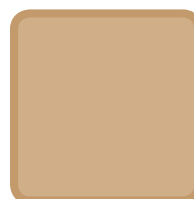




Mid-Hudson Sustainability and Smart Growth Toolkit

March 2016



ORANGE COUNTY
NEW YORK



NYSERDA
Supported



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ORANGE COUNTY
NEW YORK



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Introduction

Why a smart growth toolkit?

In 2013, after a year of research, extensive outreach and consensus-building, the Mid-Hudson Planning Consortium released its [Mid-Hudson Regional Sustainability Plan \(MHRSP\)](#), a plan funded by the New York State Energy Research and Development Authority's (NYSERDA) Cleaner Greener Communities Program. The MHRSP sets out a vision for sustainable development that builds on the region's unique social, cultural, and natural history, with the goal of promoting economic development, environmental sustainability, and enhancing quality of life. The Region encompasses the counties of Westchester, Rockland, Orange, Putnam, Dutchess, Ulster, and Sullivan. The Plan's objectives and corresponding strategies provide a common vision for the region's sustainable development, and lay out a series of priority initiatives to help achieve the vision. This toolkit is designed to be a resource to help implement the goals, objectives, and initiatives of the MHRSP as well as strategies identified in the following complementary resources:

New York State Climate Smart Communities Program and Toolkit

This is a web-based resource available at <http://nyslandusetoolkit.us>.

This Toolkit is specifically designed to complement New York State's Climate Smart Communities program and comparable initiatives striving to reduce greenhouse gas emissions and improving climate resilience. The Climate Smart Communities (CSC) program is led by a coordinated network of organizations and services jointly sponsored by six New York State agencies: Department of Environmental Conservation; Energy Research and Development Authority; Public Service Commission; Department of State; Department of Transportation; and the Department of Health.

A primary element of CSC is guidance and support given to a network of municipalities as they plan and carry out climate-friendly actions that match community goals and save taxpayer dollars.

The Climate Smart Communities program is free and voluntary; there are no fees or legal requirements. By enabling localities to act on climate without mandating which programs or policies they should adopt, the CSC program helps localities to discover and adopt the measures that

will work best for them, and to create sustainable, vibrant and attractive places to live and work.

Two types of actions enable Climate Smart Communities (CSC) to minimize the risks of climate change and reduce its long-term costs:

- **Reducing GHG Emissions:** Starting now to reduce greenhouse gas (GHG) emissions and create permanent sinks that remove GHG from the atmosphere; these actions will help stabilize atmospheric GHGs at manageable levels and avoid severe climatic changes.
- **Adapting to a Changing Climate:** Altering the built and natural environment in anticipation of predicted climatic changes, or in response to actual changes, which will alleviate the risks associated with unavoidable changes in climate.

Many municipalities begin by reducing emissions and increasing climate resilience in municipal operations alone, but action by the entire community is needed to make significant reductions in greenhouse gas emissions and to successfully adapt to unavoidable climate change. This Toolkit can help define and implement such actions. To help the broader community act, local governments can enable climate-smart practices through land use plans, zoning and building codes and efficient transportation policies. A key local government role is leading, educating and setting an example of energy efficiency and adaptation.

Climate Smart Communities are encouraged to adopt a CSC pledge that may include, but are not limited to:

- Forming of green working groups,
- Setting goals of targeted reductions in GHG,
- Developing a local climate action plan,
- Conducting a greenhouse gas inventory,
- Promoting energy efficiency and conservation,
- Reducing municipal energy use for transportation,
- Decreasing solid waste, increasing 'green purchasing,
- Growing the community's use of renewable energy, a beginning aggressive recycling, composting, materials management and water conservation campaigns.

By 2016, 175 New York communities comprising a third of the state's population have adopted the Climate Smart Communities Pledge, partnering with their state government to build a resilient, low-emission future. Once a CSC, high-performing communities may achieve recognition for their leadership and efforts. Designed around the State's original ten pledge elements, the Department of Environmental Conservation's Certification Program recognizes communities for their accomplishments through a rating system leading to four levels of award: Certified, Bronze, Silver and Gold. Orange County is the first, and to date only certified Climate Smart Community county in New York State.

For more information on the Climate Smart Communities program see: <http://www.dec.ny.gov/energy>

Orange County Design Manual

<http://www.orangecountygov.com/content/124/1362/4663/default.aspx>.

The Orange County Design Manual (OCDM), developed by Orange County, contains best practice design guidelines for different kinds of places and the policy and zoning tools to implement them. The Place Types described in the OCDM are cross-referenced in this Toolkit to help you decide if a particular best practice is suited to your type of community.

LEED for Neighborhood Development

<http://www.usgbc.org/articles/getting-know-leed-neighborhood-development>

LEED, or Leadership in Energy & Environmental Design, is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for their project.

Who is this toolkit for?

While professionals will want to use this resource, it is aimed primarily at the many citizen-planners and advocates who sit on local boards and committees – the people who know their communities best and are most concerned. To that end, an emphasis has been placed on making this Toolkit easy to use and easy to understand.

How was this toolkit developed?

This toolkit was funded by the New York State Energy Research and Development Authority (NYSERDA). It was

developed by Orange County in partnership with several non-profit and institutional partners including Regional Plan Association, the City University of New York (CUNY) Institute for Sustainable Cities and the U.S. Green Building Council Upstate New York State Chapter; as well as the participation of the City of Newburgh, the Village of Warwick, the Town of Warwick, and the Orange County Water Authority.

How is this toolkit structured?

Five Themes

In order to maximize its usefulness, the organization of the Toolkit closely parallels the MHRSP. Each section is organized around the five themes in the MHRSP, each color-coded in the margins of the pages.

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

Each section of the toolkit begins with a description of the kinds of issues associated with that theme and an explanation of why those issues are important to your community. The **Land Use, Livable Communities and Transportation** section focuses on strategies to help municipalities strengthen centers supported by transit, creating complete communities, reducing transportation fossil fuel consumption and greenhouse emissions, and improving the resilience of regional infrastructure. The **Energy** section focuses on becoming less energy intensive, expanding renewable generation, improving the resilience of energy delivery systems, and reducing the energy use of public infrastructure. The **Materials Management** section places importance on the reduction of solid waste generation, diverting materials from landfills, increasing reuse, recycling, and composting, and reducing transmission and distribution costs. The **Agriculture and Open Space** section focuses on increasing agriculture and silviculture on the region, improving access to training and technologies, reducing energy use from farm-related activities, and increasing open space and wildlife protection. Finally, the **Water** section focuses on increasing water supply by reducing consumption, reducing energy use in water treatment, reducing impervious surface cover, protecting habitat and water quality.

Within each of these thematic sections, **Objectives** that reflect the Mid-Hudson region's diverse landscapes, demographics, economy, culture and history are presented in each section and described. These are derived directly from the Objectives and Sub-Objectives in the Mid-Hudson Regional Sustainability Plan.

Each of these **Objectives** is supported by a set of **Best Practices**.

Cross Cutting Topics

Sustainable development also integrates concepts, ideas, and activities from many different sectors and disciplines. In order to highlight some common themes that recur through the five focus areas, the MHRSP identified five cross-cutting topics that should unite the best practices found within this toolkit:

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

Environmental justice (EJ), as defined by the New York State Department of Environmental Conservation, 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. EJ 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. Implementation of the best practices identified within this toolkit require careful consideration of environmental justice implications so that vulnerable communities are not unduly impacted and that, where possible, actions help to reduce existing inequalities.

Best Practices

The Best Practices are the real tools that you can use to implement the Objectives. Each Best Practice comes with a **Description**, an explanation of its **Purpose**, and a suggestion about **How to get started**: the first modest, but in some ways most important, steps you can take toward implementation. Typically this includes an audit of the conditions in your community or identifying the best practices most relevant to your community.

Just as important, these tools are accompanied by information you need to assess whether a particular strategy is right for your community:

Initial Investment

How much will it cost to do this?

- **Low:** Actions which you likely can do with your own resources. In general, this means capital improvements are not involved or can be implemented by leveraging private development.
- **Moderate:** Outside consultant work is probably required or the action requires some small-scale capital improvements. These costs should not exceed \$100,000.

- **High:** Initiatives that involve more detailed professional studies or designs or involve larger-scale capital investments, only some of which can be leveraged through private development or non-municipal funds.

Time to Implement

How long will it take to do this? This is the time it may take to adopt new policies and regulations or complete construction on a capital project.

- **Short:** One year or less.
- **Medium:** One to five years
- **Long:** Five to ten years

Professional assistance required

Do you need to hire an outside consultant, or is this something you could implement with your own staff and citizen stakeholders? This is often a threshold question since professional assistance can add time and cost.

Co-benefits

What other positive outcomes may result from this action? For example, you may implement a Walk-to-School Program for the primary benefit of providing healthy activity for your children. But in the process, you are likely to achieve the co-benefit of traffic calming and reduced congestion. Co-benefits can help you choose among best practices, apply for grants and build support in the community.

Time to Benefit

How long will it be before you start seeing visible and measurable outcomes (again, Short<1 year, Medium 1-5 years, Long 5-10 years)?

Eligible for Climate Smart Communities (CSC) points

NYSERDA's Climate Smart Communities program provides local governments with a robust framework to guide their climate action and enables high-performing communities to achieve recognition for their leadership. Communities can be certified as Gold, Silver, Bronze, or certified through earning points for more than 120 actions listed in the **CSC Certification Manual** (http://www.dec.ny.gov/docs/administration_pdf/certman.pdf). In April 2014, Orange County was one of the first places in New York to be designated a certified Climate Smart Community.

Finally, for each Best Practice, we list links to key web-based **References** where you can find more information, as well as **Sample Implementation Materials** from other communities.

How are you doing?

As part of its emphasis on implementation, the MHRSP included a set of metrics by which the region could measure its performance and accomplishments. In that spirit, this Toolkit provides metrics that can be used at the scale of your community. At the end of each section are two important implementation tools for evaluating implementation now and in the future.

Best-Practices Self Assessment

This is a check-list you can use to identify which best practices you are already doing and to identify which additional best practices might be most effective in your community. The check-list shows how well-suited different Best Practices are to different types of places – from Downtowns to Rural areas - so you can see which are most relevant to your type of community. The place types in this toolkit are the same place types used in the Orange County Design Manual to facilitate use of both resources.



Downtowns: places that already contain a mix of activities associated with a complete community: places to shop, to work, civic and public spaces and a wide variety of housing types. Municipal services (water, sewer) are in place and it is capable of accommodating some forms of transportation.



Edges: places into which the street-and-block network and land use patterns of a downtown can be extended. It may be completely undeveloped land. More likely that it will be a place that already has some development and infrastructure but at a greatly reduced density so that there is an opportunity for a significant increase in development.



Corridors: roads that are lined with auto-oriented commercial uses. While there may be other kinds of activities within the surrounding area, the commercial corridor is almost entirely single use. With a few exceptions in small areas, the environment is built around the automobile, so much so that auto access is excessive in scale and creates a hostile environment for pedestrians.



Crossroads: places that already have some of the ingredients of a new center but at lower densities: perhaps there are some auto-oriented commercial uses; often there may be a fire station, town hall or other civic use; it is surrounded by developable lands that are suitable for future walkable neighborhoods.



New Neighborhoods: places that are largely undeveloped, but are still appropriate for new development. These are mainly residential places with a wide variety of housing types. But to be “complete communities” these include some amount of neighborhood retail and services, opportunities for live-work space, and civic uses.



Rural: area located outside incorporated towns, cities and villages, not incorporated within an urban area.

Performance Metrics

Each section provides clear directions on how to evaluate the performance of your community in regards to key measures of sustainability. Two primary performance metrics are accompanied with detailed directions for data collection and measurement as well as how to set an appropriate performance target for your community. A metrics worksheet also includes several additional metrics that may also be useful for tracking performance.

Land Use, Livable Communities and Transportation

Land use and transportation are interdependent, and together have a significant effect on the health, livability, environment, and economy of the Mid-Hudson region. Currently, the region benefits from its vibrant communities and access to a great mass transit system, as well as a pattern of development that combines truly rural with truly urban landscapes. But low-density, auto-dependent development designed for cars instead of citizens reduces quality of life, increases long-term economic costs, and worsens our impact on the environment. Furthermore, ensuring access to a diversity of housing and jobs is a central environmental justice (EJ) goal. Low-income and minority communities are disproportionately affected by high housing and transportation costs and are challenged when they live in places where housing is located far from job centers.

To reverse these trends, communities can use the land use and transportation strategies laid out in the four objectives below to make the Mid-Hudson region a more livable, connected, and environmentally-friendly community in a cost-effective way. Achieving more sustainable patterns of land use development and transportation will reduce negative impacts on open space and habitat, increase residential access to transit, jobs, and community amenities, and promote reinvestment in existing communities.

Objectives







**Strengthen existing centers
and conserve open space**

Create complete communities

**Reduce transportation fossil fuel
consumption and GHG emissions**

**Improve the safety, integrity,
and resilience of regional
infrastructure for all users**

Self-Assessment

Downtowns	Edges	Corridors	Crossroads	New Neighborhoods	Rural			
								
						Best Practices	In Place	In Progress
						Strengthen existing centers and conserve open space		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Set up transfer of development rights (TDR) programs	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Promote conservation subdivision zoning	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Adopt form-based codes	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>		Adopt split-rate property tax to encourage infill	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Build compact mixed-use developments	<input type="checkbox"/>	<input type="checkbox"/>
						Create complete communities		
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Build affordable housing	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Adopt design guidelines	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Promote community-based farming	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Create connected street networks	<input type="checkbox"/>	<input type="checkbox"/>
						Reduce transportation fossil fuel consumption and GHG emissions		
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Amend comprehensive plans to support transit-oriented development (TOD)	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Zone for denser mixed-used development at transit and corridors	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Promote walk and/or bike-to-school programs	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Adopt site design guidelines for internal and external connectivity	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Adopt ordinance requiring easements for bike and/or pedestrian paths	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Develop a local anti-idling campaign	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Build multi-modal streets	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Create trails and safe walking routes	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Reduce parking requirements in TODs	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Provide comfortable and convenient transit facilities	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Create pedestrian links to station areas	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Build pedestrian-friendly streetscapes	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Reduce area devoted to parking	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Roll out new commuter incentives	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Provide biking facilities in new developments	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Make biking safer	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Incorporate electric vehicle infrastructure into local planning	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Adopt streetscape design guidelines	<input type="checkbox"/>	<input type="checkbox"/>
						Improve the safety, integrity, and resilience of regional infrastructure for all users		
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Set aside space for farmers markets	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Mandate improvements in fleet vehicle fuel efficiency	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Create coastal overlay district	<input type="checkbox"/>	<input type="checkbox"/>

- ☒ Very applicable
- ☐ Applicable
- ☐ Not applicable

Objective

Strengthen existing centers and conserve open space

Centers in the Mid-Hudson region 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. Strong centers use resources more efficiently while protecting open space from development pressures. Developing already existing centers will promote denser and more efficient land uses. Increasing the density of centers as opposed to developing new land not only saves money by taking advantage of existing infrastructure such as roads, transit and utilities, but also protects undeveloped land from development pressure.

Best Practice

Set up Transfer of Development Rights (TDR) programs

Description: TDR programs allow for the transfer of some or all of the development that would otherwise have occurred in sensitive places (sending areas), to more suitable locations (receiving areas).

Purpose: Adopting a TDR plan permanently protects open space for water supply, agriculture, habitat, recreational, or other purposes.

How to get started: Identify priority growth areas and priority sending areas. Adopt a model ordinance.

Co-benefits: Habitat protection. Livelier and more complete downtowns.

Details

Initial Investment: Moderate. Depends on cost of professional assistance, particularly in real estate market analysis.

Professional Assistance Required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium to long depending on pace of development.

CSC Reference #:

Sources

Massachusetts Smart Growth/Smart Energy Toolkit - TDR
http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-tdr.html

Sample Implementation Material

Suffolk County Department of Economic Development and Planning: Transfer of Development Rights (TDR) Study
<http://www.sustainablenyct.org/projects/SuffolkCountyTDRStudyJune062014.pdf>

Farmland Information Center- Town of Eden NY TDR Enabling Ordinance
<http://www.farmlandinfo.org/eden-ny-local-tdr-enabling-ordinance>

Farmland Information Center- Town of Lysander, NY TDR Enabling Ordinance
<http://www.farmlandinfo.org/lysander-ny-local-tdr-enabling-ordinance>

Best Practice

Promote conservation subdivision zoning

Description: Conservation subdivisions are a design strategy that require between 50 and 70 percent of buildable land be set aside as open space.

Purpose: Conservation subdivision zoning preserves undivided, buildable tracts of land as open space for recreational use and/or habitat preservation.

How to get started: Identify and prioritize areas subject to future subdivision. Adopt a model ordinance. Keep in mind rural areas that may lack water and sewer facilities will need additional assistance to ensure the success of this zoning.

Co-benefits: Reduced infrastructure costs. More efficient service provision. Continuity of open space for habitat and trails.

Details

Initial Investment: Low. Zoning overlays or changes to existing zones may need to be adopted.

Professional Assistance Required: No.

Time to Implement: Short to medium.

Time to Benefit: Short to medium.

CSC Reference #: 7.17

Sources

Essential Smart Growth Fixes for Rural Planning, Zoning, and Development Codes
http://www.epa.gov/dced/pdf/rural_essential_fixes_508_030612.pdf

Land Choices - Conservation Subdivisions
<http://www.landchoices.org/conservationsubs.htm>

Codes That Support Smart Growth Development
<http://www.epa.gov/smartgrowth/codeexamples.htm>

Sample Implementation Material

University of Wisconsin Extension- An Ordinance for a Conservation Subdivision
 Subdivision <http://urpl.wisc.edu/people/ohm/consub.pdf>

New Hampshire Department of Environmental Services Innovative Land Use Planning Techniques Guide
http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_chpt_1.4.pdf

Best Practice

Adopt form-based codes

Description: Form-based codes typically designate the form and mass of buildings, the scale of streets and blocks, and the relationship between buildings and streets. They typically also address elements within the public realm such as sidewalks, on-street parking, street trees, etc. Form-based codes may also include architectural, signage, and landscaping standards.

Purpose: Adopting a form-based code helps to achieve a community vision based on time-tested forms of urbanism.

How to get started: Conduct a visual preference survey to illustrate preferred future development patterns.

Co-benefits: Enabled contextual development generates additional municipal revenue. Robust discussion about community character.

Details

Initial Investment: Moderate. Professional assistance and public process required to do properly.

Professional Assistance Required: Yes.

Time to Implement: Short to medium.

Time to Benefit: Short to medium.

CSC Reference #: 6.2

Sources

Form-Based Codes Institute- Form-Based Codes Defined
<http://www.formbasedcodes.org/what-are-form-based-codes>

Sample Implementation Material

Town of Malta, NY: Form-Based Code
<http://www.malta-town.org/index.aspx?NID=285>

Chicago Metropolitan Agency for Planning- Form-Based Codes: A Step-by-Step Guide for Communities
<http://formbasedcodes.org/content/uploads/2013/11/CMAP-GuideforCommunities.pdf>

Best Practice

Adopt split-rate property tax to encourage infill development

Description: In a split-rate property tax system, property is assessed in two separate parts, one which taxes the value of buildings and improvements and one which taxes the value of the land.

Purpose: Adoption of a split-rate property tax systems effectively lowers the tax on the building, encouraging property owners to maintain and improve buildings while also concentrating development in appropriate areas.

How to get started: There are several ways to support split-rate property taxation. One starting point for local governments is to allow their taxing authorities to assess buildings and improvements separately from land values.

Co-benefits: Can improve local quality of life.

Details

Initial Investment: Varies.

Professional Assistance Required: Necessary.

Time to Implement: Medium.

Time to Benefit: Long.

CSC Reference #:



Split-rate taxes encourage redevelopment of vacant properties (pictured: Bridgeport, CT)

Source: RPA

*Sources***Split-Rate Property Tax**

<http://tompkinscountyny.gov/files/planning/vct/tool/split-ratepropertytax.html>

Sample Implementation Material

American Legislative Issue and Campaign Exchange-
ALICE Model Split-Rate Property Tax Authorization Act
https://stateinnovation.org/uploads/asset/asset_file/1974/ALICE_Model_Split-Rate_Property_Tax_Authorization_Act.pdf

Best Practice

Build compact mixed-use developments

Description: Compact mixed-use development blends a combination of residential, commercial, cultural, institutional, and where appropriate, industrial uses in densely populated areas.

Purpose: Adoption of compact mixed use zoning regulations allows communities to enhance neighborhoods by integrating residential and commercial uses, while offering citizens access to many destinations within walking distance of homes and therefore lowering vehicle miles traveled.

How to get started: Identify places suitable for this kind of development and audit existing regulations and compare to best-practice models.

Co-benefits: Improved public health, improved mobility and access, equity. Potential driver of economic activity.

Details

Initial Investment: Low.

Professional assistance required:
Necessary for code revisions.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #: 6.2



A mix of locally owned and chain businesses in a mixed-use building in Seattle's South Lake Union neighborhood.

Source: APA (Meghan Stromberg)

Sources

Oregon Department of Land Conservation and Development
- Smart Development Code Handbook and Appendix
<http://www.oregon.gov/lcd/tgm/documents/smartdevelopmentcodehandbook.pdf>

Town of Croton-on-Hudson - Mixed/Multiple Use,
Development Standards, Comprehensive Planning,
Open Space Preservation, Historic Preservation, Scenic
Resources, Site Design Standards, Site Plan Approval
<http://landuse.law.pace.edu/landuse/documents/laws/reg2/CrotonMultiUseDvlpmnt.doc>

*Sample Implementation Material***RPA - Community Design Manual**

<http://www.rpa.org/sites/rpa.civicactions.net/files/Community-Design-Manual.pdf>

Objective

Create Complete Communities

“Complete communities” is a concept that describes communities which make the necessities of daily life available to residents of any age, income, or level of mobility. Communities that have a range of housing types, sizes, and price points allow for residents to live close to local jobs, to remain in the community as young people starting out or as seniors looking to downsize, and to reach jobs and services through walking, biking, and transit in addition to automobiles.

Complete communities also allow for a mix of uses, including residential, commercial, parks, industrial, and office spaces in proximity to each other. The mix of uses allows for local employment opportunities, and the diverse tax base provides municipal budgets with some protection against cyclical downturns in particular real estate sectors.

In order for the diverse amenities of a complete community to be accessible by its residents, amenities should be linked by high quality pedestrian infrastructure such as sidewalks, trails, and public access crossings on private property.

Best Practice

Build affordable housing

Description: Affordable housing is usually defined as housing that is affordable to residents paying no more than 30% of their income towards housing expenses.

Purpose: Affordable housing should provide opportunities for families to live near education and employment opportunities while allowing families to budget for other household expenditures including food, transportation, energy, and clothing.

How to get started: Audit current housing cost/income burden to determine the need for affordable housing.

Details

Initial Investment: Moderate to high.

Co-benefits: Community stability and diversity. Preserve/ conserve existing buildings. Compact development.

Professional assistance required: No.

Time to Implement: Medium.

Time to Benefit: Medium to long.

CSC Reference #: 6.2

Sources

Model Affordable Housing Density Bonus Ordinance
<http://www.planning.org/research/smartgrowth/pdf/section44.pdf>

Housing and Community Development Network of New Jersey - Neighborhood Toolkit
<http://www.hcdnnj.org/neighborhoodtoolkit>

Enterprise Community Partners - Green Affordable Housing Policy Toolkit
<http://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-green-hsg.pdf>

State of Massachusetts -Affordable Housing Zoning
<http://landuse.law.pace.edu/landuse/documents/laws/reg1/MaAffHousingZning.doc>

State of New Hampshire - Inclusionary Housing
http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_chpt_1.9.pdf

Sample Implementation Material

East Fishkill - Affordable Housing
http://www.greenpolicy360.net/w/East_Fishkill,_NY_Affordable_Housing

Best Practice

Adopt design guidelines

Description: Design guidelines address issues of building character and the relationship of buildings to streets and public spaces.

Purpose: Adoption of design guidelines promote development that supports community character and reinforces the quality of streets and public spaces.

How to get started: Conduct visual preference study.

Co-benefits: Persons living in walkable neighborhoods have higher base levels of physical activity, which results in less obesity and longer life expectancies. Communities with high levels of walking and biking also benefit from increased local spending.

Details

Initial Investment: Low to moderate. Depends on extent and complexity of guidelines.

Professional assistance required: Yes.
Depends on level of detail.

Time to Implement: Short to medium.

Time to Benefit: Short to medium.

CSC Reference #: 6.5

Sources

US EPA, 2009. Smart Growth Guidelines for Sustainable Design & Development.

http://www.epa.gov/dced/pdf/sg_guidelines.pdf

National Institute of Building Sciences

Whole Building Design Guide

<http://www.wbdg.org/resources/lidsitedesign.php>

Red Hook Smart Growth Centers & Greenspace Plan

<http://www.redhook.org/PDFs/CentersAndGreenspaces/Poster2.pdf>

National Main Street Center

<http://www.preservationnation.org/main-street/main-street-news/2009/04/from-main-street-to-green.html>

Project for Public Spaces

<http://www.pps.org/reference/howyourcommunitycanthrive-evenintoughtimes/>

Sample Implementation Material

Town of Warwick - Community Design Manual

http://www.townofwarwick.org/departments/comp-plan_docs/design_guidelines.pdf

RPA - Community Design Manual

<http://www.rpa.org/sites/rpa.civicaactions.net/files/Community-Design-Manual.pdf>

Best Practice

Promote community-based farming

Description: Urban agriculture programs can take a variety of forms. Some communities develop community gardens. Others pass ordinances to explicitly allow food production in public spaces. Promotion of community based farming can serve to increase food security, promote environmental awareness, strengthen community connections, and reduce greenhouse gas emissions through lowering the amount of fuel used to transport food.

Purpose: Adoption of an ordinance allowing for publicly owned but vacant lots to be used by residents for community gardens is a way for communities to come together to transform unsightly, vacant lots into green spaces used for local food production.

How to get started: Launch community-based planning effort.

Co-benefits: Creation of green space.
Supports community-building activities.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: 6.7

Sources

Adopt-A-Lot Program - Jersey City

http://www.cityofjerseycity.com/uploadedFiles/For_Residents/Adopt_A_Lot_ORD.pdf

City of Richmond- Richmond Grows Gardens Rules and Guidelines

<http://www.richmondgov.com/content/CommunityGarden/RulesAndGuidelines.aspx>

Best Practice

Create connected street networks

Description: A connected street network is a structure of streets that serves and connects people and places through several modes of transportation. A connected network approach focuses on provides multiple routes for getting to a location.

Purpose: Connected street networks promote multiple travel routes for vehicles and minimize travel times for pedestrians.

How to get started: Map missing links in the roadway network.

Co-benefits: Improved health from walking. Less road miles to police/maintain. Easier to serve a community with transit if pedestrian connections are available between homes and collector roads.

Details

Initial Investment: Low where private development can be leveraged. High where new public infrastructure is required.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium to long.

CSC Reference #: 6.9

Sources

Congress for the New Urbanism: Benefits of Connected Street Networks

<http://www.cnu.org/sites/www.cnu.org/files/Benefits%20of%20Connected%20Street%20Networks.pdf>

Objective

Reduce transportation fossil fuel consumption and greenhouse gas emissions

Transportation is responsible for 45 percent of greenhouse gas emissions in the Mid-Hudson region. This objective aims to shift away from single-occupancy car use and towards a multi-modal network of mass transit, walking, biking, and carpooling. Strategies to make this multi-modal network more appealing include making transit more comfortable and accessible, increasing connectivity between transit and other modes, clustering destinations in walkable centers, and creating more walking and biking paths. This multi-modal network requires less fossil fuel consumption and can be better for individuals' health and budgets.

Best Practice

Amend comprehensive plans to support transit-oriented development (TOD)

Description: TOD is characterized by a relatively dense mix of uses-- including residential-- within a walkable distance of a transit stop. TOD ordinances can be applied as overlay districts or standalone districts.

Purpose: TOD seeks to integrate transit with surrounding land uses and help shape development around transit stations in order to facilitate transit use and reduce dependence on automobiles.

How to get started: Identify areas where transit resources are located and audit existing development patterns and pedestrian conditions.

Co-benefits: Improved walkability.
Beneficial to local businesses.

Details

Initial Investment: Low.

Professional Assistance Required: Necessary.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #:

Sources

Center for Transit-Oriented Development
<http://ctod.org/>

TOD Database
<http://www.cnt.org/tools/tod-database>

CTOD - Transit-Oriented Development Typology
Strategy for Allegheny County
<http://ctod.org/pittsburgh/201302pittsburgh-tod-book-web.pdf>

U.S. Green Building Council
<http://www.usgbc.org/Docs/Archive/General/Docs6131.pdf>

Sample Implementation Material

State of Massachusetts- Smart Growth Smart Energy
Toolkit Transit-Oriented Development Overlay District
http://www.mass.gov/envir/smart_growth_toolkit/bylaws/TOD-Bylaw.pdf

City of Arlington, VA- General Land Use Plan
http://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/31/2014/07/GLUP_Booklet_June_2014.pdf

Best Practice

Zone for denser mixed-used development at transit and corridors

Description: Mixed-use development blends a combination of residential, commercial, cultural, institutional, and where appropriate, industrial uses. Mixed-use development is often linked with increased density developments.

Purpose: Mixed-use development encourages residents to walk, bike, or take transit, disincentivizing automobile ridership, decreasing vehicle miles traveled, and reducing greenhouse gas emissions while lowering household transportation costs.

How to get started: Audit existing regulations and compare to best practice models.

Co-benefits: Reduced fuel costs, public health benefits, quality of life and local business benefits.

Details

Initial Investment: Professional time to craft or customize code language.

Professional assistance required: Necessary.

Time to Implement: Medium.

Time to Benefit: Long.

CSC Reference #: 6.8

Sources

Model Mixed-Use Zoning District Ordinance

<https://www.planning.org/research/smartgrowth/pdf/section41.pdf>

Essential Smart Growth Fixes for Urban and Suburban Zoning Codes

http://www.epa.gov/smartgrowth/pdf/2009_essential_fixes.pdf

U.S. Green Building Council

Arlington County - General Land Use Plan

http://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/31/2014/07/GLUP_Booklet_June_2014.pdf

Sample Implementation Material

Town of Fairfield, CT- Transit-Oriented Development Park

http://www.fairfieldct.org/filestorage/10726/11028/12429/12431/Current_Zoning_Regs_-_Master_to_July_17%2C_2014.pdf

State of Massachusetts- Smart Growth Smart Energy Toolkit Transit-Oriented Development Overlay District

http://www.mass.gov/envir/smart_growth_toolkit/bylaws/TOD-Bylaw.pdf

City of Orlando, FL - Density Bonuses

https://www.municode.com/library/fl/orlando/codes/code_of_ordinances?nodel=TITICICO_CH58ZODIUS_PT6DEINBO

Best Practice

Set aside space for farmers markets

Description: Publicly owned open space or vacant lots can be set aside for farmers markets that link farmers to a local customer base.

Purpose: Farmer's markets increase profits for farmers, provide consumers with a variety of fresh and healthy, promote community ties between urban and rural communities and support community economic development.

How to get started: Identify potential locations for farmers markets.

Co-benefits: Supports local agriculture economy. Improved health.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: 6.7



New Rochelle's seasonal farmers market at Library Green

Source: newrochellegrandmarket.com

Sources

Adopt-A-Lot Program - Jersey City

http://www.cityofjerseycity.com/uploadedFiles/For_Residents/Adopt_A_Lot_ORD.pdf

City of Richmond- Richmond Grows Gardens\ ns Rules and Guidelines

<http://www.richmondgov.com/content/CommunityGarden/RulesAndGuidelines.aspx>

Sample Implementation Material

NY Farmers Market - Building Community

<http://nyfarmersmarket.com/wp-content/uploads/2014/08/BuildingCommunityFM2010.pdf>

Best Practice

Promote walk and/or bike-to-school programs

Description: Programs include school bicycle clubs, education on pedestrian safety, and 'walking school buses' that partner children with a supervising adult for group walks to and from school.

Purpose: Walk and/or bike-to-school programs promote physical health, reduce greenhouse gas emissions, and support traffic calming measures that increase pedestrian safety.

How to get started: Audit how and where trips to school are made. Contact the New York State Safe Routes To School program.

Details

Initial Investment: Low. Funding may be necessary to staff programs in the school or supervise volunteer adults.

Co-benefits: Health through active living.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short to medium.

CSC Reference #: 6.10

Sources

SRTS Guide- The Walking School Bus
http://guide.saferoutesinfo.org/walking_school_bus/

Walk/Bike to School
<http://www.walkbiketoschool.org/>

Sample Implementation Material

Westchester Bike Walk- Safe Routes to School Program
<http://westchesterbikewalk.org/wp-content/uploads/2011/03/Irvington2008SRTSApplication.pdf>

Knox County – Walk-to-School Analysis
http://www.knoxtrans.org/schools/Final%20Deliverable%20Package_phase%202.pdf

Best Practice

Adopt site design guidelines for internal and external connectivity

Description: Site design guidelines emphasizing connectivity promote the ability of residents to walk, bike, or access transit options and help reduce the need for high-capacity roadways.

Purpose: Trips between destinations in neighborhoods with connected street grids are shorter, promoting walking and biking in lieu of automobile trips.

How to get started: Identify potential connections on large sites or missing links.

Co-benefits: Reduced traffic. Health benefits from increased walking. Community cohesion.

Details

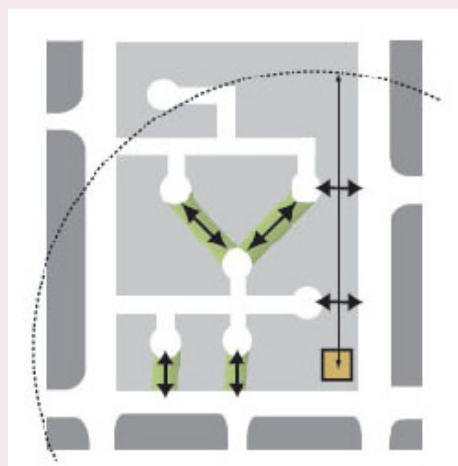
Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #: 6.5



A drawing of a suburban block retrofitted for increased connectivity to surrounding circulation systems.

Source: RPA

Sources

Town of Warwick Design Guidelines
http://www.townofwarwick.org/departments/comp-plan_docs/design_guidelines.pdf

Town of Red Hook - Centers and Greenspaces Design Guide
<http://www.redhook.org/PDFs/CentersAndGreenspaces/Poster2.pdf>

WBDG -Achieving Sustainable Site Design through Low Impact Development Practices
<http://www.wbdg.org/resources/lidsitedesign.php>

NYCDDC - Sustainable Urban Site Design Manual
http://www.nyc.gov/html/ddc/downloads/pdf/ddc_sd-sitedesignmanual.pdf

NACTO - Urban Street Design Guide
<http://nacto.org/usdg/>

U.S. Green Building Council
<http://www.usgbc.org/credits/lt8>

Best Practice

Adopt ordinance requiring easements for bike and pedestrian paths

Description: Easements are legal agreements that allow uses on properties owned by another. In this case, the property owner would grant an easement allowing bicyclists and pedestrian to access paths across private property.

Purpose: Bike and pedestrian paths can increase the ability of residents to access destinations in their community by shortening trips and routing around obstacles.

How to get started: Identify model regulations and guidelines.

Co-benefits: Improved public health. Increased mobility.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Short to medium.

CSC Reference #: 6.1



Providing a clear division between bike lanes, pedestrian walkways and automobile traffic makes travel safer and more enjoyable for bikers and pedestrians

Source: RPA

Sources

Walk Bike Dutchess County

<http://www.co.dutchess.ny.us/countygov/departments/transportationcouncil/21810.htm>

City of Rochester Bicycle Master Plan

<http://www.cityofrochester.gov/bikeplan/>

Village of Croton-on-Hudson Bike Master Plan

http://village.croton-on-hudson.ny.us/Public_Documents/CrotonHudsonNY_BComm/bike-ped-masterplan.pdf

City of Albany Bicycle Master Plan

<http://www.cdtcmpo.org/linkage/albanybmp.pdf>

Sample Implementation Material

Micropathways/Easements requirements:

Chap 9-20, sec 9(F1), p.35 -

http://cityclerk.cityofboise.org/media/223814/13609_0920.pdf

Central Savannah River Area Regional Commission - Model Bicycle and Pedestrian Land Use Regulation

<http://www.csrardc.org/docs/planning/Transportation/ModelBicycleandPedestrianLandUseRegulationGuide.pdf>

Best Practice

Develop a local anti-idling campaign

Description: Develop local Anti-Idling Campaigns for personal automobiles to complement NY State's anti-idling policy for heavy duty trucks and buses.

Purpose: Anti-idling campaigns reduce the amount of emissions from vehicle use.

How to get started: Adopt model regulations.

Co-benefits: Better air quality. Reduced noise pollution.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: 6.15

Sources

Tarrytown Environmental Advisory Council

http://www.tarrytownenvironmental.org/index.php?option=com_content&view=article&id=25:anti-idling-conference-greenburgh-nature-center&catid=2:past

NY State Department of Environmental Conservation

<http://www.dec.ny.gov/chemical/8585.html>

Anti-Idling Primer

<http://www.thehcf.org/antiidlingprimer.html>

"I Turn it Off" Pledge program

<http://iturnitoff.com/>

US Department of Energy- IdleBase

Database of Idling Ordinances

<http://cleancities.energy.gov/idlebase>

Sample Implementation Material

US Department of Energy- IdleBase

(Database of Idling Ordinances)

<http://cleancities.energy.gov/idlebase>

Best Practice

Build multi-modal streets

Description: Multimodal streets are designed to encourage use by all modes- vehicles, local transit (bus/streetcar), cyclists, pedestrians, and the disabled.

Purpose: Multimodal streets enable the use of multiple modes of transportation, expanding access for residents without the use of private vehicles.

How to get started: Community audit for bikeability/walkability. Adopt a complete streets policy.

Co-benefits: Increased health through biking and walking.

Details

Initial Investment: Low where private development can be leveraged. High where new public infrastructure is required.

Professional assistance required: Yes.

Time to Implement: Short to medium depending on ambition.

Time to Benefit: Short to medium.

CSC Reference #: 6.9



A main street in Portland, Oregon designed for transit, personal automobiles, bicycles and pedestrians.

Source: RPA

Sources

American Planning Association

<https://www.planning.org/pas/brochure/pdf/report.pdf>

Smart Growth America

<http://www.smartgrowthamerica.org/complete-streets/changing-policy/complete-streets-atlas>

ITE Journal

<http://www.smartgrowthamerica.org/documents/cs/resources/cs-ite-may08.pdf>

US Green Building Council LEED-ND

National Complete Streets Coalition

<http://www.smartgrowthamerica.org/complete-streets/changing-policy>

Smart Growth America

<http://www.smartgrowthamerica.org/documents/cs/resources/cs-policyworkbook.pdf>

Sample Implementation Material

Smart Growth America - Streets and Sidewalks

<http://www.smartgrowthamerica.org/documents/cs/policy/cs-ny-ogdensburg-ordinance.pdf>

Best Practice

Create trails and safe walking routes

Description: Trails and safe walking routes include pedestrian-only pathways as well as sidewalks and intersections designed to make walking a comfortable and safe means of transportation.

Purpose: Safe and comfortable pedestrian paths encourage transportation by foot and connect residents with local amenities.

How to get started: Map potential walking and trail routes.

Co-benefits: Improved public health, improved mobility and access, equity.

Details

Initial Investment: Low to map routes.

High to construct new trails.

Professional assistance required: No.

Time to Implement: Short to medium.

Time to Benefit: Medium.

CSC Reference #: 6.10

Sources

Texas State Department

<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cad=1&cad=rja&uact=8&ved=0CB4QFjAA&url=https%3A%2F%2Fwww.dshs.state.tx.us%2Fwellness%2Fresource%2Ftrail.pdf&ei=jk0EVd7SB4rY-QGi7oDADg&usg=AFQjCNHbcBBZHNOzE-JDwXVsQb7olqGkSVA&bvm=bv.96042044,d.cWw>

National Center for Biking and Walking

<http://www.bikewalk.org/workshopwalkableguidelines.php>

Sample Implementation Material

CSRARD - Model Bicycle and Pedestrian

Land Use Regulation Guide

<http://www.csrardc.org/docs/planning/Transportation/ModelBicycleandPedestrianLandUseRegulationGuide.pdf>

Best Practice

Reduce parking requirements in TODs

Description: Reduce or abolish minimum parking requirements that set the number of parking spaces developers and landowners are required to provide. Parking requirements are typically set using generic standards that apply to particular land use categories and often result in an oversupply of spaces; more flexible requirements will produce land uses that better reflect the needs of the surrounding area.

Purpose: Reducing required parking reduces the cost of new development and enables better site design that promotes access by multiple modes of transportation.

How to get started: Audit existing regulations and compare to best practice models.

Co-benefits: Improved aesthetic appearance. Reduced cost of development.

Details

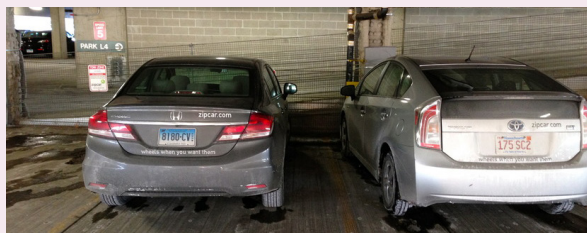
Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Medium to long depending on pace of development.

CSC Reference #: 6.8



TOD properties can further reduce auto ownership by supplementing local transit with car-sharing for infrequent automobile needs.

Source: Zipcar.com (360 State Street, New Haven, CT)

*Sources***EPA**

<http://www.epa.gov/dced/pdf/EPAParkingSpaces06.pdf>

American Planning Association

<https://www.planning.org/pas/infopackets/subscribers/pdf/eip24part1.pdf>

Austin, TX Getting the Parking Right for TOD

<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/getting-the-parking-right-transit-oriented-development.pdf>

MTC, Parking Code Guidance: Case Studies and Model Provisions

http://www.mtc.ca.gov/planning/smart_growth/parking/6-12/Parking_Code_Guidance_June_2012.pdf

*Sample Implementation Material***Zoning Regulations, City of Stamford § 3.9-(80-98)**

http://www.stamfordct.gov/sites/stamfordct/files/file/city_of_stamford_zoning_regulations15_1.pdf

City of Bridgeport – Zoning & Subdivision Regulations

www.bridgeportct.gov/filestorage/89019/89606/103897/Zoning_2010_Regulations.pdf

Best Practice

Provide comfortable and convenient transit facilities

Description: Transit facilities may include marked, sheltered, and maintained bus stops as well as bus terminals and rail stations.

Purpose: Creating comfortable and convenient transit facilities will encourage people to utilize mass transit and reduce dependence on automobiles.

How to get started: Audit existing transit facilities. Conduct community survey.

Co-benefits: Increased access to transit for disadvantaged users. They also help to remove the stigma associated with transit use. Improved health from activity associated with transit.

Details

Initial Investment: Moderate. Costs include initial installation of facilities and ongoing maintenance.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium to long.

CSC Reference #:



Savannah, Georgia's downtown transit hub provides shade and route information to the region's riders.

Source: RPA (Amanda Kennedy)

*Sources***Pace Transit Supportive guidelines**

http://www.pacebus.com/guidelines/04e_waiting_areas.asp

Journal of public transportation

<http://www.nctr.usf.edu/jpt/pdf/JPT11-2Litman.pdf>

Criterion Planners. 2012. "Local Planners Catalog of LEED-ND Measures." US Green Building Council.

<http://www.usgbc.org/resources/local-planners-catalog-leed-nd-measures>

Byerly, Meg. 2013. "Technical Guidance Manual for Sustainable Neighborhoods." US Green Building Council and Pace Law School.

<http://www.smartgrowthamerica.org/documents/Technical-Guid.-Man.-for-Sust.-Neighborhoods-2012.pdf>

U.S. Green Building Council

<http://www.usgbc.org/credits/neighborhood-development-plan-neighborhood-development/v2009/npdc7>

<http://www.metrocouncil.org/METC/files/ea/ea8d03e-2d7a-4e61-b045-391dbe737999.pdf>

(Twin Cities) Metropolitan Council- Station and Support Facility Design Guidelines User Guide

*Sample Implementation Material***SEPTA- SEPTA Bus Stop Design Guidelines**

<http://septa.org/strategic-plan/reports/SEPTA-Bus-Stop-Design-Guidelines-2012.pdf>

Best Practice

Create pedestrian links to station area

Description: The walkshed of a transit station is the area from which passengers will comfortably walk to access transit, and is generally considered to be 1/2 mile.

Purpose: Mapping this distance not as the crow flies, but instead by considering the existing street network, can identify where pedestrian connections or roads can expand the existing walkshed to more potential riders.

How to get started: Identify potential routes and survey conditions along those routes.

Co-benefits: Increased commercial activity along routes.

Details

Initial Investment: Low to Moderate depending on ambition and extent of new capital investments needed.

Professional assistance required: No.

Time to Implement: Short to medium.

Time to Benefit: Short to medium.

CSC Reference #: 6.12

Sources

FHWA Course on Bicycle and Pedestrian Transportation- Bicycle and Pedestrian Connections to Transit
http://safety.fhwa.dot.gov/ped_bike/univcourse/pdf/swless09.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>

Walkshed
<http://www.walkshed.org/>

Sample Implementation Material

BART- BART Daly City Station Access Improvement Plan https://www.bart.gov/sites/default/files/docs/Daly_City_BART_SAIP_FINAL.pdf

Best Practice

Build pedestrian-friendly streetscapes

Description: Walking is a form of active transportation that can substitute for vehicle trips but is highly sensitive to the built environment.

Purpose: By planning to accommodate pedestrians, communities can promote health and environmentally friendly alternatives to automobile travel.

How to get started: Audit existing walking conditions.

Co-benefits: Improved public health. Increased mobility.

Details

Initial Investment: Low to Moderate.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Long.

CSC Reference #: 6.9



Intersection extension shortens the crossing distance for pedestrians and provide opportunities for plantings

Source: RPA

Sources

Hawaii DOT Pedestrian-Friendly Streets Toolkit
http://hidot.hawaii.gov/highways/files/2013/07/Pedest-Tbox-Toolbox_2-Pedestrian-Friendly-Streets.pdf

ChangeLab Solutions Pedestrian-Friendly Code
<http://changelabsolutions.org/childhood-obesity/pedestrian-friendly-code>

Bike Walk Pedestrian Streetscape Guide
http://www.bikewalk.org/pdfs/sopgeorgia_ped_streetscape_guide.pdf

Best Practice

Reduce area devoted to parking

Description: Parking areas can be minimized through several strategies- calibrating parking requirements to actual demand; supporting alternative transportation options such as transit, walking, and bicycling; and managing parking fees to support efficient use of the parking supply.

Purpose: Promote walkable design and on-site stormwater management.

How to get started: Conduct parking survey. Audit existing regulations and compare with best practices.

Co-benefits: Increased revenues from more attractive commercial areas. Improved water quality from reduced non-point source pollution.

Details

Initial Investment: Cost of parking meters or other enforcement mechanism.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Medium. Depends on pass of development/redevelopment.

CSC Reference #: 6.8, 6.12



Infill development in former parking fields can provide opportunities for walkable amenities

Source: RPA

Sources

Livable City Parking Reform

<http://livablecity.org/livable-neighborhoods/parking-reform-for-a-livable-city/>

SF Planning Department Pavement to Parks Program

<http://pavementtoparks.sfplanning.org/>

EPA

<http://www.epa.gov/dced/pdf/EPAParkingSpaces06.pdf>

Sample Implementation Material

Metropolitan Transportation Commission- Parking Code Guidance Appendix B Code Examples

http://www.mtc.ca.gov/planning/smart_growth/parking/6-12/Parking_Code_Guidance_June_2012.pdf

RPA - Community Design Manual

<http://www.rpa.org/sites/rpa.civicaactions.net/files/Community-Design-Manual.pdf>

Best Practice

Roll out new commuter incentives

Description: Commuter incentives can induce a modal shift from single occupancy vehicle to transit, or they can encourage more efficient usage of cars. Commuter-targeted programs can come from employers such as carpools, office van- pools, and flexible work schedules. Local governments can accommodate for car-sharing by providing spaces for car-share vehicles in municipal lots, and by actively working to recruit companies such as Zipcar. These incentives are needed to reduce fuel use and greenhouse gas emissions due to commuting.

Purpose: Encourage shifts from automobile dependence to other transportation modes.

How to get started: Start a carpooling program amongst your office or school.

Co-benefits: Lower costs of car-ownership.

Details

Initial Investment: Varies. Existing programs provide significant benefits at very low cost to the municipality.

Professional assistance required: No.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #: 3.28



Transit subsidies and other perks can encourage commuters to make use of transit connections in lieu of driving (pictured: Stamford, CT)

Source: RPA (Amanda Kennedy)

Sources

Transit Cooperative Research Program

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_108.pdf

Buffalo Car Share

<http://www.buffalocarshare.org/>

UC Davis, 2008 "Car sharing: a Guide for Local Planners"

<https://escholarship.org/uc/item/4kf3x31h#page-1>

Sustainable Cities Institute Alternative Commuting Incentives

<http://www.sustainablecitiesinstitute.org/topics/transportation/ridesharing/telecommuting/alternative-commuting-incentives>

Sample Implementation Material

Reconnecting America - Best Workplaces for Commuters

<http://reconnectingamerica.org/assets/Uploads/bestpractice090.pdf>

Best Practice

Provide biking facilities in new developments

Description: Amend the zoning ordinance to require developers to include parking for bicycles whenever they are required to provide parking for a specified number of automobiles. For example, for every five car spaces required, one bicycle space must be provided. As an extra incentive, allow developers to substitute bicycle parking for automobile parking spaces.

Purpose: By providing biking facilities, which can include showers, in new developments communities can encourage healthy and environmentally friendly alternatives to reliance on the automobile.

How to get started: Have employers survey workers for demand and preferences.

Co-benefits: Reduced area devoted to parking. Worker health and productivity.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #: 6.10



A red bike locked to a “wave” bike rack in Millennium Park, Chicago, Illinois.

Source: APA (Kelly Wilson)

Sources

City of New Haven Bike Parking

<http://www.cityofnewhaven.com/TrafficParking/BikeParking.asp>

LA, Urban Design Studio, Bikeable Design

<http://urbandesignla.com/resources/BikeableDesignToolkit.php>

LEEDUser

<http://www.leeduser.com/credit/NC-v4/LTc6>

Sample Implementation Material

Change Lab Solutions - Bike Parking

<http://changelabsolutions.org/publications/bike-parking>

1 Toronto - Guidelines for the Design and Management Of bicycle Parking Facilities

http://www1.toronto.ca/city_of_toronto/city_planning/transportation_planning/files/pdf/bicycle_parking_guidelines_final_may08.pdf

Code Publishing - On-Street Parking Design Standards

<http://www.codepublishing.com/OR/bend/html/BendDC03/BendDC0303.html#3.3.500>

Best Practice

Make biking safer

Description: Adopt zoning ordinances to promote traffic calming measures and create bike-specific infrastructure.

Purpose: Safer biking routes will encourage more people to bike, promote healthy lifestyles, and reduce greenhouse gas emissions.

How to get started: Audit biking conditions.

Co-benefits: Improved safety, public health, quality of life.

Details

Initial Investment: Low, depending on scope of capital investments.

Professional assistance required: No.

Time to Implement: Short to medium.

Time to Benefit: Medium.

CSC Reference #: 6.10



“Sharrow” street markings remind cyclists and drivers to share the road and increase visibility of cycling in a community.

Source: Meg Dalton

Sources

Federal Highway Administration

http://safety.fhwa.dot.gov/speedmgmt/traffic_calmm.cfm

Project for Public Spaces

<http://www.pps.org/reference/livememtraffic/>

City of Sunnyvale Neighborhood Traffic Calming

<http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/Transportation/SVale%20Traffic%20Calming.pdf>

Seattle.gov, Right-of-way improvements manual

http://www.seattle.gov/transportation/rowmanual/manual/6_5.asp

City of Asheville, NC, traffic calming measures

<http://www.ashevillenc.gov/Departments/Transportation/TrafficEngineering/TrafficCalming.aspx>

Sample Implementation Material

SUNY Albany Initiative for Healthy Infrastructure- Planning and Policy Models for Pedestrian and Bicycle Infrastructure in New York state

http://www.albany.edu/ihf/files/NY_Planning_And_Policy_Models_iHi.pdf

Central Savannah River Area Regional Development Center- Model Bicycle and Pedestrian Facilities Land Use Regulations

<http://www.csrardc.org/docs/planning/Transportation/Mo-delBicycleandPedestrianLandUseRegulationGuide.pdf>

Best Practice

Incorporate electric vehicle infrastructure into local planning

Description: Establish requirements for the provision of electric vehicle charging stations and/or parking benefits for electric vehicles.

Purpose: Incorporating electric vehicle infrastructure into local planning will increase consumer acceptance and usage of electric vehicles, and therefore lower the greenhouse gas emissions associated with everyday automobile travel.

Co-benefits: Improved air and water quality.

Details

Initial Investment: Low. Leverage private development.

Professional assistance required: No.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #: 6.11

Sources

Georgetown Climate Center

<http://www.georgetownclimate.org/electric-vehicle-information-for-multi-unit-housing>

US DOE Clean Cities

<http://www.sae.org/events/gim/presentations/2012/bluestein.pdf>

NCC Clean Tech

<http://nccleantech.ncsu.edu/wp-content/uploads/Electric-Vehicle-Chapter.pdf>

Georgetown Climate Policy Toolkit

<http://www.georgetownclimate.org/creating-ev-ready-towns-and-cities-a-guide-to-planning-and-policy-tools-0>

City of Atlanta EV Deployment

<http://www.rmi.org/Content/Files/Atlanta%20EV%20Readiness%20Study%20.pdf>

Sample Implementation Material

PSRC - Electric Vehicle Infrastructure - A Guide for Local Governments in Washington State

http://www.psrc.org/assets/4327/EVI_report_Introduction.pdf

Built By Michigan - Approaches to EV Infrastructure

http://www.builtbymichigan.org/sites/www.builtbymichigan.org/files/docs/Factsheet_BbM_EVApproaches.pdf

Best Practice

Adopt streetscape design guidelines

Description: Streetscape design guidelines direct the design of buildings and relationship of buildings and building entrances to the street, sidewalks, and other buildings. They also govern the design of sidewalks, including width, material, and placement of street trees, and the location and visibility of parking.

Purpose: Streetscape design guidelines promote walking and transit use.

How to get started: Conduct visual preference study.

Co-benefits: Supports economic activity in commercial districts. Health benefits from increased walking.

Details

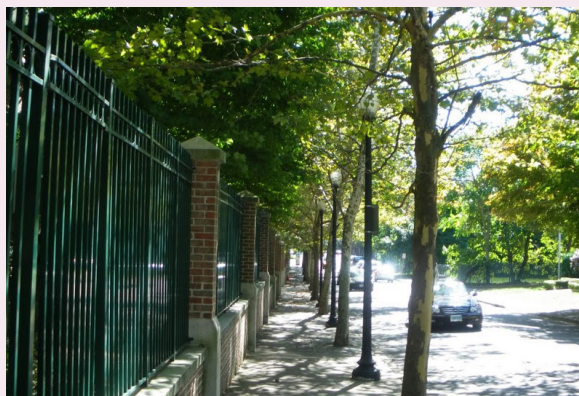
Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #: 6.10



Streetscape design guidelines can govern the placement of street trees, sidewalk widths, and material to promote walkability. (Pictured: Stamford, CT)
Source: RPA (Amanda Kennedy)

Sources

WUPCSMEE - Design Guidelines to Enhance Community Appearance and Protect Natural Resources

http://wupcenter.mtu.edu/education/land_use/design_guidelines/index.htm

U.S. Green Building Council

<http://www.usgbc.org/credits/lt8>

Sample Implementation Material

Charlotte Department of Transportation - Urban Street Design Guidelines

<http://charmeck.org/city/charlotte/Transportation/PlansProjects/Pages/Urban%20Street%20Design%20Guidelines.aspx>

City of New Haven, CT- Complete Streets Design Manual

<http://www.cityofnewhaven.com/Engineering/pdfs/CS-Manual-FINAL.pdf>

Objective

Improve the safety, integrity, and resilience of regional infrastructure for all users

A fix-it-first and preventive maintenance strategy focuses resources on existing infrastructure before building additional infrastructure, which then must also be maintained. It also anticipates the risk of damage by flooding and other storm impacts that will be increased due to climate change. Attention to existing infrastructure also means modifying existing infrastructure for broader community use, such as by adding bike lanes to existing roadways or implementing traffic calming measures within community centers. Many parts of the region's infrastructure, including transportation and utility assets, are in need of repair. Some need reconstruction to accommodate increased traffic volumes, and many need upgrades to address vulnerability to climate change events. If we do not take steps to implement strategies in this objective, there is a higher risk of service disruptions and economic costs such as those seen during Hurricane Sandy.

Best Practice

Mandate improvements in fleet vehicle fuel efficiency

Description: Municipal and other government agencies are ideal adopters of alternative fuels and high-efficiency vehicles given the large sizes of their fleets.

Purpose: Improvements in fleet vehicle efficiency increase air quality and reduce greenhouse gas emissions.

How to get started: Identify best practice standards.

Co-benefits: Improved air quality.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Medium to long depending on pace of vehicle replacement.

CSC Reference #: 3.10

Sources

Transportation.gov

<http://www.transportation.gov/mission/sustainability/corporate-average-fuel-economy-cafe-standards>

The White House

<https://www.whitehouse.gov/sites/default/files/docs/finaltrucksreport.pdf>

Sample Implementation Material

Garfield Clean Energy - Transportation

<http://www.garfieldcleanenergy.org/pdf/transportation/2010FleetsWkshp/Eagle>

Best Practice

Create coastal overlay districts

Description: Identify and prioritize significant environmental natural areas within their boundaries. Once these areas are designated, communities should consider adoptive protective ordinances which limit or regulate development in these areas.

Purpose: Coastal overlay districts protect coastal resources and environments.

How to get started: Map vulnerable areas.
Initiate community-based planning effort.

Co-benefits: Provides open space and aesthetic appeal.
Protected natural areas may increase nearby property values.

Details

Initial Investment: Low to Moderate
depending on scope and ambition.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium to long.

CSC Reference #: 6.19



Staten Island Bluebelt Stormwater Management

Source: NYCEDP Project. http://www.nyc.gov/html/dep/html/dep_projects/bluebelt.shtml

Sources

Town of Tusten Open Space and Natural Resources
http://tusten.org/Tusten_Natural_Resources.pdf

NY State Department of Environmental Conservation
http://www.dec.ny.gov/docs/remediation_hudson_pdf/hrebch.pdf

NY Gov Coastal Overlay Districts
http://docs.dos.ny.gov/communitieswaterfronts/LWRP/Lloyd%20Harbor_V/Original/LloydHarborAppA.pdf

Town of Ulysses Conservation District
<http://www.ulysses.ny.us/pdf/Zoning-Conservation-DRAFT-9-10-12.pdf>

Sample Implementation Material

Village of Mamaroneck NY - Local Waterfront Revitalization Program
http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_WebDocs/COMPLETE%20WORKING%20DRAFT.pdf

Measuring Progress

Overview

From 2000 to 2010, the Mid-Hudson region's population grew from 2,179,189 to 2,290,851, an increase of about 5.13 percent. Orange County grew at an even faster rate of approximately 9.21 percent. Urbanized areas account for 22 percent of total land area, and population density in these areas is more than triple the average density in the rest of the County. The Region benefits from an extensive mass transit infrastructure as well as the livability of its communities, though there has been a trend in recent years towards sprawl and auto-dependency.

Directing future growth towards existing urban areas and enhancing these communities' livability and connectivity is a major objective of the MHRSP that will conserve open space, give residents greater mobility, reduce auto-dependency, and promote job growth.

Table 1.1: Orange County Transit and Urbanization Baseline Data, 2010

Population, 2000	341,367
Population, 2010	372,813
County Area in Sq. Miles	839
County Area in Acres	536,960
Total Urban Area in Sq. Miles	184.65, or 22.01%
Total Urban Area in Acres	118,176
Population Per Sq. Mile	459.30
Population Density, Urban Areas	1,568

Source: 2010 U.S. Census

Table 1.2: Orange County Transportation GHG Emissions by Source (MTCO₂e), 2010

	Orange County	Region
On-Road	1,988,057	10,252,920
Air	40,044	281,235
Marine	31.074	680,978
Rail	27,437	127,831
Off-Road	117,542	834,313
Total	2,173,111	12,177,277
% of Total	17.85	100.00

Source: Mid-Hudson Regional GHG Inventory

Metric 1a: Stabilize land consumption - acres of urbanized land per capita

Significance

In 2010, urbanized land in Orange County was approximately 0.32 acres per capita, slightly higher than the Regional average of 0.31. Population density was about 459 persons per sq. mile county-wide, and 1,568 persons per sq. mile in urban areas (U.S. Census). As the population grows, the County should attempt to limit the extent of new urban development and direct new growth to existing centers and downtowns which have planned and prepared for development.

Stabilizing land consumption and directing new development towards existing sites rather than greenfields, a practice known as Land Efficient Development (LED), discourages sprawl, conserves open space, and maintains the integrity of an area's existing ecosystems and resources. It maintains surface permeability for groundwater replenishment and reduces storm water runoff, as well as mitigates the Urban Heat Island effect (UHI), among other benefits. LED promotes infill and redevelopment, brown-field remediation and revitalization, commercial corridor redevelopment of Main Streets to encourage job growth and economic development, as well as rehabilitation and re-purposing of historic buildings.

How to Measure

The MHRSP defines 'urbanized land' as having a population density of at least 500 persons/sq. mile, and recommends the formula (Total Acreage of Urban Development) / (Total Population) for calculating the metric. Urbanized land is measured by the U.S. Census Bureau every ten years at the State and County level in square meters (with 2,589,988.11 square meters in a square mile, and 640 acres in every square mile). Both urbanization and population data, as well as urban density, is available from the U.S. Census at the County level.

Target Identification

Measuring urbanized land per capita requires an understanding of future population growth as well as current and projected development. The following steps can be taken by the County or Municipality to project and measure land consumption:

- Utilize Census data, Cornell Program on Applied Demographics (PAD), or NYMTC Socioeconomic and Demographic (SED) Forecasting products to project future population growth (accessed at <https://pad.human.cornell.edu/index.cfm> and http://www.nymtc.org/project/forecasting/sed_products.html). An area's Percent Growth Rate can be calculated with the formula:

$$\% \text{ Growth Rate} = ((\text{Present Population} - \text{Past Population}) / (\text{Past Population})) \times 100$$

- Given the population forecasts, develop target goals for 2020, 2035, and 2050 (as an example, target goals for the Mid-Hudson region are 0.30, 0.25, and 0.20 acres per capita).
- Propose and implement strategies for meeting the target goals.
- At each target year, measure actual urbanization per capita utilizing Census urbanization and population data. Convert sq. miles to acres (sq. mileage x 640) and divide urban acreage by population.

Metric 1b: Direct growth to centers supported by transit - percent of population and jobs in centers supported by transit

Significance

Transit-Oriented Development (TOD) seeks to “provide mixed-use development that is close to and well-served by transit, and furthermore, is conducive to transit riding.”¹ Centers identified for potential smart growth and TOD in Orange County by the MHRSP are Middletown, Monroe, New Windsor, Newburgh, Port Jervis, and Harriman.

Encouraging the densification of urban areas by creating compact, mixed-use neighborhoods serviced by reliable public transit is a crucial policy in the pursuit of urban sustainability. TOD reduces the need for personal vehicle use, cutting vehicle miles traveled (VMT) and related emissions²; discourages urban sprawl by concentrating residential, commercial, office, and public land use in one compact area; creates “complete,” livable communities with easily accessible services and amenities; and produces health benefits by reducing air pollution, encouraging walking, and minimizing traffic-related accidents.³

How to Measure

‘Centers’ as defined by the Plan 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.” They meet the following the criteria:

Road Connectivity > 20 inter-sections/sq. mile	Area must be < 5 miles from a train station
Area must have > 1 bus stop/sq. mile	Transit Score > 1
Walkability Score > 0.3	

Transit Score is an indicator developed by NJ Transit and Delaware Valley Planning Commission⁴, and is calculated as follows:

$(\text{Population/acre}) + (\text{Jobs/acre}) + (\text{Zero Car Households/acre}) = \text{Transit Score}$. Scores are graded as Low (<0.6), Marginal (0.6 - 0.9), Medium (1 - 2.4), Medium-High (2.5 - 7.5), and High (>7.5). Population data is available from the U.S. Census, Cornell PAD, and NYMTC SED; road data from the U.S. Census TIGER; transit data from RPA and MTA; and jobs data from the U.S. Census Transportation Planning Package.

Target Identification

- Within the County or Municipality, identify all Centers for growth using the Plan’s criteria.⁵
 - Calculate the number of people and jobs living within Centers, using data from the U.S. Census and Census Transportation Planning Package at the tract level (for rural municipalities, a smaller area of measurement might be used, such as city blocks. This data should be obtained from local planning councils). Then calculate percentage of population and jobs within these Centers.
- Percent Population or Jobs in Centers** = $((\text{Total Pop. or Total Jobs in Centers}) / (\text{Total Pop. or Total Jobs in County or Municipality})) \times 100$
- Develop job and population target goals for each Center (percentages) for 2020, 2035, and 2050 (for example, the MHRSP sets population goals at 52%, 56%, and 60%).
 - Propose and implement strategies for meeting the target goals.
 - At each target year, consult Census data at the tract level (or other agreed upon area of measurement) for each Center to assess job and population growth against municipal totals.

Case Study: Harriman/Woodbury Commons TOD

Local examples of TOD include the New Rochelle Transit Center TOD Zone, the Downtown Harrison TOD, and the Harriman/Woodbury Commons TOD, discussed in detail in the Mid-Hudson Regional Sustainability Plan. At 130 acres, Orange County’s Harriman TOD plan is the largest in New York State and when completed will provide residential, retail, office, hotel, and entertainment space all within easy access of the Metro North Railroad and the NY Thruway.

1 Jacobson, Justin and A. Forsyth. “Seven American TODs: Good practices for urban design in Transit-Oriented Development projects.” *Journal of Transport and Land Use*, 1:2 (Fall 2008), p. 52.

2 Holtzclaw, John W. “Smart Growth: As Seen from the Air. Convenient Neighborhood, Skip the Car.” Presented at the Air & Waste Management Association’s 93rd Annual Meeting & Exhibition (June 23, 2000), Salt Lake City, UT.

3 Noland, Robert B., K. Ozbay, S. Dipetrillo, and S. Iyer. “Measuring Benefits of Transit Oriented Development.” *Mineta National Transit Research Consortium*, Report 12-18 (October 2014), p. 16-19.

4 Transit Score: New Jersey’s Unique Planning Tool. NJ Transit (March 2011), p. 2. (Accessed at <http://www.nj.gov/state/planning/docs/2011-0413-njt-transit-score-guide.pdf>)

5 Other TOD rating systems, such as the STAR Community Rating System (www.STARcommunities.org), are also potential templates.

Secondary Indicators

This Toolkit only discusses two primary indicators per sector; should the County or municipality decide to measure further progress within each sector, however, additional secondary indicators and their metrics are included in the Measuring Templates for reference. These are discussed in greater detail in the Mid-Hudson Regional Sustainability Plan.

Secondary indicators for the Land Use, Livable Communities, & Transportation sector are Reduce Vehicle Travel, Reduce Transportation Fuel Use, and Percentage of People Living within One Mile of at least Six Basic Services. Noted difficulties in measuring these indicators are discussed on page 4-27 of the Plan, while calculations and data sources can be found in Appendix B, Table B.1.

Measuring Template

Table 1.3 Orange County Template for Land Use, Livable Communities, & Transportation Measurement

	Indicator	Metric	Current Value	Target		
				2020	2035	2050
Primary	Stabilize Land Consumption	Acres of Urbanized Land Per Capita	0.32			
	Direct Growth to Centers Supported by Transit	% of Population				
		Jobs				
Secondary	Reduce Vehicle Travel	Annual VMT				
	Reduce Transportation Fuel Use	Transportation Fuel Use (MMBtu) Per Capita				
	% of People Living Within One Mile of at least Six Basic Services					

Energy

A sustainable energy system is about reducing risk, controlling costs, and investing in the local and 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. The Mid-Hudson region’s geography—connecting Long Island and New York City with the rest of New York State—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 New York City. 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.

The New York State 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.”

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. Furthermore, a key EJ concern is addressed in promoting energy efficien-

cy that can help reduce the need for heating and fueling as well as fuel use for transportation, which can lighten the burden on low-income and vulnerable communities. This will bring economic development and new jobs, technological innovation, energy security, and cleaner air and water.

Objectives

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

Reduce the energy use and negative environmental impacts of public infrastructures

Self-Assessment

Downtowns	Edges	Corridors	Crossroads	New Neighborhoods	Rural	Strategy	In Place	In Progress	For Future Action
						Become radically less energy and fossil fuel intensive while strengthening the regional economy			
●	●	●	●	●	●	Strengthen codes and ordinances to require more energy-efficient building construction	■	■	■
●	●	●	●	●	●	Capitalize on the diverse array of well-established renewable energy sources, including wind, solar, geothermal, hydro, biomass, and the potential for tidal	■	■	■
●	●	○	○	○	○	Facilitate energy assessments on all buildings	■	■	■
●	●	●	●	●	●	Support on-site renewable energy	■	■	■
						Expand renewable generation exponentially as an energy source across the region			
●	○	○	○	○	○	Expand distributed generation through implementation of Community Choice Aggregation (CCA)	■	■	■
●	●	●	●	●	●	Develop innovative project financing and policy models	■	■	■
						Improve the resilience of the energy delivery system throughout the region			
●	●	●	●	●	●	Increase demand response participation to reduce electricity consumption by joining the New York Battery and Energy Storage Technology Collaborative	■	■	■
●	●	●	●	●	●	Develop energy storage capacity	■	■	■
●	●	○	○	●	○	Develop community energy districts to help manage energy supply, distribution, and use at a more local scale	■	■	■
						Reduce the energy use and negative environmental impacts of public infrastructures			
●	●	○	○	○	○	Mitigate urban heat island effect	■	■	■
●	●	○	○	○	○	Orient and design buildings to optimize passive and active solar systems	■	■	■
●	●	●	●	●	●	Utilize cool and permeable paving materials	■	■	■
●	●	●	●	●	●	Develop an extreme heat event emergency plan	■	■	■
●	●	●	●	●	●	Promote cool roofs to reduce urban heat island effect	■	■	■
●	●	○	○	○	○	Design tree-lined and shaded streetscapes	■	■	■
○	○	○	●	●	●	Design shielded lighting to minimize light pollution	■	■	■

- Very applicable
- Applicable
- Not applicable

Objective

Become radically less energy and fossil fuel intensive while strengthening the regional economy

The annual net energy consumption for the Mid-Hudson region is 360 British thermal units (BTUs). The annual cost of this energy use is \$7.26 billion. Over 70 percent of this energy is produced by burning fossil fuels (petroleum products, natural gas, and coal). This heavy dependence on fossil fuels has negative consequences for the regional economy and environment. One of the goals of reducing the energy and fossil fuel dependence of the Mid-Hudson region is to reduce the amount of energy needed to produce each dollar of regional economic product. Operating costs for local businesses are often directly dependent on energy costs. Lowering the amount of energy needed would therefore lower operating costs. Freeing up money previously allocated for energy expenses allows more capital for development and innovation, which will stimulate the local economy.

This objective also encourages stricter energy performance standards for new construction. The majority of houses and businesses in the Mid-Hudson region heat and cool with fossil fuels. Creating alternative options for heating and cooling energy (such as passive solar heating), will reduce energy intensity, GHG emissions, and lower energy costs for businesses and individuals.

Best Practice

Strengthen codes and ordinances to require more energy-efficient building construction

Description: Require all public and publicly-funded facilities and projects to incorporate sustainable building practices into their design, construction, renovation, and operation. New construction or renovation of public buildings such as government offices, courthouses, libraries, schools, and community centers should be required to include sustainable building features such as energy efficiency measures, use of low volatile organic compound (VOC) and local materials, natural daylighting, and careful construction planning, including protection of trees. Consider using LEED, Net Zero, Passive House, or Energy Star rating systems as design and measurement tools, or as standards to which buildings must be built.

Purpose: Reduce energy use and provide consumer base for expanding green industries.

How to get started: Identify relevant best practices and adopt the 2016 NYS energy conservation code. Sustainable Operations for Safety (SOS) encourages first responders to install enough solar or other renewables with storage to ensure they can operate during prolonged outages or disasters. This is related to both resilience and municipal infrastructure.

Co-benefits: Increased productivity of building occupants due to healthier work places. Lower energy costs.

Details

Initial Investment: Low.

Professional assistance required: Helpful but not necessary.

Time to Implement: Short.

Time to Benefit: Long.

CSC Reference #: 3.7

Sources

<http://new.usgbc.org/leed/rating-systems>
<http://www.nassaucountyny.gov/agencies/Legis/LD/07/NewsRelease/2007/072607greenbuildingsJT.html>
http://www.epa.gov/statelocalclimate/documents/pdf/ee_municipal_operations.pdf
<http://ecode360.com/9594797>
<https://www.usgbc.org/ShowFile.aspx?DocumentID=4041>
 Zero Energy Buildings
<http://www.nrel.gov/docs/fy06osti/39833.pdf>
 Passive House
<http://nypassivehouse.org/resources/>

Best Practice

Capitalize on the diverse array of well-established renewable energy sources, including wind, solar, geothermal, hydro, biomass, and the potential for tidal

Description: One of the goals of reducing the energy and fossil fuel dependence of the MHRSP is to reduce the amount of energy needed to produce each dollar of regional economic product. Operating costs for local businesses are often directly dependent on energy costs. Lowering the amount of energy needed would in turn lower operating costs.

Purpose: Renewable energy offers New Yorkers a cheap and green alternative to carbon emitting energy sources. The Mid-Hudson region has a potential capacity of 3,000 MW from rooftop photovoltaic alone.

How to get started: Identify which technologies are feasible locally.

Co-benefits: Local economic development.

Details

Initial Investment: Moderate.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Long.

CSC Reference #: 6.3

Best Practice

Facilitate energy assessments on all buildings

Description: Energy audits analyze the energy flow in a building and identify opportunities for greater efficiency.

Purpose: Energy audits can identify minor improvements with fast returns on investments as well as strategies for more aggressive interventions.

How to get started: Identify utility supplier or vendor that can conduct energy audits.

Co-benefits: Reduce imports of oil.

Details

Initial Investment: Varies.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #: 3.1

Sources

Energy Audit Institute

<http://energyauditinstitute.com/energy-audits.html>

Energy.gov - Home Energy Audits

<http://www.energy.gov/public-services/homes/home-weatherization/home-energy-audits>

Best Practice

Support on-site renewable energy

Description: Provide tax incentives to encourage individuals and businesses to support on-site renewable energy.

Purpose: Renewable energy offers New Yorkers a cheap and green alternative to carbon emitting energy sources. The Mid-Hudson region has a potential capacity of 3,000 MW from rooftop photovoltaic alone.

How to get started: Local governments that want to support on-site renewable energy should first evaluate the local energy generation capacity to determine that type of renewable energy that will be most effective in their community.

Co-benefits: Reduced carbon emissions and lower energy costs.

Details

Initial Investment: Moderate.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #: 4.1 - .9



Installing solar panels on residential and commercial buildings is a cost-effective and eco-friendly way to consume energy
Source: RPA

Sources

On-site Renewable Energy

<http://apps3.eere.energy.gov/greenpower/onsite/index.shtml>

US Department of Environmental Protection State and Local Climate Energy Program: On-Site Renewable Energy Generation

<http://www.epa.gov/statelocalclimate/documents/pdf/OnSiteRenewables508.pdf>

New York Renewable Portfolio Standard

<http://www.nyserda.ny.gov/About/Renewable-Portfolio-Standard>

Appalachian State University Center: Affordable Passive Solar Handbook for North Carolina

<http://www.nrel.gov/docs/fy12osti/51946.pdf>

Sample Implementation Material

New York State Department of Taxation and Finance-Assessor's Exemptions re renewable energy systems

http://www.tax.ny.gov/research/property/assess/manuals/vol4/pt1/sec4_01/sec487.htm

State of Massachusetts- Model Zoning for the Regulation of Solar Energy Systems

<http://www.mass.gov/eea/docs/doer/green-communities/grant-program/model-solar-zoning.pdf>

Objective

Expand renewable generation exponentially as an energy source across the region

The region already has a network of well-established renewable energy sources, including wind, solar, geothermal, hydro- and biomass. The full capacity of existing energy generators in the Mid-Hudson region is approximately 5.61 Gigawatts (GW). On top of these previously established renewable energy sources, the region also has the potential to construct a tidal energy source, and the National Renewable Energy Laboratory estimates that region's potential capacity from rooftop photovoltaic (PV) solar panels alone exceeds 3GW.

The majority of energy used in the Mid-Hudson region comes from burning imported fossil fuels. Building up the local renewable energy industry would reduce the large amount of energy-related money exported out of the region. In addition to strengthening the regional economy, a shift from imported fossil fuels to local renewable energy would also reduce air pollution and other negative environmental issues that result from burning fossil fuels. Cleaner renewable technologies have clear and tangible benefits for the Mid-Hudson region both financially and environmentally.

Best Practice

Expand distributed generation through implementation of NYS Community Choice Aggregation (CCA)

Description: Distributed generation refers to power that is generated locally and then distributed to local users and/or stored for later use. As a means to reduce electricity costs and harness more power locally, communities in states such as Massachusetts, California, Illinois and others have adopted CCA -- a state policy in which both residents and small businesses pool their energy buying to secure lower rates. In February 2015, New York State Public Services Commission granted a petition from Sustainable Westchester to aggregate their energy purchases, subsequently approving a CCA pilot program. Currently towns and cities in Westchester County, as well as those on Long Island, can form a municipally endorsed energy-savings program for natural gas and electricity.

Purpose: Distributed generation eliminates the cost and complexity associated with transmission and distribution over long distances and shifts control of energy production to the consumer.

How to get started: Research the feasibility of local distributed generation. Investigate Sustainable Westchester, Citizens for Local Power, and other entities active in the CCA movement.

Co-benefits: Building design and site decisions can maximize the potential to produce on-site solar energy.

Details

Initial Investment: Low. Guidelines may need to be prepared and adopted as part of municipal zoning.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:

Sources

The Potential Benefits of Distributed Generation and Rate-Related Issues That May Impede Their Expansion

<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=OCCMQFjAAahUKEw-j6pMKa1pLHAhWCkx4KHx4DAno&url=https%3A%2F%2Fwww.ferc.gov%2Flegal%2Ffed-sta%2Fexp-study.pdf&ei=iWPCVbq8HYK-nev6GiNAH&usg=AFQjCNHqi6cQF4OKHJJxME5UjRGJ7QCqw&sig2=DL-NdmaJzM627nw5Jldytiw&bvm=bv.99556055,d.dmo>

Virginia Tech - Introduction to Distributed Generation

<http://www.dg.history.vt.edu/ch1/introduction.html>

Sustainable Westchester CCA Guidelines

<http://sustainablewestchester.org/community-toolkits/cca>

Citizens for Local Power (Ulster County)

<http://www.citizensforlocalpower.com/community-choice--cca-.html>

Community Choice Aggregation Overview

http://apps3.eere.energy.gov/greenpower/markets/community_choice.shtml

Best Practice

Develop innovative project financing and policy models

Description: Technological innovation and the increasing competitiveness from renewable energy resources-- combined with aging infrastructure, extreme weather events, and system security and resiliency needs-- are all leading to significant changes in how electricity is generated, distributed, managed and consumed.

Purpose: Innovative production, financing and policy models can promote clean energy generation and greater energy efficiency.

How to get started: Review materials and recommendations developed by the New York Reforming the Energy Vision (REV) Market Design and Platform Technology Group; leverage Property Assessed Clean Energy (PACE) financing and NY Green Bank options; encourage Community Solar or Community Renewables, where individuals may achieve scalability by pooling resources to develop larger solar or other renewable systems.

Co-benefits: Local economic development.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #: 8.12

Sources

New York State- Reforming the Energy Vision
<http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2E-FA3A23551585257DEA007DCFE2?OpenDocument>

PACE financing
<http://www.pacenation.us/about-pace/>

NY Green Bank
<http://greenbank.ny.gov/>

Objective

Improve the resilience of the energy delivery system throughout the region

An energy system is only as strong as its weakest link. Experts predict that climate change will increase the prevalence of extreme weather events (wind, storms, heat and flooding). These extreme weather events pose several threats to the regional energy system. Wind and storms can bring down power lines, extreme heat can cause transformers to fail, and flooding threatens the several generation and storage facilities along the Hudson River. The consequence of these extreme weather events were on full display during Hurricane Irene and Superstorm Sandy. If the Mid-Hudson region's energy system is to survive and thrive in the face of a changing climate, it needs to become more resilient.

The first step in increasing the system's resilience is reducing the risk of interruption in energy delivery. This step can be accomplished a number of ways, such as burying utility lines in denser communities or rating transformers for increases in temperature. Businesses will be more likely to invest in the region if they are confident that there is a reliable source of energy. Next, communities should rely on life-cycle cost analysis (LCCA) when determining the most cost effective infrastructure developments. A LCCA takes into account all the future costs of the development, so the most efficient option over the long run is selected, instead of just the cheapest option at the moment. Developing community energy districts (CEDs) will help manage the supply and distribution of energy at a local level. CEDs will support energy efficiency and diversity, while also providing demand response capacity and energy storage. These four factors combine to create a more reliable and resilient energy system, which again makes the region more attractive to businesses. Lastly, the MHRSP should not look to only improve the local energy system, but should also strive to be a leader in technology development and service business models. Increased local expertise will reduce the risk of energy interruptions and further outside business investments in the region.

Best Practice

Increase demand response participation

Description: Utilities operate load management and demand response programs to reduce peak utility demand by offering financial incentives for electricity users to voluntarily reduce consumption during specified high-demand periods. Typically, utilities provide consumers with day-ahead advisories and 2-hour advance notice. Consumers who reduce their electricity use during these periods are eligible for rebates or other incentive payments. Utilize existing incentive programs such as the Emergency Demand Response Program, the Day Ahead Demand Response Program, and the Installed Capacity Special Case Resources program.

Purpose: Demand response programs maintain system reliability and prevent blackouts and brownouts. In addition demand response programs can provide price mitigation and ancillary services to utilities and grid operators.

How to get started: Meet with local energy providers and state energy officials to coordinate the direction of CCA activity in order to best serve burdened populations. Larger consumers should hire a curtailment service provider (CSP) to maximize response availability.

Co-benefits: Relieve pressure on electrical grid.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #:

Sources

conEdison - Demand Response - Get Paid to Use Less Energy
http://www.coned.com/energyefficiency/demand_response.asp

NYSERDA - Demand Response Incentives for Existing Facilities Program
<http://www.nysenda.ny.gov/All-Programs/Programs/Existing-Facilities-Program/Demand-Response-Incentives>

Best Practice

Increase demand response participation to reduce electricity consumption by joining the New York Battery and Energy Storage Technology Collaborative

Description: Demand response (DR) programs pay customers to temporarily reduce electricity consumption in response to supply conditions. Developing local DR resources will create jobs and strengthen businesses throughout the Region, encourage the development of upstate wind energy, reduce regional and state-wide environmental impact, reduce the need for imported fossil fuel, and ensure that the Region and NYS are in the vanguard for clean technology.

Purpose: Reduce the need for additional power plants to satisfy peak loads. In addition, DR programs can provide price mitigation and ancillary services to utilities and grid operators.

How to get started: To implement this strategy, local governments should join the New York Battery and Energy Storage Technology Collaborative.

Co-benefits: Produces more reliable infrastructure than its current centralized state.

Details

Initial Investment: Moderate.

Professional assistance required: No.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:

Sources

NY-BEST

<http://ny-best.org/>

New York Battery and Energy Storage Technology (NY-BEST) Consortium

<http://www.nyserda.ny.gov/Cleantech-and-Innovation/Energy-Storage/NY-BEST>

Federal Energy Regulatory Commission - National Demand Response Potential Model Guide

<https://www.ferc.gov/industries/electric/indus-act/demand-response/NADR-guide.pdf>

Sample Implementation Material

Newburgh: Central Hudson Electric began a demand response program in July 2015.

http://www.centralhudson.com/News/News/July1_2015.html

Town and Village of Warwick: See Demand Response program info at

<http://www.oru.com/programsandservices/incentivesandrebates/greenteam/businessprograms/demandresponseprograms.html>

Best Practice

Develop energy storage capacity

Description: Energy storage includes a diverse set of technologies divided into those that store energy for use as electricity or for thermal capacity.

Purpose: Energy storage amplifies the value of both traditional generation and newer, distributed, renewal generation, while enhancing grid reliability as well.

How to get started: To implement the strategy, local governments should first commission a study on current energy storage capacity and open lines of communication with local energy producers.

Co-benefits: Choice of fuel source, recovery of waste energy.

Details

Initial Investment: Moderate.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:

Sources

New York State Energy Research and Development Authority-NYSERDA Announces Partnerships With Nine NY-BEST Members to Promote Energy Storage Innovation in New York State <http://www.nyserda.ny.gov/About/Newsroom/2014-Announcements/2014-10-27-NYSERDA-Announces-Partnerships-with-Nine-NY-Best-Members-to-Promote-Energy-Storage>
<http://www.nyiso.com>

Energy Storage, PSD3: New York State Climate Action Council Interim Report, 2010

http://www.dec.ny.gov/docs/administration_pdf/irchap8.pdf
<http://hudsonvalleyregionalcouncil.org/mid-hudson-regional-sustainability-plan/>

Best Practice

Develop community energy districts (CEDs) to help manage energy supply, distribution, and use at a more local scale

Description: CEDs share a source of renewable energy among multiple buildings, increasing 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. Micro-grids are the central feature of a CED, integrating energy efficiency, cogeneration, solar photovoltaic, wind, and other types of renewables, as well as localized smartgrid and demand response applications. Distributed Energy Resources (DERs) connect with demand response and community energy districts, a key focus of the Reinventing the energy Vision (REV) process.

Purpose: CEDs increase the energy resilience of a community. If the grid goes down, buildings within the CED can continue to operate.

How to get started: To implement this strategy, local governments should consider the objectives of creating a CED and convene a group of local energy producers and community members.

Co-benefits: Lower energy costs.

Details

Initial Investment: Must conduct audit and benchmarking before setting goals.

Professional assistance required: Yes.

Time to Implement: Long.

Time to Benefit: Long.

CSC Reference #:

Sources

National Energy Center for Sustainable Communities-Community-District Energy Systems
http://www.necsc.us/docs/Community_District_Energy_Systems.pdf

US EPA- District-Scale Energy Planning (San Francisco)
http://www2.epa.gov/sites/production/files/2015-06/documents/sf_district_energy_planning.pdf

Sample Implementation Material

City of Stamford, CT Energy Improvement District Ordinance:
http://www.boardofreps.org/Data/Sites/43/userfiles/committees/legrules/items/2015/lr29039/lr29039_o1185_150406.pdf

Best Practice

Adopt the energy conservation code

Description: Adoption of the 2016 statewide energy code update will promote the use of light colored and reflective pavement and roofing materials.

Purpose: Reduce energy use and provide consumer base for expanding green industries.

How to get started: Adopt model regulations and standards; connect with NYSERDA and local utility taking applications for CDG projects.

Co-benefits: Improved health.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Medium. Depends on pace of development.

CSC Reference #:

Sources

US EPA- EPA Clean Energy Guide to Action:
 Building Codes for Energy Efficiency
http://www.epa.gov/statelocalclimate/documents/pdf/guide_action_chap4_s3.pdf

City of New York, NY: 2014 NYC Energy Conservation Code
http://www.nyc.gov/html/dob/html/codes_and_reference_materials/nycecc_about.shtml

State of New York: State Energy Conservation and Construction Code
https://www.dos.ny.gov/dcea/energycode_code.html

City of New York- Greener Greater Buildings Plan
<http://www.nyc.gov/html/gbee/html/plan/plan.shtml>

NYSERDA Energy code
<http://www.nyserderda.ny.gov/All-Programs/Programs/Energy-Code-Training>

Sample Implementation Material

Town of Babylon, NY- Green Building Certification (all buildings except single-family homes)
<http://ecode360.com/6806036>

Village of East Aurora, NY- Green Building Standards (public buildings)
<http://ecode360.com/9594862>

Objective

Reduce energy use and negative environmental impacts of public infrastructures

All public and publicly-funded facilities and projects should incorporate sustainable building practices into their design, construction, renovation, and operation. New construction or renovation of public buildings such as government offices, courthouses, libraries, schools, and community centers can adopt energy efficiency measures, use of low-VOC materials, local materials, natural daylighting, and careful construction planning including protection of trees. LEED, Net Zero, Passive House, or Energy Star rating systems can provide standards for construction and operation.

Best Practice

Mitigate urban heat island effect

Description: Urban heat islands are urbanized areas that are warmer than surrounding areas due to the heat created by humans, cars, and energy that is absorbed by paved surfaces.

Purpose: Reducing the urban heat island effect improves the comfort of residents, reduces costs and energy for air-conditioning, and lessens the risks of extreme heat events.

How to get started: Draft a plan to take action to reduce urban heat islands.

Co-benefits: Trees, common tools in the reduction of the urban heat island effect, are associated with higher real estate values and make neighborhoods appear more desirable.

Details

Initial Investment: Moderate.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Long.

CSC Reference #: 7.4, 7.8

Sources

Keeping Baltimore Neighborhoods Cool

<http://adaptationstories.com/2013/06/24/keeping-baltimore-neighborhoods-cool/>

<http://www.epa.gov/heatislands/resources/pdf/TreesandVegCompendium.pdf>

City of Miami Heat Island Effect Ordinance

<http://egov.ci.miami.fl.us/Legistarweb/Attachments/53610.pdf>

Best Practice

Orient and design buildings to optimize passive and active solar systems

Description: Include provisions in the building code that facilitate the installation of photovoltaic systems. Municipalities can require that all new residential units be pre-wired and pre-piped with electrical conduit and plumbing that would allow for future installation of photovoltaics.

Purpose: These changes reduce the post-construction cost of installing renewable energy systems, make future conversions to green energy sources more feasible, and reduce heating costs for new constructions.

How to get started: Adopt site design guidelines for solar orientation. Could increase building costs.

Co-benefits: Increase value of housing.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short to medium.

CSC Reference #: 4.2

*Sources***Solar Ready Homes**

<http://www.planning.org/pas/infopackets/open/pdf/30part5.pdf>

DSIRE

<http://programs.dsireusa.org/system/program?state=NY>

NYSERDA Programs & Services

<http://www.nyserra.ny.gov/renewable>

<http://energy.appstate.edu/sites/energy.appstate.edu/files/APSplanbook.pdf>

*Sample Implementation Material***Rocky Mountain Land Use Institute**

<http://www.law.du.edu/images/uploads/rmlui/rmlui-sustainable-siteDesignStrategiesSolarAccess.pdf>

Best Practice

Utilize cool and permeable paving materials

Description: Cool/permeable pavement materials reflect a large percentage of solar energy or enhance water evaporation, helping to mitigate the urban heat island effect.

Purpose: Permeable surfaces allow stormwater to soak into the soil and are also typically 'cooler.' Lighter colored materials are generally cooler than darker materials because they are more reflective. Cooler paving materials result in cooler air temperatures, which reduce summer energy demand and slow the rate of ground-level ozone formation.

How to get started: Adopt green infrastructure guidelines.

Co-benefits: Improvements in stormwater control and quality.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short to medium depending on pace of development.

Time to Benefit: Short.

CSC Reference #: 6.8



Permeable landscaping pavers promote natural drainage of stormwater

Source: RPA

*Sources***CalEPA - "Urban Heat Island Effect"**

http://www.leginfo.ca.gov/pub/11-12/bill/asm/ab_0251-0300/ab_296_cfa_20120829_225952_asm_floor.html

Town of Gilbert - Urban Heat Island

<http://www.gilbertaz.gov/departments/development-services/planning-development/urban-heat-island>

*Sample Implementation Material***NYC Gov - Stormwater**

<http://www.nyc.gov/html/gbee/downloads/pdf/stormwater.pdf>

US EPA - Reducing Heat Islands Compendium of Strategies- Cool Pavements

<http://www.epa.gov/heatisland/resources/pdf/CoolPavesCompendium.pdf>

Best Practice

Develop an extreme heat event emergency plan

Description: A municipal preparedness plan includes notifying the public of potential risks, provides cooling centers and access to healthcare, and ensures that the most vulnerable residents have access to resources.

Purpose: An emergency plan can help to reduce the risk of deaths from extreme heat.

How to get started: Identify model plans from comparable communities.

Co-benefits: Increased equity for at-risk populations.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: 7.7

Sources

Excessive Heat Events Guidebook

http://www.epa.gov/heatisland/about/pdf/EHEguide_final.pdf

Sample Implementation Material

City of Philadelphia, Excessive Heat Plan

<http://oem.readyphiladelphia.org/HeatPlan>

Kings County - Extreme Heat Emergency Plan

<http://www.countyofkings.com/home/showdocument?id=896>

County of Fresno - Heat Emergency Contingency Plan

http://www.co.fresno.ca.us/uploadedFiles/Departments/Public_Health/Divisions/PPC/content/Articles/content/Heat_Health_and_Safety/Heat%20Plan%20Final%202012.pdf

Best Practice

Design tree-lined and shaded streetscapes**Description:**

Purpose: Tree-lined and shaded streetscapes encourage walking and bicycling and discourage speeding, reduce urban heat island effects, improve air quality, increase evapotranspiration, and reduce cooling loads in buildings.

How to get started: Adopt “green street” design guidelines.

Co-benefits: Increased health through walking.

Details

Initial Investment: Low where private development can be leveraged. High where new public infrastructure is required.

Professional assistance required: No.

Time to Implement: Medium to long.

Time to Benefit: Medium to long.

CSC Reference #: 6.18



Tree-lined streets encourage walking and bicycling, discourage speeding, reduce the urban heat island effect, improve air quality, increase evapotranspiration and reduce cooling loads in buildings

Source: RPA

Sources

EPA - Trees and Vegetation

<http://www.epa.gov/heatisland/mitigation/trees.htm>

Sample Implementation Material

RPA - Community Design Manual

<http://www.rpa.org/sites/rpa.civicaactions.net/files/Community-Design-Manual.pdf>

Best Practice

Design shielded lighting to minimize light pollution

Description: Light pollution is excessive, misdirected, or obtrusive artificial light.

Purpose: Light pollution has several consequences: it washes out starlight in the sky, interferes with astronomical research, disrupts ecosystems, has adverse health effects and wastes energy.

How to get started: Adopt “dark skies” ordinance.

Co-benefits: Avian habitat protection. Neighborhood quality of life.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #:



A streetlight with wooden pole and shielded fixture in Claremont, California

Source: APA (James Van Hemert)

Sources

New Hampshire Department of Environmental Sciences - Preserving Dark Skies

http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_chpt_3.4.pdf

Limiting the impact of light pollution on human health, environment and stellar visibility

<http://www.sciencedirect.com/science/article/pii/S030147971100226X>

SHWEC - The Wisconsin Model Exterior Lighting Ordinance

<http://www4.uwm.edu/shwec/publications/cabinet/p2/WI%20Model%20Ext%20Lighting%20Ordinance-%200812.pdf>

Sample Implementation Material

New York State Assembly, Healthy, Safe, and Efficient Outdoor Lighting Act.

http://assembly.state.ny.us/leg/?default_fld=&bn=A00751&term=2013&Summary=Y&Actions=Y&Text=Y&Votes=Y

Town of Warwick, NY: § 164-43.4 Lighting

<http://ecode360.com/11977661>

Best Practice

Promote cool roofs to reduce urban heat island effect

Description: 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.

Purpose: By adding green roofs or using light-colored roof coatings, buildings can help mitigate the urban heat island effect while also reducing cooling loads.

How to get started: Adopt performance standards for roof construction.

Co-benefits: Increased equity for at-risk populations.

Details

Initial Investment: Will depend on local conditions.

Professional assistance required: No.

Time to Implement: Short to medium depending on pace of development.

Time to Benefit: Medium to long.

CSC Reference #:

Sources

NYC Cool Roofs

<http://www.nyc.gov/html/coolroofs/html/home/home.shtml>

Sample Implementation Material

City of Los Angeles, CA- Municipal Code

<http://www.coolrooftoolkit.org/wp-content/uploads/2014/03/2014LAamendmentforGreen-BuildingCode-CR-EXCERPT.pdf>

Measuring Progress

Overview

The Mid-Hudson region contains a range of energy generating facilities, including nuclear and hydroelectric considerable potential for renewables. Nevertheless, the area remains a net energy importer, spending about \$4,303,447,137 for out-of-state energy in 2010. Orange County spent \$770,790,850 that year, or about \$2,010 per capita.¹ A majority of households in the County and throughout the Region rely on fuel oil, kerosene, or natural gas, the GHG emissions from which contribute considerably to climate change.

The proposals outlined in the MHRSP have the potential to benefit both the environment and the economy. Modest energy upgrades could save Orange County nearly \$19 million annually², while the expansion of renewable energy generation such as wind, solar, biomass, and tidal would create jobs, improve regional energy security, and mitigate GHG emissions.

Table 2.1 Orange County Net Energy Consumption (MMBtu) by Sector, 2010

	Orange Co.	Region
Residential Fuel	14,982,928	90,691,653
Commercial Fuel	12,066,659	65,330,331
Industrial Fuel	2,720,296	25,389,466
Transportation Fuel	32,530,175	178,789,925
Total MMBtu	62,300,059	360,201,375
MMBtu per capita	162.44	157.31

Source: Mid-Hudson Regional GHG Inventory

Table 2.2 Orange County Stationary Fuel Consumption GHG Emissions (MTCO₂e), 2010

	*Scope 1 (direct)	**Scope 2 (indirect)
Residential	580,673	257,956
Commercial	532,981	1,838,920
Industrial	152,457	444,244
Total	1,266,111	4,109,338

Source: Mid-Hudson Regional GHG Inventory

*Scope 1 = direct emissions from the combustion of natural gas, coal, kerosene, distillate, motor gasoline, and other fuels. **Scope 2 = indirect emissions from the consumption of electricity

Table 2.3 Orange County Energy Use by Household, 2010

	Orange Co.	Region
Total Occupied Households	124,627	809,150
Fuel Oil or Kerosene	44,976	338,350
Natural Gas	57,561	342,131
Electricity	12,372	80,158

Source: NYSDERDA, 2012. NYS Energy Profiles: 1996 - 2010

*Other = no fuel, coal, coke, or solar

Table 2.3 Orange County Energy Use by Household, 2010

	Orange Co.	Region
Bottled Tank or LP Gas	5,305	25,659
Wood, *Other	4,413	22,852

Source: NYSDERDA, 2012. NYS Energy Profiles: 1996 - 2010

*Other = no fuel, coal, coke, or solar

Metric 2a: reduce stationary fossil fuel consumption - stationary fossil fuel use (MMBtu) per capita

Significance

Fossil fuel combustion for the primary purpose of space heating and cooling residential, commercial, or industrial units is what is referred to here as “stationary” fossil fuel use, as opposed to mobile consumption associated with the transportation sector. It includes “direct emissions from the combustion of natural gas, coal, kerosene, motor gasoline and other fuels, as well as indirect emissions from electricity consumption.”³

In 2010, Orange County consumed 29,769,883 MMBtu's of stationary (residential, commercial, industrial, electricity, and natural gas) fossil fuels, accounting for approximately 5,375,449 MTCO₂e of emissions.⁴ A reduction in stationary fossil fuel consumption (through either increased energy and building efficiency, a transition to renewable energy, or - preferably - some combination thereof) would provide numerous economic, security, and environmental benefits. Less dependence on fossil fuels for stationary purposes helps low-income households, who may otherwise spend a disproportionate amount of their income on heating and cooling.⁵ It also keeps money in the local economy, an especially important consideration for Orange County given the Region's status as a net energy importer. And perhaps most importantly, a reduction in fossil fuel consumption cuts related emissions, the primary driver of climate change.

How to Measure

Stationary fuel consumption pertains to residential, commercial, and industrial sectors, while excluding mobile energy, solid waste, wastewater treatment, industrial processes, agriculture, and energy supply sectors. Fossil fuels are any finite, non-renewable fuel sources, such as coal, kerosene, natural gas, motor gasoline, etc. The majority of households in Orange County utilized fuel oil/kerosene or natural gas in 2010, with an average MMBtu of about 79.85 per capita. The MHRSP suggests measuring with the formula (The sum of fuel combustion for space heating and cooling or Total population of the County or Municipality).

¹ NYSDERDA, 2012. NYS Energy Profiles: 1996 - 2010

² Mid-Hudson Regional Sustainability Plan, p. 5-18.

³ Mid-Hudson Regional Sustainability Plan, p. 5-12.

⁴ Mid-Hudson Regional GHG Inventory

⁵ Mid-Hudson Regional Sustainability Plan, p. 5-11.

Consumption is measured in MMBtu, or One Million British Thermal Units, and data is available at the state level from the U.S. Energy Information Administration (EIA)⁶, and by sector and fuel type at the state level from NYSERDA.⁷ Total stationary MMBtu at the County level can be roughly estimated by assuming Orange County's population to account for about 1.92% of the State total (or 12 percent of the Regional total) and extrapolating from there. Local utilities may have more County- or municipality-specific data.⁸

Target Identification

The Mid-Hudson region, with a current per capita fossil fuel consumption rate (MMBtu) of 80.2, suggests reductions of 15 percent, 30 percent, and 50 percent by 2020, 2035, and 2050, respectively. Orange County, at 79.85 MMBtu per capita, might aim for similar targets. In order to project and measure future reductions, the County or municipality should:

- Determine the area's total population, accounting for future population growth. (As a reference, Orange County's population grew 9.21 percent between 2000 and 2010).
- Determine its baseline energy mix for the residential, commercial, and industrial sectors, and develop target goals while accounting for future transitions to renewable fuel sources.
- Within these three stationary sectors, separate renewable from non-renewable fuel sources and add total non-renewable MMBtu (the MHRSP suggests adding only MMBtu used for heating and cooling, if possible⁹).
- Divide total non-renewable MMBtu by the area's population.
- Compare against target goals.

$X = [(Current\ MMBtu)(Percent\ Reduction)/100], then$
 $((Current\ MMBtu - X))/((Future\ Population)) = MMBtu\ per\ capita$

Case Study: Mid-Hudson Regional CED Project

Despite the benefits of State and local energy-related programs, their focus on individual home and building owners has resulted in modest participation levels.¹⁰ A neighborhood-focused approach, such as the creation of a Community Energy District, can increase participation while expanding energy efficiency and reducing energy-related GHG emissions. CEDs promote energy efficiency and resiliency by aggregating supply and demand opportunities within a specific neighborhood or cluster of facilities, and the Mid-Hudson Regional CED Project aims to create four within the Region. Similar neighborhood-scale energy efficiency projects might

include the creation of microgrids¹¹, or a community solar leasing program.¹²

Metric 2b: increase installed renewable generation capacity - installed capacity (MMBtu) per capita

Significance

Increasing installed renewable generation capacity would entail many of the same economic and environmental benefits as reducing fossil fuel consumption, as well as the added benefit of increased energy security and resiliency. By investing in solar, wind, hydro, and other renewable energy technologies, the Region could become less dependent on out-of-state energy sources and their associated market fluctuations. Local renewable utility systems (distributed generation), such as community microgrids or solar leasing projects, have also been proposed as ways to maintain uninterrupted power generation in the event of an emergency or extreme weather event.

How to Measure

Renewable energy sources are on-site solar PV, on-site solar thermal, on-site wind turbine, on-site geothermal, and other on-site sources such as biomass. Generation capacity is measured in megawatts (MW), and the energy supply from this generation is measured in megawatt hours (MWh) per year. In order to find an area's renewable energy consumption in MMBtu per year equivalent, multiply the MWh/year generation capacity by 3.413.¹³ Then divide MMBtu by the area's total population, available from the Census. Generator information and capacity in MW is available from the NYISO Gold Book¹⁴; other renewable capacity data can be obtained from NYSERDA and the Regional GHG Inventory Tier 2 Subcomponents.

Target Identification

- Determine the area's population, accounting for future population growth.
- Find area's total renewable capacity in megawatts (MW), including on-site solar PV, on-site solar thermal, on-site wind turbine, on-site geothermal, and other on-site sources such as biomass. Distinguish, if possible, between facility generation and private generation (i.e. rooftop solar).

6 U.S. EIA, New York Profile Data (Accessed at <http://www.eia.gov/state/data.cfm?sid=NY#-ConsumptionExpenditures>)

7 NYSERDA, New York State Energy Fast Facts

8 Orange & Rockland Utilities (Accessed at <http://www.oru.com/index.html>)

9 Mid-Hudson Regional Sustainability Plan, p. B-5.

10 Ibid, p. 5-21.

11 The Role of Microgrids in Helping to Advance the Nation's Energy System (Accessed at <http://energy.gov/oe/services/technology-development/smart-grid/role-microgrids-helping-advance-nation-s-energy-system>)

12 Solar for All (Accessed at <http://vault.sierraclub.org/sierra/201301/community-solar-rooftop-panels-292.aspx>)

13 Mid-Hudson Regional Sustainability Plan, p. 5-23.

14 NYISO Gold Book 2015 (Accessed at http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Planning_Data_and_Reference_Docs/Data_and_Reference_Docs/2015%20Load%20and%20Capacity%20Data%20Report.pdf)

- Convert total MW capacity to megawatt hours (MWh) per year, where 1 MW = 8,765.81277 MWh per year.
- Convert MWh to MMBtu by multiplying by 3.413, then divide the result by population.

The Mid-Hudson region sets target increases of +200%, +2000%, and +20000% for 2020, 2035, and 2050. The same formula for determining stationary fossil fuel use can be used to find installed renewable generation capacity per capita; simply substitute Percent Reduction with Percent Increase and add X to Current MMBtu rather than subtract.

$$X = [(Current\ MMBtu)(Percent\ Increase)/100], \text{ then } ((Current\ MMBtu + X)) / ((Future\ Population)) = MMBtu\ per\ capita$$

Secondary Indicators

Secondary indicators for the Energy sector are Reduce Stationary Fossil Fuel Consumption GHG Emissions, Improve the Resiliency of the Energy Delivery System, and Public Literacy about Energy-related Topics. Reducing GHG emissions is directly related to the first primary indicator, and targets can be set accordingly. The other secondary indicators are less quantifiable and thus open to interpretation by the County or municipality. They are discussed on pages 5-15 through 5-17 of the MHRSP, and relevant data sources are located in Appendix B, Table B.2.

Measuring Template

Table 2.4 Orange County Template for Energy Measurement

	Indicator	Metric	Current Value	Target		
				2020	2035	2050
Primary	Reduce Stationary Fossil Fuel Consumption	Stationary Fossil Fuel Use (MMBtu) Per Capita	79.85			
	Increase Installed Renewable Generation Capacity	Installed Capacity (MMBtu) Per Capita				
Secondary	Reduce Stationary Fuel Consumption GHG Emissions	Stationary Fuel Consumption GHG Emissions (MTCO ₂ e)	1,266,111			
	Improve the Resilience of the Energy Delivery System					
	Public Literacy about Energy-Related Topics					
	Improve the Resilience of the Energy Delivery System					

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. 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. Materials management questions have historically been at the heart of the EJ debate with respect to the siting of landfills and hazardous waste facilities in areas with disproportionately high populations of low-income or minority residents. Though there are no active landfills in the Region, other waste management facilities, hazardous materials storage facilities, and infrastructure can present risk to surrounding communities.

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. This requires a reduction in the quantity of waste generated as well as the introduction of new management solutions. 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. 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. The siting of these facilities must take EJ into consideration.







Objectives

Reduce the volume of solid waste generated

Increase the proportion of material diverted from landfills and incinerators

Reduce transmission and distribution (T&D) cost

Self-Assessment

	Downtowns	Edges	Corridors	Crossroads	New Neighborhoods	Rural			
									
	Best Practices							In Place	In Process
								For Future Action	
	Reduce the volume of solid waste generated								
●	●	●	●	●	●	●	Promote product stewardship and environmentally-preferable purchasing	■	■
●	●	●	◐	○	○	○	Adopt a ban or surcharge on single-use plastic and/or paper bags	■	■
●	●	●	●	●	●	●	Mitigate construction-related negative impacts	■	■
●	●	●	●	●	●	●	Strengthen electronics reuse and recycling	■	■
●	●	●	●	●	●	●	Ensure proper disposal of pharmaceutical and other household hazardous material	■	■
	Increase the proportion of material diverted from landfills and incinerators								
●	●	●	●	●	●	●	Maximize the useful lifespan of materials	■	■
●	●	●	●	●	●	●	Expand organics recycling	■	■
●	●	●	●	●	●	●	Recover clothing and textiles	■	■
●	●	●	●	●	●	●	Expand environmental education programs and outreach	■	■
	Reduce transmission and distribution (T&D) cost								
●	●	●	●	●	●	●	Reuse and recycle materials locally	■	■
●	●	●	●	●	●	●	Facilitate inter-county cooperation	■	■
●	●	●	●	●	●	●	Create local or regional management and disposal options.	■	■
●	●	●	●	●	●	●	Encourage individual waste reduction	■	■

- Very applicable
- ◐ Applicable
- Not applicable

Objective

Reduce the volume of solid waste generated

Today, each person in the US throws out about four pounds of waste a day on average, far surpassing many countries in Europe and Asia. This waste not only affects us financially, but also environmentally. Solid waste disposal is a contributor to greenhouse gas emissions through energy expended for transport, incineration, recycling, and through methane release during decomposition. Solid waste, once disposed of, tends to end up in an incinerator or in a landfill. Landfills produce toxins; leachate and greenhouse gases and many solid waste materials contain toxic substances which release these contaminants into soil and groundwater. Landfills also contribute to greenhouse gas emission. Organic materials and green waste are usually compacted down before they are put into a landfill. This process removes all traces of oxygen, causing it to decompose anaerobically, which eventually releases harmful gas methane into the environment.

Incinerators also emit pollutants into the air, land and water. The process of incineration of solid waste produces two kinds of ashes: bottom ash, which comes from the furnace, and fly ash which contains more hazardous contaminants. These emissions can contain highly toxic substances—the incineration of plastic, for example, can give rise to heavily toxic pollutants which are detrimental to human and environmental health. Incinerators require energy and release harmful emissions such as dioxin, which can cause cancer, respiratory problems, neurological damage, and many other irreparable health issues.

Best Practice

Promote product stewardship and environmentally-preferable purchasing

Description: Product stewardship policies encourage the use of energy-efficient fixtures and supplies and/or purchased goods made from recycled materials in homes and offices.

Purpose: A purchasing policy for energy efficient products will ensure that all procured appliances, information technology equipment, lighting and control equipment will have the greatest efficiency for their use, reducing utility bills and lowering operations and maintenance costs.

How to get started: Investigate policies requiring municipal buildings to transition towards environmentally-preferable fixtures and products.

Co-benefits: Cost-savings in recyclable or reusable materials.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: 3.24

Sources

New York State Green Procurement and Agency Sustainability Program Approved Specifications
<http://ogs.ny.gov/EO/4/ApprovedSpecs.asp>

Ulster Sustainability Guide
http://www.sustainableulster.com/docs/Sustainability_Guide.pdf

Bedford Green Purchase Policy
<http://www.midhudsoncsc.org/documents/Bedford%20Green%20Purchase%20Policy%20Final%203-5-12.pdf>

Commission for Environmental Cooperation
<http://www.cec.org/files/pdf/NAGPI%20Policy%20Paper2e.pdf>

Department of Environmental Conservation
<http://www.dec.ny.gov/energy/57119.html#Efficient>

EPA Energy Purchasing
<http://www.epa.gov/statelocalclimate/documents/pdf/energyefficientpurchasing.pdf>

Sample Implementation Material

New York City - Environmentally Preferable Purchasing (EPP)
http://www.nyc.gov/html/mocs/downloads/pdf/epp/nycepp_construction.pdf

Best Practice

Adopt a ban or surcharge on plastic and/or paper bag use

Description: Single-use paper and plastic bags make up a large percentage of the litter stream, increasing waste processing cost. Plastic bags can also block stormwater drains and find their way into bodies of water, polluting water and harming wildlife.

Purpose: Reduces single-use waste, encourages sustainable behavior, protects fragile ecosystems.

How to get started: Coordinate with advocacy groups, state officials, local leaders to petition legislation resolving single-use paper/plastic bag waste.

Co-benefits: Long-term commercial cost-savings.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #:



An overflowing public trash can in Chicago, Illinois
Source: APA (Kelly Wilson)

Sources

National Conference of State Legislatures - State Plastic and Paper Bag Legislation
<http://www.ncsl.org/research/environment-and-natural-resources/plastic-bag-legislation.aspx>

Sample Implementation Material

Village of Larchmont - Plastic Bag Ban
<http://villageoflarchmont.org/wp-content/uploads/2013/03/Local-Law-1-2013-plasticbagban.pdf>

Village of Mamaroneck
[http://www.village.mamaroneck.ny.us/pages/mamaroneckny_web-docs/Local%20Law%206-2012%20\(Plastic%20Bags\).pdf](http://www.village.mamaroneck.ny.us/pages/mamaroneckny_web-docs/Local%20Law%206-2012%20(Plastic%20Bags).pdf)

Best Practice

Mitigate construction-related negative impacts

Description: Construction activities have numerous negative effects on the environment. Heavy machinery can compact soils, destroy vegetation, and pollute neighboring streams.

Purpose: Green construction codes and enforcement can mitigate the negative environmental impacts related to construction projects. Among the many impacts the codes can address are ways to protect and conserve water and reduce the environmental impacts of construction materials during and after construction.

How to get started: Draft a set of green construction laws.

Co-benefits: Constructive steps towards making construction greener could provide ancillary benefits to the community, such as noise reduction and improved safety measures.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #:

Sources

EPA - Federal Environmental Requirements for Construction
<http://www.cem.va.gov/pdf/fedreqs.pdf>

U.S. Green Building Council
<http://www.usgbc.org/articles/federal-guiding-principles-new-construction-and-major-renovations>

U.S. Green Building Council
<http://www.usgbc.org/node/2612120>

Sample Implementation Material

EPA - Managing Your Environmental Responsibilities: A Planning Guide for Construction and Development
http://www.safetybok.org/managing_your_environmental_responsibilities_a_planning_guide_for_construction_and_development/

Best Practice

Strengthen electronics reuse and recycling

Description: Efforts could be made to strengthen performance goals and convenience standards, and petition manufacturers to cover the costs of recycling in order to efficiently manage electronics recycling and reuse.

Purpose: Relieves the financial burden placed on communities overwhelmed by e-scrap, manages end-of-life electronics, and provides logistical assistance to rural communities struggling to cope with large volumes of hard-to-dispose materials.

How to get started: Coordinate with New York Product Stewardship Council and others to establish a 100% manufacturer pickup system and convenient year-round collection opportunities.

Co-benefits: Shifts waste management costs off taxpayers, reduces waste destined for landfills, and improves product and packaging design for recycling and materials recovery.

Details

Initial Investment: Moderate.

Professional Assistance Required?: Yes.

Time to Implement: Varies. Depends on community need.

Time to Benefit: Medium.

CSC Reference Number: 3.22

Sources

Model EPR Resolutions for Local Governments

<http://nypsc.org/local-resolutions/>

E-waste Recycling

<http://www.dec.ny.gov/chemical/65583.html>

Recycling Your Electronic Waste

<http://www.dec.ny.gov/chemical/66872.html>

CP-57 /

Use of Enforcement Discretion for Cathode Ray Tube (CRT) Glass

<http://www.dec.ny.gov/regulations/89804.html>

Best Practice

Ensure proper disposal of pharmaceutical and other household hazardous material

Description: Hazardous products carelessly tossed in the trash can injure sanitation workers, damage collection vehicles, or leak into the environment. Unused or unwanted medications are often abused.

Purpose: To ensure the safe disposal of hazardous material and pharmaceutical products.

How to get started: Adopt programs such as medication drop boxes to curb the abuse of unwanted prescription drugs, increase the frequency of hazardous material collection, and coordinate with law enforcement agencies to provide program oversight.

Co-benefits: Improves quality of life and cultivates environmental awareness.

Details

Initial Investment: Moderate.

Professional Assistance Required?: Yes.

Time to Implement: Short.

Time to Benefit: Moderate.

CSC Reference Number: 5.12

Sources

Household Hazardous Waste Overview

<http://www.ucrra.org/services/household-hazardous-waste/>

Dutchess County Prescription Medication Drop Box Program

<http://www.co.dutchess.ny.us/CountyGov/Departments/STOPDWI/DWPrescriptionDrugTakeback.pdf>

Objective

Increase the proportion of material diverted from landfills and incinerators

Many people don't think about where their trash goes after they throw it away. Recycling and composting are easy in practice, and have many benefits. Recycling programs can cost less than landfilling. When they are well-designed, recycling programs can save a significant amount of money in the long run: many companies have saved millions of dollars through recycling programs, and in 2004, New York City signed a 20-year contract that will save the city \$20 million annually through recycling programs. Recycling also creates job opportunities in collecting, processing and preparing material and making new products from recycling materials, which fuels the economy. Recycling and composting removed 85 million tons of materials from landfills and waste-to-energy facilities in the US in 2010 . Recycling and composting also reduce air pollution by curbing greenhouse gas emission rates. Less energy is spent transmitting and distributing waste around the country, and when scrap material is used instead of virgin feedstock, mining ores, cutting trees, and drilling for oil becomes less of a necessity.

Best Practice

Maximize the useful lifespan of materials

Description: Identify ways to reuse materials in new ways, either through passing them on to second owners or reclaiming raw materials for new uses.

Purpose: This will help reduce the environmental impacts associated with producing new goods and materials. This will also reduce GHG emissions from landfills.

How to get started: Identify major sources of waste products.

Co-benefits: Reduction in landfill waste and tipping fees; reduced costs through reclaiming/reusing materials.

Details

Initial Investment: Moderate.

Professional assistance required: Yes.

Time to Implement: Medium. May require investment in facilities and vehicles.

Time to Benefit: Medium.

CSC Reference #: 5.6

Sources

NYSDEC, 2010. Beyond Waste: A Sustainable Materials Management Strategy for New York State.
<http://www.dec.ny.gov/chemical/41831.html>

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

ReDo

http://loadingdock.org/redo/Benefits_of_Re-use/body_benefits_of_reuse.html

U.S. Green Building Council
<http://www.usgbc.org/credits/mr3>

U.S. Green Building Council
<http://www.usgbc.org/credits/mr21>

Best Practice

Expand organics recycling

Description: Organic materials continue to be the largest component of municipal solid waste. Of the 254 million tons of MSW generated in 2013, USEPA estimates that food makes up 14.6 percent (37 million tons). Projects can include efforts to encourage small-scale composting, in situ organics management, or larger-scale county or regional composting schemes.

Purpose: Organics recycling seeks to prevent introduction of or remove organics from the waste stream and reprocess the material for beneficial reuse.

How to get started: Identify opportunities for large users to develop composting programs, and potential sites for processing.

Co-benefits: Waste products may be reused to enrich soils. Saves money by reducing over-purchasing and disposal costs; reduces environmental impacts, and supports efforts to eliminate hunger.

Details

Initial Investment: Moderate. Initial actions may include passing ordinances legalizing on-site composting as well as coordination of municipal or regional organics processing facilities.

Professional assistance required: Yes

Time to Implement: Medium. Time is needed for adoption of ordinances and implementation by residents and/or communities.

Time to Benefit: Short

CSC Reference #: 12.5

Sources

Sustainable Materials Management Coalition, 2012. Sustainable Materials Management – A New Materials Hierarchy, Solutions to Barriers, and Recommendations for a Path Forward. http://www.michaeldbakker.com/documents/smm_final_report.pdf

NYSDEC, 2010. Beyond Waste: A Sustainable Materials Management Strategy for New York State. <http://www.dec.ny.gov/chemical/41831.html>

Food Recovery Task Force launched in Rockland <http://www.midhudsonnews.com/News/2015/October/06/RCFRTF-06Oct15.html>

EPA Food Recovery Challenge <http://www.epa.gov/sustainable-management-food/food-recovery-challenge-frc>

EPA Food Recovery Hierarchy <http://www.epa.gov/sustainable-management-food/food-recovery-hierarchy>

EPA Tools for Assessing Wasted Food <http://www.epa.gov/sustainable-management-food/tools-assessing-wasted-food>

Rescuing Leftover Cuisine (nonprofit) <http://www.rescuingleftovercuisine.org/>

Sample Implementation Material

State of California - AB No. 1826 http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB1826&search_keywords

Best Practice

Recover clothing and textiles

Description: The NYSDEC has determined that approximately 1.4 billion pounds of clothing and textiles are disposed of in the state annually.

Purpose: Recovering and reusing textiles repurposes materials for commercial and personal use, reduces unnecessary waste, and cuts costs while furthering sustainability measures throughout the state.

How to get started: Utilize the New York State Association for Reduction, Reuse, and Recycling (NYSAR) statewide textile recovery campaign and set up a textile recovery location page.

Co-benefits: Promotes management practices that integrate reduction, reuse and recycling.

Details

Initial Investment: Moderate.

Professional Assistance Required? No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference Number:

Sources

New York State Association for Reduction, Reuse and Recycling http://www.nysar3.org/textile_recovery_locations.php

Best practice

Expand environmental education programs and outreach

Description: Waste reduction and recycling education to instruct New Yorkers of all ages on environmental responsibility and best practices.

Purpose: instructing the general public on environmental sustainability and protection facilitates behavior change, furthering long-term sustainability goals.

How to get started: Advertise the NYSAR3 annual statewide conference and pursue EPA funding to provide environmental education, such as the 2015 grant supporting the Warwick Valley Central School District's Envirocation Project, which will implement two major initiatives: a comprehensive recycling program, and a composting program in every district school building by August 2017.

Co-benefits: Improves educational quality of schools and improves quality of life through individual awareness.

Details

Professional Assistance Required? No.

Time to Implement: Moderate.

Time to Benefit: Short.

CSC Reference Number: 5.13

Sources

EPA—Warwick Valley News Release

<http://yosemite.epa.gov/opa/admpress.nsf/0/49DA-91816F8AF48E85257F0F00691E9F>

NYSAR3 annual statewide conference

<http://www.nysar3.org/page/conference-31.html>

Objective

Reduce transmission and distribution (T&D) cost

By making an effort to reduce and recycle, and by implementing local waste management resources, the Mid-Hudson region can reduce the amount of money being expended on the transmission and distribution of solid waste. Reducing transportation and distribution costs will also cut down on greenhouse gas emissions and environmental damage, as less energy will be spent shipping out waste to landfills and incinerators that are hundreds of miles away.

Best Practice

Create local or regional management and disposal options

Description: Local management and disposal options allow for local reuse of materials and a reduction in transportation-related costs and emissions.

Purpose: By keeping material local, transportation costs and associated energy use and GHG emissions can be reduced.

How to get started: Discuss local options with local waste management agencies.

Co-benefits: Local economic development. Potentially lower materials and transportation costs.

Details

Initial Investment: Varies.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:



In Bridgeport, CT, used mattresses are re-processed into raw materials for reuse, like these bales of cotton

Source: City of Bridgeport

Sources

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

NYSDEC, 2012. Division of Solid & Hazardous Materials, Annual Planning Unit Recycling Report – All County Planning Units.

U.S. Green Building Council

<http://www.usgbc.org/Docs/Archive/General/Docs6131.pdf>

Best Practice

Facilitate inter-county cooperation

Description: 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. One critical step for inter-county cooperation is the adoption of consistent materials accounting methodologies and definitions. Adoption of consistent and uniform labels to be used in marking different waste receptacles can help increase recycling and waste diversion efforts.

Purpose: Adoption of consistent and uniform labels to be used in marking different waste receptacles can help increase recycling and waste diversion efforts.

How to get started: Create a forum to foster inter-county discussion.

Co-benefits: Potential reduction in operating costs.

Details

Initial Investment: Moderate. Action requires participation by multiple agencies.

Professional assistance required: No.

Time to Implement: Varies depending on county interest.

Time to Benefit: Varies.

CSC Reference #:

Sources

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

NYSDEC, 2012. Division of Solid & Hazardous Materials, Annual Planning Unit Recycling Report – All County Planning Units.

U.S. Green Building Council

<http://www.usgbc.org/Docs/Archive/General/Docs6131.pdf>

Measuring Progress

Overview

Overall, the Mid-Hudson region generates less waste per capita and recycles a greater percentage of its waste compared with the rest of New York State.¹ However, the sector still presents many challenges for the Region, which relies on out-of-state and out-of-region landfills and water-to-energy facilities to dispose of the majority of its waste, resulting in high transportation and disposal (T & D) costs. Flow control, regulatory enforcement, programmatic funding, and consistent data collection and management are other challenges facing the Region as a whole, and the related GHG emissions from the sector are significant contributors to climate change.

Table 3.1 Orange County Materials Management Baseline Data, 2010

	Orange County	Region
Per Capita MSW Disposal Rate (lb./person/day)	3.8	3.7
Recycling Rate (percentage)	38	42
MSW CH₄ Emissions	104,404 MTCO ₂ e	324,372 MTCO ₂ e
C & D CH₄ Emissions	1,728 MTCO ₂ e	25,832 MTCO ₂ e
Total CH₄ Emissions	106,133 MTCO ₂ e	350,204 MTCO ₂ e
Percent of Total	30	100

Source: Orange County Solid Waste Management Plan, 2010, Regional GHG Inventory

Metric 3a: Decrease MSW disposal rate - per capita MSW disposal (lbs/person/day)

Significance

Municipal Solid Waste (MSW) generally consists of everyday items which are found in household wastes such as product packaging, food scraps (organic waste), newspapers, clothing, leaves and grass clippings, furniture, bottles and cans, appliances, and batteries. It may also include small quantities of household hazardous materials such as oil based paints, cleaning products, caustics, and consumer electronics.² In 2009, Orange County generated 259,927 tons of MSW, all of which was transported out of the County for disposal.

Decreasing MSW disposal rate by reducing, reusing, and recycling is the first step towards achieving the MHRSP's goal of a 'zero waste' future. By reducing MSW, coun-

ties and municipalities will spend considerably less on transport and disposal (T & D), and the implementation of multi-stream recycling and recovery programs could catalyze local job creation. Less waste also means less materials destined for landfills or incinerators, and thus a reduction in the associated GHG emissions (whether from transport, incineration, or anaerobic digestion) and potential landfill runoff into streams, groundwater, and other important resources. And finally, placing importance on responsible reuse and discouraging wastefulness has less quantifiable but nevertheless important long-term societal benefits.

How to Measure

MSW excludes recycled materials, C & D (construction and demolition) debris waste, municipal wastewater treatment sludge, scrap metal, and non-hazardous industrial waste. The formula recommended by the Plan for calculating MSW Disposal Rate is ((Annual lbs. MSW) / (population)) / (365 days/year).

The amount of MSW in tons (by County) is available in the Orange County Planning Unit Recycling Reports, submitted annually to the New York State Department of Environmental Conservation. Population data is available from the U.S. Census, and future population projections are available from the Cornell Program on Applied Demographics³, and NYMTC's Socioeconomic and Demographic (SED) Forecasting products.⁴

Target Identification

The Mid-Hudson region has a current MSW disposal rate of 3.7 lbs./person/day, and has set target reductions of about -54%, -86%, and -92% for 2020, 2035, and 2050. Orange County, at 3.8 lbs./person/day, might set similar targets. Total MSW (in tons) is available at the County level from annual Orange County Planning Unit Recycling Reports.

- Determine the area's population, accounting for future population growth.
- Utilizing baseline data at the County or municipality level, develop target reductions. The following formula can be used to identify potential percent reductions and corresponding reductions per capita (in pounds), using projected populations for the target years.

$$X = [(Current\ Disposal\ Rate)(\% \text{ Reduction})/100], \text{ then } (((Current\ Disposal\ Rate - X)) / (Future\ Population)) \times 365 = Disposal/capita$$

- Propose and implement strategies for meeting the target reductions.
- At each target year, obtain population data and MSW Disposal data and convert from tons to pounds, where 1 ton = 2000 lbs.

3 Cornell Program on Applied Demographics (PAD). (Accessed at <https://pad.human.cornell.edu/index.cfm>).

4 NYMTC, Socioeconomic and Demographic Forecasting. (Accessed at http://www.nymtc.org/project/forecasting/sed_products.html).

1 Mid-Hudson Regional Sustainability Plan, p. 6-4.

2 Orange County Solid Waste Management Plan Draft, 2010.

- Find actual MSW Disposal Rate with the formula ((Annual lbs. MSW) / (population)) / (365 days/year).
- Compare actual Disposal Rate with target goals.

Metric 3b: Increase recycling - recycling rate (percentage)

Significance

Increasing the recycling rate (38 percent for Orange County in 2009⁵) will entail many of the same environmental and economic benefits as decreasing MSW disposal rate; namely, less money spent on T & D, less emissions from landfills and incinerators, reduced environmental degradation caused by runoff, and job creation in the materials management sector. Reusing materials rather than disposing of them in landfills has the added benefit of mitigating the environmental impact created by the production of new goods. It also encourages and contributes to both formal economic activities, such as thrift stores and material reuse sites, and informal activities, such as internet exchange sites and swap meets.

How to Measure

The MHRSP defines recycling rate as “the proportion of MSW diverted from a landfill or incineration. It excludes C & D [construction and demolition waste], miscellaneous waste (textiles, electronics, tires, etc.) biosolids, and metal reported by automobile dismantlers, junkyards, and scrap metal processors.”⁶ The formula recommended by the Plan for calculating County or municipality recycling rate is (Total materials recycled) / (Total materials generated per year per County/municipality).

Measuring recycling rate is a challenge throughout the Region, as variation exists in how each unit defines which materials streams are included in the recycling rate. Orange County, for instance, does include C & D debris, as well as biosolids, miscellaneous waste, etc. in its Recovered Recyclables data. What materials to include in Recycling Rate, then, should be at the discretion of the County of municipality depending on the available data. The 2010 Orange County Solid Waste Management Plan provides baseline materials management data as well as recycling rate projections to 2020. In order to calculate actual rate, data should be obtained by waste stream from annual Orange County Planning Unit Recycling Reports.

Target Identification

The Mid-Hudson region, with a current recycling rate of 42 percent (excluding C & D, miscellaneous waste, etc.) has set target increases of about +20%, +80%, and +126% for 2020, 2035, and 2050. Orange County and its municipalities will need to consider their solid waste management plans and potential changes in recycling program capacity,

as well as projected future waste generation, in order to develop realistic targets.

- Determine which waste streams will be included in the Recycling Rate (C & D, biosolids, scrap metal, etc.).
- Utilize the Orange County Solid Waste Management Plan to obtain projected waste generation for each target year.
- Develop target increases based on projected waste generation and potential changes in recycling capacity. Corresponding increases in waste recycled (in tons) can be calculated using the following formula:

((Current Waste Recycled [tons])(% Increase))/100=X, then (X+Current Waste Recycled)=Future Waste Recycled (tons)
- Propose and implement strategies for meeting the target increases.
- At each target year, refer to the Orange County Planning Unit Recycling Reports for total materials recycled (in tons). Divide by total materials generated to find Recycling Rate (percentage).
- Compare actual Recycling Rate to target goals.
- Keep in mind that given the difficulty in measuring both formal and informal recycling rates, this indicator should be construed as a proxy.

Case Study: Chestnut Hill, PA

Chestnut Hill, a Philadelphia suburb, is home to two innovative materials management programs - one citizen-led and the other administered by the City. In the first program, residents bring recyclable materials not covered under municipal curbside pickup to a drop-off location, where volunteers sort the material and deliver it to a local recycling center. The revenue generated by the program is used to fund community beautification efforts and other related projects. In the City program, recycling trucks equipped with scales weigh each resident's weekly contribution, which is entered into a municipal database. The weight is then converted into vouchers redeemable at local businesses, incentivizing recycling and aiding the local economy.⁷

Secondary Indicators

Secondary indicators for the Materials Management sector (listed below in the Measuring Template) are closely tied to the primary indicators: Decreasing MSW disposal rate will lead to a subsequent decline in related GHG emissions and solid waste generation, and improvements to the recycling process might

⁵ Mid-Hudson Regional Sustainability Plan, p. 6-5.

⁶ Ibid.

⁷ Smith, Tim. "Civic Ecology: An EcoDistrict Community Design Framework." Making EcoDistricts: Concepts & Methods for Advancing Sustainability in Neighborhoods" (September 2010), p. 40.

place greater emphasis on salvaging and reuse. Descriptions of these indicators, as well as noted difficulties in measuring them, are discussed on pages 6-12 through 6-15 of the Regional Plan.

Measuring Template

Table 3.2 Orange County Template for Materials Management Measurement

	Indicator	Metric	Current Value	Target		
				2020	2035	2050
Primary	Decrease MSW Disposal Rate	Per Capita MSW Disposal (lbs/person/day)	3.8 (2009)			
	Increase Recycling	Recycling Rate (Percentage)	38 (2009)			
Secondary	Reduce Stationary Fuel Consumption GHG Emissions	Stationary Fuel Consumption GHG Emissions (MTCO ₂ e)	1,266,111			
	Reduce GHG Emissions	GHG Emissions (MTCO ₂ e)	106,133 (2010)			
	Tons of Annual Solid Waste Generation by County					
	Proportion of Total Waste Salvaged/Reused (by Waste Type)					

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 also fragmented and faces pressure from invasive species, climate change, and other threats. With respect to EJ considerations, access to healthy food is central. In some areas, low-income communities have limited access to healthy food, which can lead to high rates of obesity and related health issues.

Actions to promote agriculture in the Hudson Valley include expanding and supporting markets for local products including in underserved areas, preserving agricultural land and helping farming to remain a viable industry, and promoting agricultural practices that minimize negative impacts to water, soil, or habitats.

Objectives

Improve access to sustainable agriculture and silviculture training and technologies

Increase agriculture and silviculture activities in the region







Strengthen the economic viability of agriculture and silviculture in the region

Increase intra-regional consumption of food and fiber

Protect wildlife and maintain biodiversity

Increase open space

Self-Assessment

Downtowns	Edges	Corridors	Crossroads	New Neighborhoods	Rural			
						Best Practices		
						Improve access to sustainable agriculture and silviculture training and technologies		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Residue management including mulch tillage and no-tillage	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Implement comprehensive nutrient management plan	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Utilize new technology such as GPS-guided variable rate fertilization and pest management systems	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Use crop rotation and cover crops	<input type="checkbox"/>	<input type="checkbox"/>
						Increase intra-regional consumption of food and fiber		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Increase access to value-added facilities and distribution	<input type="checkbox"/>	<input type="checkbox"/>
						Strengthen the economic viability of agriculture and silviculture in the region		
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Increase access to local foods by promoting direct marketing, CSAs, farmer's markets, and other market access programs	<input type="checkbox"/>	<input type="checkbox"/>
						Increase open space		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Promote and expand farmland protection program	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Expand urban agriculture	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Set up TDR programs	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Promote conservation subdivision zoning	<input type="checkbox"/>	<input type="checkbox"/>

☒ Very applicable

☐ Applicable

☐ Not applicable

Objective

Improve access to sustainable agriculture and silviculture training and technologies

Given the Region's abundance of farmland and forestland, the region must work towards practicing sustainability in the care and keeping of land. Good agricultural practice (GAP) means that farmers take care to: ensure the safety and quality of their produce, incorporate the use of compost and recycled fertilizer, implement green crop practices such as crop rotation and crop covering, reduce soil and fertilizer erosion and run-off, reduce excessive energy and water use, respect the well-being and health of domesticated animals, increase energy efficiency and renewable energy on agriculture, and generally be conscious of the impact that they are making on the environment on a daily basis. Besides being financially savvy, by practicing GAP farmers are not only protecting the environment, but also the wellbeing of the community by producing healthy and ecologically honest harvests.

Silviculture, the healthy management and treatment of growing trees for forest resources, can have an economically and ecologically positive impact if practiced carefully and correctly. While silviculture safeguards the forest ecosystem, practices can also improve the growth rate, quality, and strength of trees growing in the forest. These practices regenerate tree species to ensure long-term environmental sustainability. Ultimately, the practice of silviculture enables conservation while also promoting the economy.

Best Practice

Residue management including mulch tillage and no-tillage

Description: Mulch tillage leaves crop residue on the surface of the soil; no tillage means plants/crops are left untilled, which increases the amount of water that goes into soil and also increases organic matter retention.

Purpose: Mulch mowing of leaves and grass can eliminate or significantly reduce the need to collect and dispose of these materials thereby greatly reducing costs, energy use, and GHG emissions due to grass and leaf removal. Mulch tillage also allows for in situ decomposition, which provides multiple benefits including reducing the need for fertilization.

How to get started: Commission a study on current regional residue management practices. Distribute information on the environmental and economic benefits of switch to mulch- and no-tillage farming.

Co-benefits: Lowers GHG emissions

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: -

Sources

Minnesota Department of Agriculture: Conservation Practices
<http://www.mda.state.mn.us/protecting/conservation/practices/constillage.aspx>

UCA: Classification of Conservation Tillage Practices in California Irrigated Row Crop Systems
<http://anrcatalog.ucdavis.edu/pdf/8364.pdf>

Sample Implementation Material

NCAGR - Crop Residue Management
http://www.ncagr.gov/SWC/costshareprograms/ACSP/documents/crop_residue_mgt.pdf

Best Practice

Implement a comprehensive nutrient management plan

Description: Nutrient management practices include land application and/or composting of animal waste, food waste, and sewage as well as the storage of animal waste.

Purpose: Nutrient management can reap many benefits, including the preservation of local and regional water sources as well as the enhancement of farm efficiency and profitability by reducing fertilizer costs, improving soil quality and productivity, and protecting public health through the improvement of air quality and minimized impact on the environment.

How to get started: The first step in developing a Comprehensive Nutrient Management Plan (CNMP) is a full engineering and conservation planning resource assessment of current site conditions.

Co-benefits: Protecting public health & surrounding bodies of water

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #:

Sources

Minnesota Department of Agriculture: Conservation Practices
<http://www.mda.state.mn.us/protecting/conservation/practices/nutrientmgmt.aspx>

USDA Revises National Nutrient Management Standard to Achieve Maximum Agricultural, Environmental Benefits 2011
<http://www.usda.gov/wps/portal/usda/usda-home?contentid=2011/12/0513.xml>

Sample Implementation Material

PSU - Nutrient Management

<http://extension.psu.edu/plants/nutrient-management/act-38/act-38-of-2005>

PSU - Nutrient Management Regulations

<http://extension.psu.edu/plants/nutrient-management/act-38/act-38-nutrient-management-regulations>

Best Practice

Use of new technology such as GPS-guided variable rate fertilization and pest management systems

Description: GPS guidance divides fields into small units, or cells, that are then tested for nutrient levels. Fertilizer is then recommended for each unique cell and spread with the help of the GPS system.

Purpose: The use of GPS-guided variable rate fertilization produces accurate and time-saving results. When used correctly, results have yielded significant improvement of plant health and quality of water in surface and ground water. GPS-guided precision farming can also reduce overlaps and over-application in the distribution of fertilizer

How to get started: Commission a study on current agriculture and silviculture techniques that could stand to benefit from the introduction of new technology.

Co-benefits: More productivity.

Details

Initial Investment: High.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #: -

Sources

Virginia Cooperative Extension- Precision Farming Tools: GPS Navigation
<http://pubs.ext.vt.edu/442/442-501/442-501.html>

United States Department of Agriculture: Variable-Rate Application of Fertilizer
http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_053935.pdf

Best Practice

Crop rotation and use of cover crops

Description: Crop rotation is the sequential planting of different crops in the same patch of soil. Cover crops are planted in between primary harvest crops.

Purpose: By rotating crops, nutrient levels can be held stable within the soil. Cover crops have several functions, including returning nitrogen to the soil, preventing soil runoff, and preventing weeds from forming in between plantings.

How to get started: Encourage farmers and other practitioners of agriculture to invest and engage in sustainable farming. Crop rotation and crop covers are simple and do not really need monetary investment, but instead the investment of time and dedication of farmers to sustainable and environmentally conscious farming.

Co-benefits: A consistent harvest of healthy crops benefits farmers' bottom lines and consumers. In addition, maintaining soil health naturally reduces the need for chemical fertilizers, which saves money and reduces the negative environmental externalities of farming.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: -

Sources

Sustainable Agriculture Research & Education:

Crop Rotation with Cover Crops

<http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Prof-itably-3rd-Edition/Text-Version/Crop-Rotation-with-Cover-Crops>

Sands of Iowa- The Benefits of Crop Rotation

<http://www.sandsofiowa.com/images/E0240401/CropRotationBenefits91914.pdf>

Northeast Organic Network: A Crop Rotation Planning Procedure

<http://www.neon.cornell.edu/croprotation/eChapter5.pdf>

Objective

Increase agriculture and silviculture activities in the region

Given the Region's abundance of farmland and forestland, the region must work towards practicing sustainability in the care and keeping of land. Good agricultural practice (GAP) means that farmers take care to: ensure the safety and quality of their produce, incorporate the use of compost and recycled fertilizer, implement green crop practices such as crop rotation and crop covering, reduce soil and fertilizer erosion and run-off, reduce excessive energy and water use, respect the well-being and health of domesticated animals, increase energy efficiency and renewable energy on agriculture and generally be conscious of the impact that they are making on the environment on a daily basis.

Best Practice

Expand urban agriculture

Description: Urban agriculture programs can take a variety of forms. Some communities develop community gardens; others provide educational resources to groups forming gardens. Others pass ordinances to explicitly allow food production in public spaces. Such programs can serve to increase food security, promote environmental awareness, strengthen community connections, and reduce greenhouse gas emissions.

Purpose: Adoption of an ordinance allowing for publicly owned but vacant lots to be used by residents for community gardens is a way for communities to come together to transform unsightly, vacant lots into green spaces used for local food production.

How to get started: Launch community-based planning effort. This process can receive help from the Agriculture and Farm Protection Board and the Cornell Cooperative Extension.

Co-benefits: Health, access to high-quality food, education, communication. Creation of green space. Supports community-building activities.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Medium.

CSC Reference #: 6.7



A mock-up design of people enjoying an ideal urban farm

Source: RPA

Sources

Five Borough Farm- Urban Agriculture in NYC

<http://www.fiveboroughfarm.org/urban-agriculture/>

American Planning Association- Urban Agriculture

<http://www.planning.org/zoningpractice/2010/pdf/mar.pdf>

UrbanFarming.org

<http://www.urbanfarming.org>

New York State Department of Agriculture

<http://www.agriculture.ny.gov/>

Objective

Strengthen the economic viability of agriculture/silviculture in the region

A core strategy in preserving local agriculture is to support its viability as an industry. Strategies include tax policies which reward conservation, Transfer of Development Rights programs which enable farm owners to profit from conserved lands, support of local markets and distribution systems to bring goods to outside markets, and flexibility with land use restrictions.

Best Practice

Increase access to local foods by promoting direct marketing, community supported agriculture (CSA), farmer's markets, and other market access programs

Description: Buying from local food systems also benefits the health of the community. Small, family-run farms are more likely to focus on sustainable agricultural practices, such as no-till agriculture, composting, and minimized use of pesticides in crops. The produce is often fresher, as it does not have to travel a long way. Buying and eating locally is not only an environmentally conscious decision, but also has numerous health benefits that industrial and large-scale farming cannot offer.

Purpose: Provide potentially higher prices for locally-produced goods.

How to get started: Identify consumer opportunities.

Co-benefits: Enhanced local access to healthy foods.

Details

Initial Investment: Moderate.

Professional assistance required: No.

Time to Implement: Varies.

Time to Benefit: Medium.

CSC Reference #:



Pick-your-own farms provide direct consumer access to seasonal crops

Source: RPA (Amanda Kennedy)

Objective

Increase intra-regional consumption of food and fiber

Buying and consuming regionally produced food supports local farmers and their agricultural practices. By increasing the consumption of local food and expanding urban agriculture, we fuel the economy while also lowering the cost of transmitting and distributing produce. The reduction of distribution costs has a positive effect on the environment, as less greenhouse gases are emitted from the energy used to sell produce outside of the region. Buying from local food systems also benefits the health of the community. Small, family-run farms are more likely to focus on sustainable agricultural practices, such as no-till agriculture, composting, and minimized use of pesticides in crops. The produce is often fresher, as it does not have to travel a long way. Buying and eating locally is not only an environmentally conscious decision, but also benefits community health.

Best Practice

Increase access to value-added facilities and distribution

Description: Value-added agricultural facilities increase the value of primary agricultural commodities through bench-top product developing, packaging, and food analyses. Facilities may include distribution infrastructure such as shipping warehouses, USDA approved abattoirs and kitchens, or local resellers of locally-produced goods. Investment is needed to create food hubs to serve the small and mid-sized farms of the Region, fostering economic development.

Purpose: Increasing access to value-added facilities and distribution firms helps to meet growing demand for healthy food grown locally and bring economic benefits to farmers. Inability to access USDA-approved facilities severely limits food producers from bringing meats and prepared goods to consumers.

How to get started: Identify the gaps in local food processing system. Utilize the resources of the Cornell Cooperative Extension to help interface with USDA approved facilities.

Co-benefits: Crop diversity may protect farmers from economic losses.

Details

Initial Investment: Moderate.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:



A direct-to-consumer store and USDA-approved on-site kitchen allows the Griggstown Poultry Farm in Somerset, NJ to sell ready-to-eat foods direct to customers

Source: RPA (Amanda Kennedy)

Objective

Protect wildlife and maintain biodiversity

Healthy ecosystems must provide all resources necessary for species to survive throughout their lifecycle. Bobcats, for example, require ranges of 10,000 to 15,000 acres of habitat to survive. Other species require specific combinations of vernal swamps and forest uplands to complete a full reproductive lifecycle. Protecting wildlife and biodiversity, therefore, requires preserving lands as part of an ecosystem of habitats that support the species of the Mid-Hudson region, instead of viewing preserved parcels in isolation from one another.

Best Practice

Promote and expand farmland protection programs

Description: Farmland protection programs can take the form of use restrictions, funds to promote municipal purchase of land or preservation easements, and Transfer of Development Rights programs that provide incentives for property owners to keep land in agriculture.

Purpose: Protecting farmland protects regional food supply, wildlife and biodiversity and the economies of rural areas.

How to get started: Explore the New York Farm Agricultural and Farmland Protection Program and explore grants that could apply to local farmers and municipalities; develop programs based on Warwick, Red Hook, and other Dutchess county townships best practices.

Co-benefits: Reduction of municipal costs for servicing new developments.

Details

Initial Investment: Varies.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Long.

CSC Reference #:

Sources

New York Department of Agriculture & Markets - Agricultural and Farmland Protection Program
<http://www.agriculture.ny.gov/ap/agsservices/farmprotect.html>

American Farmland Trust - Linking Farmers to Institutional Markets in New York
<https://www.farmland.org/initiatives/farm-to-institution-new-york-state-finys>

Town of Warwick Community Preservation Project Plan
http://www.townofwarwick.org/agriculture/cppdocs/community_preservation_plan.pdf

Partnership for Manageable Growth Program (PMG)
<http://www.co.dutchess.ny.us/CountyGov/Departments/Planning/16882.htm>

Sample Implementation Material

Town of Nichols, NY - Agriculture & Farmland Protection Plan
<http://www.agriculture.ny.gov/ap/agsservices/NicholsTownPlan.pdf>

NYS Department of Agriculture - What are the Key Elements of a Good Agricultural Protection Plan?
http://www.agriculture.ny.gov/ap/agsservices/GoodPlan_County.pdf

Objective

Increase open space

Regions with open space have the potential to thrive economically, socially and environmentally. Open spaces engender a sense of community by creating areas that attract families, physical activity, and social interactions, which can create safe neighborhoods. Financially, open spaces increase property values which can lead to higher property tax revenues for local governments, as residential areas that are close to parks and promenades are attractive and in high demand. But beyond the amenities that benefit private landowners, open spaces such as wetlands and forests supply drainage for storm water and support the ecosystem. Parks and natural areas improve and protect conservation areas and healthy ecosystems. The presence of plants, clean water and air can protect biological diversity and ecological functions while at the same time reducing flood control and storm water management costs. Trees help to improve air quality by reducing pollutants and other contaminants from the atmosphere.

Best Practice

Set up TDR programs

Description: A transfer of development rights program allows for the transfer of some or all of the development that would otherwise have occurred in sensitive places (sending areas), to more suitable locations (receiving areas).

For more information on this best practice see: Land Use, Livable Communities and Transportation (pg. 16)

Best Practice

Promote conservation subdivision zoning

Description: Conservation sub-divisions are a design strategy that requires approximately 50 to 70 percent of buildable land is set aside as open space.

For more information on this best practice see: Land Use, Livable Communities and Transportation (pg. 11)

Measuring Progress

Overview

The Mid-Hudson region, and Orange County in particular, is home to a vibrant agricultural economy and an abundance of open space. From 2007 to 2012 the County increased both the number of farms and total acreage of farmland, trailing only Dutchess County in the Region. Net cash income from agricultural activities nearly tripled during this time period, while average net cash income per operator per farm more than doubled.¹ On the other hand, in 2010 the County accounted for more than a quarter of the Region's agriculture-related GHG emissions, and pressure to develop farm and open land remains a concern. Farming as a career has become increasingly unattainable for the next generation of would-be farmers, who lack access to markets, resources, and affordable land.²

In order to maintain the Region's rural character as well as preserve the quality of life and economic benefits afforded by the agricultural sector, efforts must be made to protect existing farmland and open space, expand it where possible, as well as adopt more sustainable agricultural practices and improve access to resources, training, and markets.

Table 4.1 Orange County Agriculture Baseline Data

	2007	2012
Number of Farms	642	658
Land in Farms (acres)	80,990	88,030
Harvested Cropland (acres)	38,677	38,448
Net Cash Income, Total	\$4,669,000	\$13,037,000
Net Cash Income, Avg. per Farm	\$7,272	\$19,814
Total Value of Land, Buildings, and Equipment	\$483,076,020	\$564,410,166

Source: 2007 and 2012 Census of Agriculture

Table 4.2 Orange County Agriculture GHG Emissions by Source (MTCO₂e), 2010

	Orange County	Region
Enteric Fermentation	21,003	74,769
Manure Management	4,673	12,515
Agricultural Soils	15,111	62,603
Total	40,787	149,887
% of Total	27%	100%

Source: Mid-Hudson Regional GHG Inventory

TABLE 4.3 Orange County Open Space Baseline Data (Acres), 2004

	Permanent	Temporary
Federal	2,830	14,355
State	68,900	
County	2,730	3,960
Municipal	5,840	2,370
Private	9,486	18,200
Total	89,786	38,885

Source: Orange County Open Space Plan, 2004

Metric 4a: Increase farmland - acres of farmland

Significance

Farmland in the Region decreased by approximately 16 percent from 2002 to 2007, a trend that has since reversed; from 2007 to 2012 the Region added approximately 16,000 acres of new farmland, or about a 5 percent increase.³ Orange County added 16 new farms and about 7,000 new acres during this time period.

Promoting the continued expansion of farmland and agricultural activities in Orange County would provide a number of benefits, from strengthening the area's food security to supporting the local economy. More farms means better access to fresh, affordable produce, benefitting rural inhabitants or residents of so-called food deserts (of which there were at least two in Orange County as of 2011⁴). The agricultural sector supports ancillary industries such as feed suppliers, distribution, and veterinarians, among others, as well as encourages tourism. Preservation and expansion of farmland preserves the pastoral character of the Region, discourages sprawl, and, if practiced sustainably, can provide valuable ecosystems services such as carbon sequestration.

How to Measure

Total farmland is measured in acres and data is available at the state and county level from the United States Department of Agriculture.⁵ The Census of Agriculture is conducted every five years, with most recent data available for 2012. The MHRSP sets target dates at 2020, 2035, and 2050; note that corresponding Agricultural Census data, because of the five-year interval, will be available in 2022, 2037, and 2052.

Target Identification

- Develop target goals for 2020, 2035, and 2050 using County or municipality baseline data as a starting point. As a reference, the Mid-Hudson region sets tar-

1 2007 and 2012 Census of Agriculture, USDA, National Agricultural Statistics Service

2 Mid-Hudson Regional Sustainability Plan, p. 7-8.

3 2007 and 2012 Census of Agriculture, USDA, National Agricultural Statistics Service

4 2011 Food Desert Locator Data, USDA, Economic Research Service (Accessed at www.ers.usda.gov/datafiles/.../Archived_Version/data_download.xls)

5 Census of Agriculture, USDA, National Agricultural Statistics Service (Accessed at <http://www.agcensus.usda.gov/>)

get increases of +3%, +6%, and +9% for 2020, 2035, and 2050.

- Calculate the Multiple Year Growth Rate Percentage necessary to reach target goals:

$$\text{Target Annual \% Growth in Farmland} = ((\text{Farmland Goal (acres)}) / (\text{Current Farmland (acres)}))^{(1 / (\text{\#years}))} - 1$$

- Propose and implement strategies for reaching the desired Target Annual % Growth in Farmland.
- At each target year, compare actual farmland acreage with the projected target acreage. Note that because of the 5-year intervals between the USDA's Agricultural Census, corresponding data for each target year will be available in 2022, 2037, and 2052.

Metric 4b: Increase protected land - acres of land preserved from development

Significance

In 2012, the Mid-Hudson region had approximately 618,100 acres of land preserved from development, or about 21 percent of the Region's total land area.⁶ Orange County's 2004 Open Space Plan designates 92,156 acres as permanently protected open space and 36,515 acres as temporarily protected.⁷ These are protected at the Federal, State, County, Municipal, and Private level, and are comprised primarily of parkland and water resources.

Protecting and expanding open space should be a primary goal for the County, especially as its population grows, spurring more development. Access to open space provides physical as well as mental benefits for a community, and various environmental benefits and ecosystem services. Forests and wetlands act as carbon sinks, helping to mitigate climate change; they also improve the quality of groundwater and reduce the Urban Heat Island effect in nearby urban areas. Furthermore, the Region's abundance of open space provides various recreational opportunities, encouraging tourism and aiding the economy.

How to Measure

Orange County's Open Space Plan defines protected open space as "predominantly undeveloped land that is historical, agricultural, recreational, vacant, or any combination thereof in nature and is at least temporarily protected from development."⁸ It further divides this land into Permanently and Temporarily protected open space. The MHRSP suggests measuring the metric in terms of acres per capita, or (Total land preserved) / (Total Population).

Open space data is available from County and municipal open space plans, as well as Scenic Hudson.⁹

Target Identification

The same approach and formula used to measure Farmland acreage can be utilized to measure Protected Land acreage, as well.

- Develop target goals for 2020, 2035, and 2050 using County or municipality baseline data as a starting point. As a reference, the Mid-Hudson region sets target increases of about +14%, +30%, and +38% for 2020, 2035, and 2050.
- Calculate the Multiple-Year Growth Rate Percentage necessary to reach target goals:

$$\text{Target Annual \% Growth in Protected Land} = ((\text{Protected Land Goal (acres)}) / (\text{Current Protected Land (acres)}))^{(1 / (\text{\#years}))} - 1$$

- Propose and implement strategies for reaching the desired Target Annual % Growth in Protected Land.
- At each target year, compare actual protected land acreage with the projected target acreage.

Case Study: Scenic Hudson Land Trust

Local non-profit Scenic Hudson is currently engaged in two efforts which specifically address farmland and open space conservation in the Region. Conserve the Valley's Breadbasket, an initiative based in Red Hook, Dutchess County, works with land trusts, local government, and farmers to conserve agricultural land and maintain land affordability. Saving the Land that Matters Most is a collaboration between Scenic Hudson, land trusts, and government to preserve forests and wetlands and protect biodiversity, as well as enhance local quality of life.¹⁰

Secondary Indicators

Secondary indicators suggested by the Plan for measuring additional progress in the Agriculture and Open Space sector are Increase Farmer Income, Increase Forest Patch Size, and Annual Change in Area of Prime Agricultural Soils. Average patch size (acres of contiguous forest) might grow with sustainable forestry practices and an increase in protected land, and is discussed on pages 7-9 through 7-10 of the Plan. Calculations and data sources for the metrics are located in Appendix B, Table B.4.

⁶ Scenic Hudson, 2012. Protected Land.

⁷ Orange County Open Space Plan, June 2004. I / II - 13.

⁸ Open Space Plan, Chapter IIIA Protected Open Space, 2004. Orange County Department of Planning (Accessed at <http://www.orangecountygov.com/content/124/1362/4586/4592/default.aspx>)

⁹ Scenic Hudson, Land Preservation (Accessed at <http://www.scenichudson.org/ourwork/landpreservation>)

¹⁰ Mid-Hudson Regional Sustainability Plan, C-4 - C-7.

Measuring Template

Table 4.4 Orange County Template for Agriculture and Open Space Measurement

	Indicator	Metric	Current Value	Target		
				2020	2035	2050
Primary	Increase Farmland	Acres of Farmland	88,030 (2012)			
	Increase Protected Land	Acres of Land Preserved from Development	92,156 (Permanent) 36,515 (Temporary) (2004)			
Secondary	Increase Farmer Income	Net Cash Farm Income Per Farm	\$19,814.00 (2012)			
	Increase Forest Patch Size	Avg. Acreage of Contiguous Forest				
	Annual Change in Area of Prime Agricultural Soils					

Water

The Mid-Hudson region benefits from a relative abundance of both surface and groundwater 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 to 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. EJ considerations include the siting of wastewater treatment facilities, which are known to cause negative health impacts and can also be a public nuisance due to the smells. Parts of the Region are also vulnerable to flooding and other water stresses related to climate change, and adverse impacts on the residents—and specifically on vulnerable groups such as EJ communities—must be anticipated and mitigated.

The Plan's water-related goals include reducing consumption, improving the efficiency and reliability of supply and treatment to avoid the siting of additional facilities, and improving watersheds and water quality through changes to water treatment and land use practices. These strategies will help to improve recreational opportunities and quality of life in the Region's communities, while improving habitat for wildlife and flora.

Objectives

**Increase available water supply
by reducing water consumption**







**Improve the reliability of water
treatment and distribution systems
and wastewater treatment
and collection systems**

**Encourage watershed
management planning**

Protect habitat and water quality

**Reduce impervious surface cover
and connect permeable surfaces
to infiltrate and treat stormwater**

Self-Assessment

Downtowns	Edges	Corridors	Crossroads	New Neighborhoods	Rural			
						Best Practices	In Place	In Progress For Future Action
						Increase available water supply by reducing water consumption		
●	●	●	●	●	●	Install water-efficient fixtures and fittings	■	■
●	●	●	●	●	○	Benchmark energy use of water infrastructure	■	■
						Improve the reliability of water treatment and distribution systems and wastewater treatment and collection systems		
●	●	●	●	●	●	Promote LID and/or Green infrastructure techniques such as Rain Gardens, bio-retention areas, vegetated swales, green roofs, porous pavement, tree plantings or tree pits, stormwater planters, rain barrels or cisterns	■	■
●	●	●	○	○	○	Repair existing infrastructure and enforce sump pump removal to reduce the load on wastewater treatment plants	■	■
●	●	●	●	●	○	Implement microgrids at wastewater treatment plans	■	■
○	○	○	○	●	●	Implement greywater reuse systems	■	■
						Protect habitat and water quality		
○	○	○	○	●	●	Wetlands preservation and buffering	■	■
●	●	●	●	●	●	Create coastal overlay district	■	■
○	○	○	●	○	●	Promote conservation subdivision zoning	■	■
						Encourage watershed management planning		
●	●	●	●	●	●	Continue to create and support watershed management plans and programs	■	■
						Reduce impervious surface cover and connect permeable surfaces to infiltrate and treat stormwater		
●	●	●	●	●	●	Utilize cool and/or permeable paving materials	■	■
●	●	●	○	○	○	Incentivize local funding for preventative maintenance and capital improvements by removing impediments to local tax revenue generation	■	■

- Very applicable
- Applicable
- Not applicable

Objective

Increase available water supply by reducing water consumption

Water consumption may be reduced without impacting quality of life for the Region's residents. Water-efficient fixtures reduce water used for domestic and commercial activities. Smart sensor installations can customize irrigation flows based on soil moisture conditions. Greywater systems reuse lightly-used water as non-potable water for irrigation.

Best Practice

Install water-efficient fixtures and fittings

Description: A leaky faucet can waste up to 2,700 gallons of water per year and older toilets use up three gallons per flush, while newer models can use single gallon. Local governments can promote the use of water efficient fixtures in both private residencies and businesses. These fixtures include but are not limited to: low-flow toilets, showerheads, dishwashers and more accurate water meters.

Purpose: Through promoting or mandating efficient water fixtures, the government can encourage individuals and business to conserve water and save money.

How to get started: Adopt performance standards.

Co-benefits: Reduced housing costs.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: 7.23, 3.9

Sources

USEPA: How to Conserve Water and Use it Effectively
<http://water.epa.gov/polwaste/nps/chap3.cfm>

USEPA: Top 10 Water Management Techniques
<http://www.epa.gov/greeningepa/water/techniques.htm>

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_50_8_FINALDec.pdf

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>

United States Geological Survey, 2005. Estimated Use of Water in the United States in 2005, County-Level Data.
<http://water.usgs.gov/watuse/>

Commercial Existing Facilities Program
<http://www.nyserda.ny.gov/All-Programs/Programs/Existing-Facilities-Program>

Sample Implementation Material

EPA Gov - How efficiency Programs Help Water Utilities Save Water and Avoid Costs
http://www.epa.gov/WaterSense/docs/utilityconservation_508.pdf

Best Practice

Benchmark the energy use of water infrastructure

Description: Measuring energy use of water infrastructure is a first step towards identifying strategies to reduce energy. Tools such as the US EPA's Energy Star Portfolio Manager can be readily used for facility benchmarking purposes.

Purpose: A centralized program to benchmark facilities' energy use will provide much needed data that can be used to prioritize investments in energy efficiency.

How to get started: Institute a program that measures the energy usage of water infrastructure.

Co-benefits: Higher energy efficiency, public health, and wellness.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Short.

Time to Benefit: Short.

CSC Reference #: 3.32

Sources

Claudia Copeland - Energy- Water Nexus:

The Water Sector's Energy Use

<https://www.fas.org/sgp/crs/misc/R43200.pdf>

USEPA: Water & Energy Efficiency in

Water and Wastewater Facilities

<http://www.epa.gov/region9/waterinfrastructure/benchmark.html>

USEPA: Cutting Energy Usage & Costs

http://water.epa.gov/infrastructure/sustain/cut_energy.cfm

Water and Wastewater Technical Reports

<http://www.nyserda.ny.gov/About/Publications/Research-and-Development-Technical-Reports/Water-and-Wastewater-Technical-Reports>

NYS EFC's Green Innovation Grant Program

<http://www.efc.ny.gov/Default.aspx?tabid=461>

NYS Hudson River Estuary Program

<http://www.dec.ny.gov/lands/4920.html>

Hudson Valley Regional Council

<http://hudsonvalleyregionalcouncil.org/>

Objective

Improve the reliability of water treatment and distribution systems and wastewater treatment and collection systems

When a large storm sweeps through the Region, water treatment systems can be overwhelmed and dump untreated water straight into the Hudson River or other local watersheds. On top of damaging the local environment, the overwhelmed water systems can flood, leading to property damage and various other daily inconveniences.

The first way to increase the reliability of the Region's water systems is to strengthen asset management and planning for water-related infrastructure. Increasing initial investments in the water systems can prevent unexpected and costly repair charges in the future. Local communities can also reduce the strain on wastewater systems by enforcing sump pump regulations. Sump pumps dump excess groundwater from basements directly into sewage pipes for treatment. This additional amount of water can overwhelm the wastewater system and again, cause treatment centers to dump raw sewage into local bodies of water. Enforcing sump pump removal codes would help reduce the load on wastewater treatment plants.

Best Practice

Repair existing infrastructure and enforce pump removal to reduce the load on wastewater treatment plants

Description: While these improvements have clear benefits for the Regional environment, the financial benefits are often harder to realize. With less clear financial benefits, investment and preventative maintenance in water and wastewater systems have to be incentivized by removing barriers to local tax revenue generation.

Purpose: To reduce the amount of water treated by traditional stormwater plants.

How to get started: Identify where sump pumps are being used.

Co-benefits: Lower electric costs for stormwater treatment.

Details

Initial Investment: Moderate.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:



Community residential infiltration trench in Chester, PA
Source: RPA

Sources

US EPA: Combined Sewer Overflow Technology Fact Sheet, Inflow Reduction
http://water.epa.gov/scitech/wastetech/up-load/2002_06_28_mtb_inflwred.pdf

Sample Implementation Material

AN ORDINANCE AMENDING THE CODE OF CHELTENHAM, Cheltenham, PA: Ordinance for Sump Pump and Groundwater Standards
<http://www.cheltenhamtownship.org/files/documents/stormwater-SumpPumpOrdinance.pdf>

New York State Model Sewer Use Law
<http://www.dec.ny.gov/chemical/8729.html>

Best Practice

Promote LID and/or Green infrastructure techniques, including rain gardens, bio-retention areas, vegetated swales, green roofs, porous pavement, tree plantings or tree pits, stormwater planters, rain barrels or cisterns

Description: 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. Green infrastructure refers to natural or constructed storm-water management systems that emulate the function of an undisturbed catchment, by working to infiltrate stormwater, and work as part of an overall LID strategy.

Purpose: 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 ground-water recharge, the creation of conservation of habitats, water quality improvements, and contribution to healthier, more beautiful neighborhoods.

How to get started: Adopt green infrastructure design guidelines and details.

Co-benefits: Ground-water recharge, the creation of conservation of habitats, water quality improvements.

Details

Initial Investment: Low.

Professional assistance required: No.

Time to Implement: Short, depending on pace of development.

Time to Benefit: Short.

CSC Reference #: 6.1



Planter boxes are ideal landscaping elements in compact urban environments

Source: RPA

Sources

US EPA Low Impact Development (LID) Program

<http://water.epa.gov/polwaste/green/index.cfm>

Minnesota Pollution Control Agency: Stormwater Management-- Low Impact Development and Green Infrastructure

<http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/stormwater-management/low-impact-development-and-green-infrastructure-stormwater-management.html>

University of Denver

<http://www.law.du.edu/documents/rmlui/sustainable-development/LID-Green-Infrastructure.pdf>

U.S. Green Building Council

<http://www.usgbc.org/credits/ss6>

Sample Implementation Material

Columbia University Water Center- Green Infrastructure:

Sustainable Solutions in Eleven Cities

http://water.columbia.edu/files/2014/04/Green_Infrastructure_FINAL.pdf

EPA- Water Infrastructure: Successful Strategies for Local Leadership

http://water.epa.gov/infrastructure/sustain/upload/dvd_si_lgac_fs_casestudies-2.pdf

EPA Gov - Green Infrastructure Case Studies: Municipal Policies for Managing Stormwater with Green Infrastructure

http://www.sustainablecitiesinstitute.org/Documents/SCI/Report_Guide/Guide_EPA_GICaseStudiesReduced4.pdf

Best Practice

Implement microgrids at wastewater treatment plants

Description: Microgrids connect critical power users, such as emergency shelters or sewage treatment plants with a shared source of energy that can be accessed in the event of a failure of the power grid. Microgrids at water treatment plants enable the system to function in case of a power outage, and can be built to use the plant's waste products as a fuel source.

Purpose: Microgrids enable the continued operations of public facilities during emergencies.

How to get started: Identify properties to be included in microgrids and potential power solutions.

Co-benefits: Potential reduction in operating costs.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:

Sources

NYSERDA- Microgrids 101

<http://www.nysenda.ny.gov/All-Programs/Programs/NY-Prize/Microgrids-101>

Sample Implementation Material

Bay Park Sewage Treatment Plant, East Rockaway, NY

<http://liherald.com/eastrockaway/stories/Power-to-the-people,69428>

Best Practice

Implement greywater reuse systems

Description: Greywater is wastewater from bathroom sinks, showers, tubs, and (sometimes) washing machines that is minimally contaminated and can be re-used on-site.

Purpose: Aside from saving water (and money on water bills), reusing greywater keeps it out of the sewer or septic system, thereby reducing the chance that it will pollute local water bodies.

How to get started: Conduct a cost-benefit analysis on installing local greywater reuse systems. Rural communities with on-site septic systems are better suited for these systems, urban centers could require construction of additional sewer collection lines.

Co-benefits: Lowers pollution in local bodies of water.

Details

Initial Investment: High. (Varies).

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Short.

CSC Reference #: 3.9



Yale's Kroon Hall drains rainwater to water gardens, which filter runoff for use in the building's toilets

Source: RPA (Amanda Kennedy)

Sources

New York State Department of Environmental Conservation: Potential Reuses of Greywater and Reclaimed Wastewater in New York State, 2010
http://www.dec.ny.gov/docs/water_pdf/waterresue.pdf

Greywater Action: About Greywater Reuse
<http://greywateraction.org/content/about-greywater-reuse/>

LEEDUser

<http://www.leeduser.com/credit/NC-v2.2/WEc2>

Sample Implementation Material

NY Greywater Law

https://www.health.ny.gov/regulations/nycrr/title_10/part_75/appendix_75-a.htm

City of Santa Monica, CA: A Guide to Developing a Greywater System in Santa Monica:

http://www.smgov.net/uploadedFiles/Departments/PCD/Applications-Forms/Greywater_System_Permitting_Checklist.pdf

U.S. Green Building Council

<http://www.greywater-systems.com/regs.htm>

Objective

Protect habitat and water quality

Water quality is important for the health of the region's wildlife and for industries such as agriculture and aquaculture, which depend on surface and groundwater sources. The Mid-Hudson region also depends on groundwater as an important source of drinking water. Once a groundwater resource is contaminated, it is difficult or impossible to remediate it.

Best Practice

Wetlands preservation and buffering

Description: Wetland buffers are vegetated zones located between wetlands and adjacent areas subject to human alteration. Streams require forested buffers in order to maintain water temperature and to ensure a food supply for fish. Human use in these areas must be carefully controlled, and in some cases, prohibited to preserve natural function and to maintain the qualities that give these areas their value.

Purpose: Wetlands should be protected for their social, economic, and ecological value.

How to get started: Identify at risk wetlands.

Co-benefits: Preserves wildlife and vegetation habitat and water quality.

Details

Initial Investment: Low. May require changes to subdivision regulations requiring a public process.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium. Benefit will come from disruptive activities avoided by preservation.

CSC Reference #: 7.12



Preserved wetlands in New Jersey

Source: RPA (Amanda Kennedy)

Sources

Alliance for the Chesapeake Bay- Riparian Buffer Preservation
<http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/subjects/streamreleaf/Docs/1506bufferpreserve.pdf>

U.S. Green Building Council
<http://www.usgbc.org/credits/neighborhood-development-plan-neighborhood-development/v4-draft/sllp3>

Sample Implementation Material

Passaic River Coalition & New Jersey Department of Environmental Protection- Riparian Buffer Conservation Zone Model Ordinance
<http://www.state.nj.us/dep/watershedmgmt/DOCS/pdfs/StreamBufferOrdinance.pdf>

Best Practice

Create coastal overlay district

Description: Identify and prioritize significant environmental natural areas within their boundaries. Once these areas are designated, communities should consider adoptive protective ordinances which limit or regulate development in these areas.

Purpose: Coastal overlay districts protect coastal resources and environments.

How to get started: Map vulnerable areas. Initiate community-based planning effort.

Co-benefits: Provides open space and aesthetic appeal. Protected natural areas may increase nearby property values.

Details

Initial Investment: Low to Moderate depending on scope/ambition.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium to long.

CSC Reference #: 6.19



Staten Island Bluebelt Stormwater Management

Source: NYCEDP Project. http://www.nyc.gov/html/dep/html/dep_projects/bluebelt.shtml

Sources

Town of Tusten Open Space and Natural Resources

http://tusten.org/Tusten_Natural_Resources.pdf

NY State Department of Environmental Conservation

http://www.dec.ny.gov/docs/remediation_hudson_pdf/hrebch.pdf

NY Gov Coastal Overlay Districts

http://docs.dos.ny.gov/communitieswaterfronts/LWRP/Lloyd%20Harbor_V/Original/LloydHarborAppA.pdf

Town of Ulysses Conservation District

<http://www.ulysses.ny.us/pdf/Zoning-Conservation-DRAFT-9-10-12.pdf>

U.S. Green Building Council

<http://www.usgbc.org/credits/neighborhood-development-plan-neighborhood-development/v4-draft/sllp5>

Sample Implementation Material

Village of Mamaroneck - Local Waterfront Revitalization Program

http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_WebDocs/COMPLETE%20WORKING%20DRAFT.pdf

Best Practice

Promote conservation subdivision zoning

Description: Conservation subdivisions are a design strategy that require between 50 and 70 percent of buildable land be set aside as open space.

For more information on this best practice, see: Land Use, Livable Communities and Transportation (pg. 11)

Objective

Reduce impervious surface cover and connect permeable surfaces to infiltrate and treat stormwater

By replacing impervious surfaces with permeable surfaces, we can reduce water treatment costs, reduce the energy footprint of the stormwater system and recharge groundwater. Over 10 % of the Mid-Hudson region's ground is covered by impervious surfaces, like concrete or asphalt. During storms, rainwater runs off these impervious surfaces and is piped to treatment facilities. This current system of stormwater management is detrimental to the region in two ways. First, stormwater treatment plants take money and energy to operate. When the plants are overwhelmed by large storms, they dump untreated water into local watersheds. By reducing impervious surface cover, less water is sent to stormwater treatment plants, which conserves money and energy and protects local watersheds. Second, impervious systems do not allow rain to recharge local groundwater. Less groundwater means dry wells, higher irrigation costs for farmers and a greater regional reliance on external water sources.

Best Practice

Incentivize local funding for preventative maintenance and capital improvements by removing impediments to local tax revenue generation

Description: Some communities have experimented with "rain taxes" that charge users for the amount of stormwater runoff generated by a property, revenue that is used to repair or expand water treatment systems.

Purpose: Stormwater fees incentivize on-site treatment and provide revenue for investment.

How to get started: Identify whether heavy stormwater flows could be discouraged by pricing.

Co-benefits: Reduction in paved areas.

Details

Initial Investment: Low.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #:

Sources

Sample Implementation Material

State of Illinois- Public Act 098-0335

<http://ilga.gov/legislation/publicacts/fulltext.asp?Name=098-0335>

Best Practice

Utilize cool and/or permeable paving materials

Description: Cool or permeable pavement materials reflect a large percentage of solar energy or enhance water evaporation, helping to mitigate the urban heat island effect.

For more information on this best practice, see: Energy (pg. 43)

Objective

Encourage watershed management planning

Our water system respects no municipal or government boundaries. Pollutants that enter a river upstream carry negative impacts with them throughout a watershed. The best way to combat pollution of groundwater and surface water is to implement coordinated and enforceable watershed management programs throughout the Region. These management programs should focus on maintaining and improving watershed quality. The implementation of these programs will ensure the long-term availability of high quality drinking water and habitat in the Region.

Best Practice

Continue to create and support watershed management plans and programs

Description: Watershed management programs implement land use and water management practices to protect wetlands and water quality, often by coordinating multiple municipal management programs across a single watershed.

Purpose: Watershed management programs protect the quality of water entering a watershed and preserve critical riverine and coastal habitats.

How to get started: Identify critical watersheds, adopt local preservation practices, and begin to coordinate with other jurisdictions within a shared watershed. Leverage leaders in watershed management such as Hudson River Alliance to guide administration and program formation.

Co-benefits: Preservation of wildlife and plant habitat and protection of water sources.

Details

Initial Investment: Moderate. May require inter-municipal agreements and changes to zoning and subdivision ordinances.

Professional assistance required: Yes.

Time to Implement: Medium.

Time to Benefit: Medium.

CSC Reference #: 7.1



Vegetation surrounding Lincoln Park's North Pond, Chicago, Illinois
Source: APA (Carolyn Torma)

Sources

Central New York Regional Planning and Development Board Oneida Lake and Watershed Advisory Council - A Management Strategy for Oneida Lake and its Watershed
<http://www.cnyrpd.org/oneidalake/ManagementStrategy.asp>

EPA - A Quick Guide to Developing Watershed Plans to Restore and Protect Our Waters
http://water.epa.gov/polwaste/nps/upload/watershed_mgmt_quick_guide.pdf

Hudson River Alliance

<http://www.hudsonwatershed.org/>

Sample Implementation Material

Westchester County - Bronx River Watershed Management Plan (Volume 1)
http://www.cwp.org/online-watershed-library/doc_download/83-bronx-river-watershed-assessment-and-management-report

EPA- A Quick Guide to Developing Watershed Plans to Restore and Protect Our Waters
http://water.epa.gov/polwaste/nps/upload/watershed_mgmt_quick_guide.pdf

Measuring Progress

Overview

Between 2005 and 2010, water withdrawals in Orange County decreased by about 480 million gallons per day (MGD), with the sharpest decline coming from the thermoelectric sector. Public supply withdrawals also decreased during this time period, as well as withdrawals from the industrial, livestock, and mining sectors. Domestic supply and irrigation withdrawals increased, however, by about 2 and 1.7 MGD respectively. Despite a relative abundance of surface and groundwater, Orange County and the Region should continue to reduce water withdrawals in order to ensure a potable water supply, mitigate associated GHG emissions from water treatment plants, and preserve the integrity of aquatic ecosystems upon which various economic and recreational activities depend.

Table 5.1 Orange County Water Withdrawals per Sector (MGD), 2005 and 2010

	2005	2010
Public Supply	33.07	24.81
Domestic Supply	5.75	7.73
Industrial	9.14	0.01
Irrigation	1.81	3.50
Livestock	0.36	0.19
Aquaculture	0.00	0.00
Mining	0.81	0.09
Thermoelectric	804.15	338.06
Total	855.09	374.39

Source: USGS, 2005 & 2010. Estimated Use of Water in the United States, County-Level Data

Table 5.2 Orange County Water Quality Impairments, 2007

	Orange County	Region
# of Impaired Streams or Water Bodies	3	50
Total Assessed	22	203
% Impaired of Total Assessed	13.6	24.63
Assessed/Total	22/155	203/897

Source: NYSDEC, 2007. Waterbody inventory and priority waterbodies list.

Metric 5a: per capita water withdrawals for domestic self-supply

Significance

Approximately 30 percent of the Region relies on private, domestic self-supplied water for “drinking, food prepara-

tion, bathing, washing clothes and dishes, flushing toilets, watering lawns and gardens, and maintaining pools.”¹ From 2005 to 2010, Orange County’s domestic self-supply withdrawals grew from 5.75 MGD to 7.73 MGD, an increase of about +35 percent, or 5.31 gpcd.

In a future threatened by climate change, water conservation through efficiency measures and public education programs will be an important component of regional sustainability. Though the U.S. EPA projects increased precipitation for the Northeast,² the potential for both drought and groundwater contamination from saline intrusion makes water conservation a necessary measure. Reducing withdrawals for domestic self-supply will increase the available water supply and reduce impacts to stream flows and groundwater resources, as well as reduce health risks associated with contamination of private wells.³

How to Measure

Domestic Self-Supply water withdrawals are measured in millions of gallons/day (MGD), and data is available at the state and county level every five years from the United States Geological Survey.⁴ The most recent data is from 2010; 2015 measurements will be taken beginning in 2016. Domestic self-supply is the total of both groundwater and surface water withdrawals (“Domestic, total self-supplied withdrawals, fresh,” or “DO-WFrTo” in the USGS dataset) withdrawn from a private source such as a well.⁵ The MHRSP suggests calculating the metric using the formula (Total water withdrawals for domestic self-supply) / (Total population) to get gpcd, or gallons per capita daily.

Target Identification

The Mid-Hudson region, with a current domestic self-supply withdrawal rate of 75 gpcd,⁶ has set target reductions of -25%, -45%, and TBD for 2020, 2035, and 2050. Orange County has a current MGD of 7.73 and gpcd of 20.74. In order to develop realistic target reductions in withdrawals, the County or municipality will need to account for future population growth and potential changes in the area’s water supply infrastructure.

- Develop target reductions (%) for 2020, 2035, and 2050, accounting for future population growth,⁷ infrastructural improvements, and water efficiency education programs. Once targets are established, the following formula can be used to find corresponding reductions per capita (in gallons):

1 USGS, Domestic Water Use (Accessed at <http://water.usgs.gov/watuse/wudo.html>)

2 U.S. EPA, Climate Impacts in the Northeast (Accessed at <http://www.epa.gov/climatechange/impacts-adaptation/northeast.html>)

3 Orange County Department of Health, Healthy Orange - Private Wells (Accessed at <http://www.healthyorange.com/section/healthy-environment/private-wells>)

4 USGS, Water Use in the United States (Accessed at <http://water.usgs.gov/watuse/>)

5 USGS, Domestic Water Use

6 Mid-Hudson Regional Sustainability Plan, p. 8-17.

7 Census data, Cornell PAD, or NYMTC SED data can be used to project future population growth.

$X = [(Current Domestic MGD)(\% Reduction)/100]$, then
 $(Current Domestic MGD - X) / (Future Population) = Target\ gpcd$

- Propose and implement strategies for meeting target reductions.
- At each target year, obtain Census population data and USGS Water Use data for domestic self-supply. (Note that corresponding USGS data will be available in 2021, 2036, and 2051). Divide total water withdrawals for domestic self-supply by the area's total population to get actual gpcd.
- Compare actual reduction in gpcd to target goals.

Metric 5b: Per capita water withdrawals for public supply

Significance

Approximately 70 percent of domestic users in the Region rely on public water supply, withdrawn and delivered by private and public suppliers. Public water supply is also used for some commercial and industrial purposes, as well as public services such as public pools, parks, firefighting, water and wastewater treatment, and municipal buildings.⁸ Public supply withdrawals in Orange County decreased from 33.07 MGD in 2005 to 24.81 MGD in 2010, a decline of about -33 percent, or 22.16 gpcd.

In addition to increasing the available water supply and reducing impacts to stream flows and groundwater sources, reducing public supply withdrawals can reduce new infrastructure needs and save a significant amount of energy required for water and wastewater treatment.⁹ Cutting down on water and wastewater treatment through increased efficiency, water reuse, and public education programs would likewise decrease associated GHG emissions from the water treatment sector, which accounted for 36,270 MTCO₂e in Orange County in 2010.

How to Measure

Public Supply withdrawals, like domestic self-supply, are measured in millions of gallons/day (MGD) and data is available every five years from the U.S. Geological Survey.¹⁰ Public Supply is the total of both groundwater and surface water withdrawals ("Public supply, total withdrawals, fresh," or "PS-WFrTo" in the USGS dataset) by public and private water suppliers, delivered to users for domestic, commercial, and industrial purposes.¹¹ The formula (Total water withdrawals for public supply) / (Total population) will give you gallons per capita daily (gpcd).

Target Identification

The Mid-Hudson region currently has a public supply withdrawal rate of 95 gpcd, and sets target reductions at -25%, -45%, and -60% for 2020, 2035, and 2050. Orange County has a current public supply withdrawal rate of 66.55 gpcd (24.81 MGD total). The process for identifying targets and measuring progress is nearly identical to that for measuring domestic self-supply, described earlier.

- Develop target reductions (%) for 2020, 2035, and 2050, accounting for future population growth, infrastructural improvements, and water efficiency education programs. Then use the following formula to find corresponding reductions per capita (in gallons):

$X = [(Current Public MGD)(\% Reduction)/100]$, then
 $(Current Public MGD - X) / (Future Population) = Target\ gpcd$

- Propose and implement strategies for meeting target reductions.
- At each year, obtain Census population data and USGS water use data for public supply. (Note that corresponding USGS data will be available in 2021, 2036, and 2051). Divide total water withdrawals for public supply by the area's total population to get actual gpcd.
- Compare actual reduction in gpcd to target goals.

Case Study: Massachusetts Water Research Authority

With a clientele of 2.2 million people, the Massachusetts Water Research Authority (MWRA) serves a population similar in size to that of the Mid-Hudson region. Faced with exceedingly high withdrawal rates and an expensive plan to divert the Connecticut River, the MWRA opted instead to implement various efficiency measures. These included detecting and repairing leaks in MWRA and community pipes; retrofitting homes with low-flow plumbing devices; developing a water management program for area businesses and municipal buildings; improving meters to more accurately track water use; and conducting public information programs, among others.¹² The plan reduced average daily demand from 336 MGD to 256 MGD over ten years, and saved between \$111 and \$153 million.

Local examples of water efficiency projects include the Poughkeepsie Underwear Factory Demonstration Project, SUNY New Paltz Watershed Resilience Project, Cornell Cooperative Extension Municipal Septic Density Analysis, and others, described in detail in the Mid-Hudson Regional Sustainability Plan.¹³

8 USGS, Public Supply Water Use (Accessed at <http://water.usgs.gov/watuse/wups.html>)

9 Mid-Hudson Regional Sustainability Plan, p. 8-4.

10 USGS, Water Use in the United States (Accessed at <http://water.usgs.gov/watuse/>)

11 USGS, Public Supply Water Use

12 U.S. EPA. Cases in Water Conservation: How Efficiency Programs Help Water Utilities Save Water and Avoid Costs (Accessed at http://www.epa.gov/WaterSense/docs/utilityconservation_508.pdf), p. 27.

13 Mid-Hudson Regional Sustainability Plan, p. 8-21 - 8-22.

Secondary Indicators

The Water Loss Rate for Potable Water Supply Systems indicator is closely tied to the primary indicators in that increased efficiency measures for reducing water withdrawals should also reduce the loss rate, mostly due to leakage. This and the other secondary indicators, as well as noted limitations in measuring them, are described on pages 8-16 through 8-18 of the Plan. Calculations for measuring and relevant data sources are available in Appendix B, Table B.5.

Measuring Template

Table 5.3 Orange County Template for Water Measurement

	Indicator	Metric	Current Value	Target		
				2020	2035	2050
Primary		Per Capita Water Withdrawals for Domestic Self-Supply	20.74 gcpd			
		Per Capita Water Withdrawals for Public Supply	66.55 gcpd			
Secondary	Reduce Overall Watershed Impervious Cover	HUC 12 Watersheds with >10% Impervious Cover				
	Stream/Water Body Impairment	Percent of Assessed 303(d) Streams/Water Bodies that are Impaired	13.6			
		Water Loss Rate for Potable Water Supply Systems throughout the Region (as a percent of annual supply)				



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