNoeo2wWWoICQBw&usg=AFQjCNFHTIcBVYczy3EWe-hzFRiei8fJBg&bvm=bv.1355325884,d.b2I&cad=rja

- Riverkeeper, 2011. How is the Water? Sewage Contamination in the Hudson River Estuary. http://www.riverkeeper.org/wp-content/uploads/2011/08/RvK_How-Is-the-Water_2006-10.pdf
- US EPA, 2012. Frequently Asked Questions. Sanitary Sewer Overflows and Peak Flows. http://cfpub.epa.gov/npdes/home.cfm?program_id=4
- Barnard, Patrick, 2011. 'Heat Related' Delays on Metro-North New Haven Line Reported. http://norwalk.patch.com/articles/heat-related-delays-on-metro-north-new-haven-line-reported
- Center for Disease Control, 2006. Heat-Related Deaths--United States, 1999-2003. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5529a2.htm
- NOAA, 2012. 2011 Summary of Hazardous Weather Fatalities, Injuries, and Damage Costs by State. http://www.nws.noaa.gov/om/hazstats/state11.pdf
- NOAA, 2011. C-CAP Land Cover Atlas. Coastal Change Analysis Program (C-CAP). http://www.csc.noaa.gov/ccapatlas/#
- NOAA National Weather Service, 2012. Natural Hazard Statistics: 2011 Heat Related Fatalities. http://www.nws.noaa.gov/om/hazstats/heat11.pdf
- North East State Foresters Association 2007. The Economic Importance and Wood Flows from New York's Forests. http://www.dec.ny.gov/docs/lands_forests_pdf/economic.pdf
- SHELDUS, 2011. SHELDUS Spatial Hazard Events and Losses Database for the United States. SHELDUS 9.0. http://webra.cas.sc.edu/hvri/products/sheldus.aspx
- Transportation Research Board, 2011. Critical Issues in Aviation and the Environment. Transportation Research Circular, no. Number E. http://onlinepubs.trb.org/onlinepubs/circulars/ec148.pdf
- Wadsworth Center. Disease Carriers. Edited by New York State Department of Health. http://www.wadsworth.org/databank/borreli.htm
- Weber, Christopher L, and Scott H Matthews, Penn State University, 2008. Food-Miles and the Relative Climate Impacts of Food Choices in the United States. http://psufoodscience.typepad.com/psu_food_science/files/es702969f.pdf
- Esseks, Dick, and Lucy Joyce, Farmland, 2008. Farm Viability in Urbanizing Areas. Case Study Report: Orange County New York.

http://www.farmland.org/resources/sustaining-agriculture-in-urbanizing-counties/OrangeFinalRept.pdf

- Hazards & Vulnerability Research Institute, University of South Carolina, 2011. The Spatial Hazards Events and Losses Database for the United States, Version 9.0. University of South Carolina. http://www.sheldus.org/
- Insurance Information Institute, 2012. Catastrophes: US. U.S. Natural Catastrophes. http://www.iii.org/facts_statistics/catastrophes-us.html
- US Global Change Research Program, 2009. Global Climate Change Impacts in the United States. http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts
- US EPA, 1995. Planning for Disaster Debris. http://www.epa.gov/osw/conserve/imr/cdm/pubs/disaster.htm.
- Kebede, A., 2009. Assessing Potential Risks of Impacts of Climate Change on Coastal Landfills. http://repository.tudelft.nl/view/ir/uuid%3A2fbad788-285d-46b8-9173-964a09702902/
- NYS Department of Public Service, 2012. Utility Performance Report Following Hurricane Irene and Tropical Storm Lee. NYS Department of Public Service. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={AD5B750D-A5DC-4ABB-972F-EB0557269D9F}
- Orange and Rockland Utilities, Inc., 2011. Report of on Preparation and System Restoration Performance. Hurricane Irene August 28, 2011 through September 3, 2011 and Tropical Storm Lee September 5, 2011 through September 8, 2011. Orange and Rockland Utilities, Inc. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={4526ACB5-F9B0-478F-B547-36627B3769D1}
- Sea Level Rise Task Force, 2010. New York State Sea Level Rise Task Force Report to the Legislature. http://www.dec.ny.gov/docs/administration_pdf/slrtffinalrep.pdf
- USACE, 2011. Disaster Impact Models & Mapping - Past Storm Events. https://eportal.usace.army.mil/sites/ENGLink/DisasterImpactModels/Past%20Storm%20Events/Forms/AllItems.aspx?RootFolder=%2fsites%2fENGLink%2fDisasterImpactModels%2fPast%20Storm%20Events%2f2011%2fIrene&FolderCTID=&View={FE687E11-DB84-4F4B-8CEC-D4F97E1BA5BD}
- Wasik, K., 2006. Tulane Environmental Law Journal. Municipal Liability for Disaster Debris Disposal.

E Selection of Watershed Management Plans

Table E.1 contains a selection of existing watershed management plans in the Mid-Hudson Region. Note that this is not a comprehensive list, and that not all of the documents or efforts listed below constitute a watershed management plan in the strictest sense.

Table E.1 Watershed Management Plans

Plan Title	Geographic Coverage	Link
Hudson River Estuary: Action Agenda 2010-2014	Watersheds that drain to the Hudson from the Troy dam to the Verrazano Narrows.	http://www.hudsonwatershed.org/plans09/hreaa2010.pdf
Orange County Water Master Plan, 2010	Orange County	http://waterauthority.orangecountygov.com/county_plans.html (Not strictly a watershed management plan)
Delaware River Basin Commission – Special Protection Waters Program	Delaware River Basin	http://www.state.nj.us/drbc/programs/quality/spw.html
Delaware River Basin Commission - Interstate Water Management Recommendations	Delaware, New Jersey, New York State, New York City, and Pennsylvania	http://www.state.nj.us/drbc/library/documents/regs/GoodFaithRec.pdf
A Watershed Management Plan for the Fall Kill, Dutchess County	Fall Kill Watershed in eastern Dutchess County and the City of Poughkeepsie	http://www.hudsonwatershed.org/plans09/fallkill.pdf
Moodna Creek Watershed Conservation and Management Plan	Moodna Creek Watershed in Orange County, NY	http://waterauthority.orangecountygov.com/moodna.html
Wallkill River Watershed Conservation and Management Plan	Wallkill River in Sussex Co, NJ and Orange and Ulster Counties in NY	http://www.hudsonwatershed.org/plans09/wallkill.pdf
Glenmere Lake Watershed Plan	Glenmere Lake Watershed in the Towns of Chester and Warwick, NY	http://waterauthority.orangecountygov.com/glenmere.html
Quassaick Creek Watershed Management Plan	Quassaick Creek Watershed in Orange and Ulster Counties	http://waterauthority.orangecountygov.com/quassaick_watershed.html
Indian Brook-Croton Gorge Watershed Plan	Westchester County	http://www.hudsonwatershed.org/plans09/indianbrook.pdf
Upper Esopus Creek Management Plan	Covers Pine Hill, Phoenicia, Panther Mountain and Boiceville	http://www.hudsonwatershed.org/plans09/esopus.pdf
Natural Resource Management Plan for the Wappinger Creek Watershed	Wappinger, Poughkeepsie, Dutchess County	http://www.hudsonwatershed.org/plans09/wappinger.pdf

Table E.1 Watershed Management Plans		
Plan Title	**Geographic Coverage**	**Link**
Lower Esopus Reconnaissance Study	The Lower Esopus Creek from the Ashokan Reservoir to the Hudson River	http://www.loweresopus.org/downloads
Casperkill Assessment Document	Town of Poughkeepsie, Dutchess County	http://www.townofpoughkeepsie.com/planning/stormwater/2009/Health_of_the_Casperkill.pdf
Lower Non-Tidal Rondout Management Plan	Rochester, Warwarsing, Ellenville Village, New Paltz Rosendale, Marbletown	http://www.clearwater.org/green-cities/watershed-management/rondout-creek-watershed-council/#rondout
Tri-State Watershed Management Plan	Delaware, New Jersey, Pennsylvania, New York	http://www.nj.gov/drbc/programs/subbasin/tristate/index.html
Bronx River Memorandum of Agreement	Bronx River Watershed	http://www.hudsonwatershed.org/imas.html
Ramapo River Watershed Intermunicipal Council MOU	Ramapo River Watershed, Orange, Rockland (NY), Bergen and Passaic (NJ)	http://www.hudsonwatershed.org/plans09/ramapo.pdf
Rondout Creek Watershed Agreement	Rondout Creek Watershed, Ulster County	http://www.hudsonwatershed.org/plans09/rondout_creek_agreement.pdf
Saw Mill River Watershed Agreement	Saw Mill River Watershed, Westchester County	http://www.hudsonwatershed.org/plans09/sawmill.pdf
Wappinger Creek Watershed Intermunicipal Agreement	Wappinger Creek Watershed, Dutchess County	http://www.hudsonwatershed.org/plans09/wappinger_watershed_agreement.pdf

F Sample Reporting Template

Mid-Hudson Regional Sustainability Plan Indicator Report

County:				**Reporting Section:**	
Year:					
Indicator	**Value**	**Time Period**	**Source**	**Contact Information/Location of Source**	**Notes**
Date:		**Author Signature:**		**Author Name:**	
Contact Information:					